DSA BACK CHECK SUBMITTAL 3-29-2018
TECHNICAL SPECIFICATIONS

FOR

MOORPARK COLLEGE GYMNASIUM RENOVATION

VENTURA COUNTY COMMUNITY COLLEGE DISTRICT
Bid No. 550

DSA IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

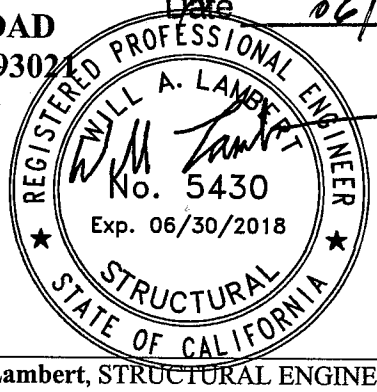
03 118379

AC FLS ZH SS PO
Date 06/19/18

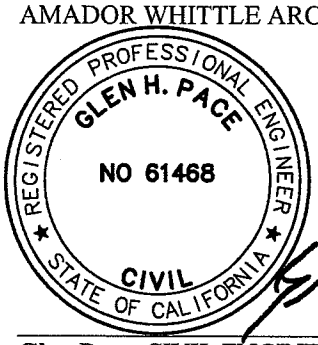
FOR

MOORPARK COLLEGE
7075 CAMPUS ROAD
MOORPARK, CA 93021

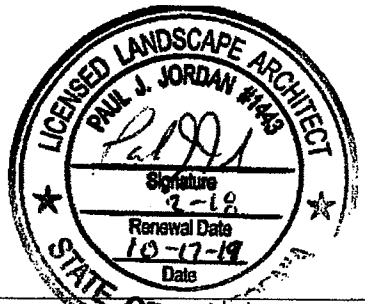
William J Amador AIA, ARCHITECT
AMADOR WHITTLE ARCHITECTS, INC



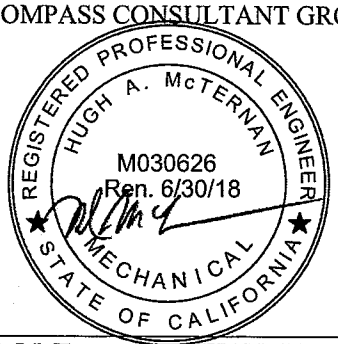
Will Lambert, STRUCTURAL ENGINEER
ORION STRUCTURAL ENGINEERS



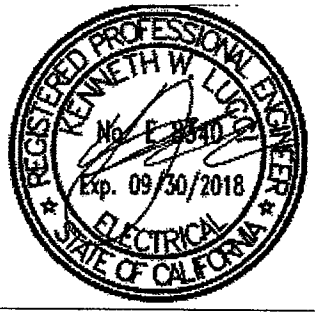
Glen Pace, CIVIL ENGINEER
ENCOMPASS CONSULTANT GROUP



Paul Jordan, LANDSCAPE ARCHITECT
JORDAN, GILBERT & BAIN



Hugh McTernan, MECHANICAL ENGINEER
AE GROUP MECHANICAL ENGINEERS, INC.



Ken Lucci, ELECTRICAL ENGINEER
LUCCI & ASSOCIATES, INC.

TECHNICAL SPECIFICATIONS
FOR
MOORPARK COLLEGE GYMNASIUM RENOVATION

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 1 – GENERAL REQUIREMENTS

DIVISION 2 - DEMOLITION

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DIVISION 5 – METAL FABRICATIONS

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

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DIVISION 9 - FINISHES

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APPENDIX

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SECTION 01 1100

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The furnishing of all labor, materials, equipment, services, and incidentals necessary for Work of the Gymnasium Renovation Project at Moorpark College located at 7075 Campus Road, Moorpark, California 93021, as set forth in the Construction Documents which include, but are not limited to, the Drawings, Addenda and Specifications.

1.02 RELATED REQUIREMENTS:

1. Section 01 1216: Phasing of the Work.

2. Section 01 3113: Project Coordination.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 USE OF PREMISES

A. CONTRACTOR shall coordinate Work of all trades, Subcontractors, utility service providers, with OWNER and/or Separate Work Contract. CONTRACTOR shall sequence, coordinate, and perform the Work to impose minimum hardship on the operation and use of the existing facilities and/or Project site. CONTRACTOR shall install all necessary protection for existing improvements, Project site, property, and new Work against dust, dirt, weather, damage, vandalism, and maintain and relocate all protection to accommodate progression of the Work.

B. CONTRACTOR shall confine entrance and exiting to the Project site and/or facilities to routes designated by the OWNER.

C. Within existing facilities, OWNER will remove portable equipment, furniture, and supplies from Work areas prior to the start of Work. CONTRACTOR shall cover and protect remaining items in areas of the Work.

D. CONTRACTOR is advised school may be in session during performance of the Work. CONTRACTOR shall utilize all available means to prevent generation of unnecessary noise and maintain noise levels to a minimum. When required by the OWNER, CONTRACTOR shall immediately discontinue noise-generating activities and/or

provide alternative methods to minimize noise generation. CONTRACTOR shall install and maintain air compressors, tractors, cranes, hoists, vehicles, and other internal combustion engine equipment with mufflers, including unloading cycle of compressors. CONTRACTOR shall discontinue operation of equipment producing objectionable noise as required by the OWNER.

E. CONTRACTOR shall furnish, install, and maintain adequate supports, shoring, and bracing to preserve structural integrity and prevent collapse of existing improvements and/or Work modified and/or altered as part of the Work.

F. CONTRACTOR shall secure building entrances, exits, and Work areas with locking devices as required by the OWNER.

G. CONTRACTOR assumes custody and control of OWNER property, both fixed and portable, remaining in existing facilities vacated during the Work.

H CONTRACTOR shall cover and protect surfaces of rooms and spaces in existing facilities turned over for the Work, including OWNER property remaining within as required to prevent soiling or damage from dust, dirt, water, and/or fumes. CONTRACTOR shall protect areas adjacent to the Work in a similar manner. Prior to OWNER occupancy, CONTRACTOR shall clean all surfaces including OWNER property.

I. CONTRACTOR shall not use or allow anyone other than OWNER employees to use facility telephones and/or other equipment, except in an emergency. CONTRACTOR shall reimburse OWNER for telephone toll charges originating from the facility except those arising from emergencies or use by OWNER employees.

J. CONTRACTOR shall protect all surfaces, coverings, materials, and finished Work from damage. Mobile equipment shall be provided with pneumatic tires.

K. CONTRACTOR is advised OWNER may award Separate Work Contracts at this Project site.

L. CONTRACTOR shall not permit the use of portable and/or fixed radio's or other types of sound producing devices including walkmans and similar devices.

3.02 PROPERTY INVENTORY

A. Property, OWNER intends to remove property before a room or space is vacated for the Work. Before performing Work in each room or space, OWNER and CONTRACTOR shall prepare a detailed initial written inventory of OWNER property remaining within, including equipment and telephone instruments and the condition thereof. OWNER and CONTRACTOR shall retain a signed copy of the inventory dated and signed by both parties. Prior to subsequent OWNER occupancy of each such room or space, OWNER and CONTRACTOR shall perform a final inventory of

OWNER property and all discrepancies between the initial inventory and final inventory shall be the responsibility of CONTRACTOR.

3.03 FURNITURE, FIXTURES AND EQUIPMENT (MATERIALS) OWNER FURNISHED CONTRACTOR INSTALLED (OFCI)

A. Certain materials identified in the Contract Documents as OWNER Furnished CONTRACTOR Installed, OFCI, will be delivered to the Project site by the OWNER.

B. If designated in the Contract Documents to be OWNER furnished CONTRACTOR installed, (OFCI), CONTRACTOR shall unload, store, uncrate, assemble, install, and connect OWNER supplied materials.

C. Ninety days before the date the CONTRACTOR needs to have the OFCI materials on site, CONTRACTOR shall notify OWNER of the scheduled date for needed OFCI materials. Upon delivery to Project site, CONTRACTOR shall store OFCI materials inside rooms and/or protected spaces and will be responsible for security of OFCI materials until Substantial Completion. OWNER will sign receipt or bill of lading as applicable.

D. CONTRACTOR shall, within ten days after delivery, uncrate and/or unpack OFCI materials in presence of OWNER who shall inspect delivered items. OWNER shall prepare an inspection report listing damaged or missing parts and accessories. OWNER shall transmit one copy of the report to CONTRACTOR. OWNER will procure and/or replace missing and or damaged OFCI materials, as indicated in inspection report.

E. CONTRACTOR shall install OFCI materials in the locations and orientation as indicated in the Contract Documents. CONTRACTOR shall verify exact locations with OAR before final installation of OFCI materials.

F. If required, OWNER will furnish setting and or placement drawings for OFCI materials.

G. CONTRACTOR shall install OFCI materials by proper means and methods to ensure an installation as recommended by the manufacturer. CONTRACTOR shall furnish and install all necessary fasteners and required blocking to properly install OFCI materials.

H. CONTRACTOR shall install OFCI materials with manufacturer recommended fasteners for the type of construction to which the OFCI materials are being fastened and/or anchored.

I. CONTRACTOR shall provide final connections of any electrical, signal, gas, water, waste, venting and/or similar items to OFCI materials. CONTRACTOR shall, prior to

final connection, verify the operating characteristics of OFCI materials are consistent with the designated supply.

3.04 FURNITURE, FIXTURES AND EQUIPMENT (Materials) - OWNER furnished, OWNER installed (OFOI)

A. Certain materials are identified in the Contract Documents as OWNER Furnished, OWNER Installed (OFOI)

B. On dates and during times designated by OWNER, CONTRACTOR shall provide clear off-loading, receiving, protected storage, and OWNER'S dumpster space areas for the use of OWNER or OWNER'S third party OFOI installation contractors. At such times, CONTRACTOR shall also make clear routes and access available to all rooms and spaces to receive OFOI materials.

C. On dates and during times designated by OWNER, CONTRACTOR shall provide access to the elevators for use of OWNER or OWNER'S third party OFOI installation contractors.

D. CONTRACTOR shall cooperate fully with OWNER or OWNER'S third part OFOI installation contractors.

E. CONTRACTOR may be requested by OWNER to provide supplemental labor and equipment to support OFOI activities. Such requests must be submitted in accordance with the change order clauses of Contract.

F. Immediately prior to mobilization of OWNER or OWNER'S third party OFOI installation contractors, OWNER shall document the condition of the Work in areas to be utilized for OFOI activities.

G. CONTRACTOR shall not be responsible for damage caused by OWNER or OWNER'S forces. OWNER shall document the condition of the Work and report to CONTRACTOR any damage in areas utilized for OFOI activities.

END OF SECTION

SECTION 01 1216
PHASING OF THE WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for phasing of Work include logistics, phasing, and completion of designated phases prior to commencement of subsequent phases.

1.02 RELATED REQUIREMENTS

A. Section 01 1100: Summary of Work.

B. Section 01 3113: Project Coordination.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 SUBMITTALS

A. CONTRACTOR shall submit a Project site logistics plans in accordance with and as required by this Section.

3.02 LOGISTICS

A. Prior to commencement of Work, CONTRACTOR shall prepare and submit to OWNER, a detailed Project site logistic plan, in same size and scale of Drawings, setting forth CONTRACTOR plan of Work relative to following, but not limited to, items:

1 Hauling route shall be in accordance with local ordinances a truck access route to and from Project site.

2. The identification of any overhead wire restrictions for power, street lighting, signal or cable.

3. Local sidewalk access and street closure requirements.

4. Protection of sidewalk pedestrians and vehicular traffic.

5. Project site fencing and access gate locations.

6. Construction parking.

7. Material staging or delivery areas.

8. Material storage areas.

9. Temporary trailer locations.

10. Temporary service location and proposed routing of all temporary utilities.

11. Location of temporary or accessible fire protection.

12. Trash removal and location of dumpsters.

13. Concrete pumping locations.

14. Crane locations.

15. Location of portable sanitary facilities.

16. Mixer truck wash out locations.

17. Traffic control signage.

18. Perimeter and site lighting.

20. Stockpile or lay down areas.

21. Security lighting

B. Revised Project site logistic plan may be required by OWNER for separately identified phases of Work as set forth in this Section.

C. CONTRACTOR is responsible for securing and/or obtaining all approvals and permits from authorities having jurisdiction relative to any activities set forth in Article 3.02.A.

3.03 PHASING OF THE WORK

A. Project will be constructed in separate Milestone increments, as identified or as described in this Section or Contract Documents. Phasing will also delineate Work to be completed in each designated phase. Unless otherwise approved or directed by OWNER, each phase shall be completed according to approved Baseline Schedule prior to commencement of next subsequent phase.

B. CONTRACTOR shall install all necessary Work for, but not limited to, power, lighting, signal, HVAC, drainage, and plumbing systems in phased Work before completion of designated phase. All valves, pull boxes, stub outs, temporary

capping, and other Work necessary for phased completion and operation of all necessary systems shall be provided whether or not such Work is specifically identified in Contract Documents.

3.04 PHASING OF THE WORK – GENERAL

A. CONTRACTOR shall prepare Construction Schedule in order to complete Work and related activities in accordance with phasing plan as established. CONTRACTOR shall include all costs to complete all Work within Milestones or Contract Time.

B. OWNER will be seriously damaged by not having all Work completed within Milestones or Contract Time. It is mandatory Work be complete within Milestones or Contract Time.

3.05 PHASING OF THE WORK – SPECIFIC

A. CONTRACTOR shall prepare Construction Schedule, and shall complete following, but not limited to Milestones, within designated phases in accordance with following:

1. Phase 1 Mobilization –calendar days **1 to 30**:

   a. Set up temporary facilities.
   b. Prepare and submit project schedule for approval.
   c. Process project submittals.
   d. Provide temporary facilities to allow for continued occupancy of Gymnasium, Wrestling and Exercise areas West of Grid Line H including, but not limited to:
      i. Barricades and environmental barriers.
      ii. Temporary Exit and Maximum Occupancy signs.
      iii. Power, lighting, signal, data, ventilation and fire alarm.
      iv. Clear access to/from exterior doors to Gymnasium, Wrestling and Exercise.
      v. Provide four fire alarm pull stations in construction areas for emergency notification.
      vi. Provide up to twelve web-based surveillance cameras throughout project area compatible with campus network system.
         1. Pansonic WV-SFN 531, cable connected to existing network within Gymnasium.
         2. Cameras shall be turned over to the OWNER at completion of project.
   e. Protect power to tennis courts which are fed from Gymnasium power panel.

2. Phase 2 Construction, Gymnasium, Wrestling and Exercise occupied – calendar day **31 to April 14, 2019**:

    a. Demolition and construction of all work east of Grid Line H.
    b. Maintain operation of UV-1 for ventilation of Gymnasium, Wrestling mezzanine and Exercise mezzanine.
    c. Maintain all power, lighting and fire life safety features for Gymnasium, Wrestling mezzanine and Exercise mezzanine.

3. Phase 3 Construction, vacant building – (**47**) calendar days, **April 15, 2019 to May 31, 2019**:

    a. Complete all demolition and construction work within the Gym – G-1.
    b. Complete the new walls at Grid Lines 3 and 10 between Grid Lines H and K to separate Gym - G-1 from Cardio – 213A and Fitness – 206A and 206B.
    c. Complete installation of AH-2 to provide ventilation only (no heating or cooling necessary) to Gym - G-1.
    d. Provide temporary or permanent lighting, power, signal, data, fire life safety for Gym - G-1.

4. Phase 4 Construction, Gym - G-1 occupied – **June 1, 2019** to calendar day **365**:

    a. Complete construction of balance of work.

5. Phase 5 Administrative Closeout – (**30**) calendar days:

    a. Final commissioning.
    b. Prepare close-out documents including but limited to as-built drawings, maintenance and operations manuals, warranties and DSA forms.
    c. Complete staff training.
    d. Removal of temporary facilities.
    e. Final cleaning.

B. The Contract Time shall be a total of (**395**) calendar days from date of commencement of Contract Time.

END OF SECTION

SECTION 01 2613

REQUEST FOR CLARIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Procedure for requesting clarification of the intent of the Contract Documents.

1.02 RELATED REQUIREMENTS

A. Section 01 1100: Summary of Work.

B. Section 01 3113: Project Coordination.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 PROCEDURE

A. CONTRACTOR shall prepare a Request for Clarification on the form provided at the end of this section. CONTRACTOR shall transmit the Request for Clarification to ARCHITECT with a concurrent copy to the OWNER.

B. ARCHITECT response is a clarification of the intent of the Contract Documents and does not authorize changes in the Contract Amount, Milestones and/or Contract Time.

C. A Request for Clarification may be returned with a stamp or notation "Not Reviewed," if:

1. The requested clarification is ambiguous or unclear.

2. CONTRACTOR has not reviewed the Request for Clarification prior to submittal.

D. Allow a minimum of nine days for review and response time, after receipt by ARCHITECT and OWNER. CONTRACTOR shall verify and is responsible in verifying ARCHITECT and OWNER receipt of a Request for Clarification.

E. Changes or alterations to the approved drawings or specifications shall be made by means of addenda or change orders as per section 4-338 of the California Building Standards Commission's, California Administrative Code.

END OF SECTION

Ventura County Community College District

Moorpark College - Facilities, Maintenance & Operations

REQUEST FOR CLARIFICATION *(RFC)*

School Name: Moorpark College

RFC Number: _____

Project Name: Gymnasium Renovation

Date: _____

Project Description: Remodel of Building Interior & Sitework

Project No.: 16-MPC-023

Issued To: (AOR) Amador-Whittle Architects
(Architect)

Contract No.: Bid # 550

Drawing Number Detail _____ Specification Section _____ Sub-Contractor RFC No. _____

Request:

Request Issued by:

_____ _____ _____
Contractor's Name ***Signature*** ***Date***

Response:

Response Issued by:

_____ _____ _____
Architect's Signature ***Name (Printed)*** ***Date***

This Form Cannot Modify Contract Amount or Milestones and/or Contract Time.

cc:

SECTION 01 3113

PROJECT COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements necessary for coordinating Work operations including, but not limited to, the following:

1. General coordination procedures.

2. Coordination drawings.

1.02. RELATED REQUIREMENTS

A. Section 01 1216: Phasing of the Work.

B. Section 01 4523: Testing and Inspection.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 COORDINATION

A. CONTRACTOR shall coordinate operations included in various sections of Contract Documents to assure efficient and orderly installation of each part of Work. Coordinate Work operations included under related sections of Contract Documents that depend on each other for proper installation, connection, and operation of Work, including but not limited to:

1. Schedule construction operations in sequence required where installation of one part of Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

3. Provide provisions to accommodate items scheduled for later installation.

4. Prepare and administer provisions for coordination drawings.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required in notices, reports, attendance at meetings, and:

1. Prepare similar memoranda for OWNER and Separate Work Contract where coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of Work. Such administrative activities include, but are not limited to, following:

1. Preparation of schedules.

2. Installation, relocation, and removal of temporary facilities.

3. Delivery and processing of submittals.

4. Progress meetings.

5. Project closeout activities.

D. Conservation: Coordinate Work operations to assure operations are carried out with consideration given to conservation of energy, water, materials, and:

1. Salvage materials and equipment involved in performance of, but not actually incorporated into Work.

END OF SECTION

SECTION 01 3119

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements for Project meetings, including but not limited to, the following:

1. Job start meeting.
2. Pre-installation conferences.
3. Progress meetings.
4. Meetings as required by OWNER.

1.02 RELATED REQUIREMENTS

A. Section 01 1216: Phasing of the Work.

B. Section 01 3113: Project Coordination.

PART 2 – PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 JOB START MEETING

A. OWNER will schedule a job start meeting before starting the Work, at a time and date determined by OWNER. Meeting shall be held at the Project site or another location as determined by OWNER. Meeting will be held in order to review responsibilities, procedures, and other administrative requirements contained within the Contract Documents.

B. Authorized representatives of OWNER, INSPECTOR, ARCHITECT, CONTRACTOR and other parties shall attend the meeting. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda items shall include significant items which could affect progress of the Work, including, but not limited to the following:

1. Preliminary Construction Schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Identification of OWNER representative.
5. Procedures for processing field decisions.
6. Request for Proposal.
7. Request for Clarification.
8. Construction Directive and Change Order.
9. Procedures for processing Applications for Payment.
10. Prevailing wages.
11. Submittal and review of Shop Drawings, Product Data, material lists, and Samples.
12. Preparation of project record documents.
13. Use of the Project site and/or premises.
14. Parking availability.
15. Office, work, and storage areas.
16. Equipment deliveries and priorities.
17. Safety procedures.
18. First Aid.
19. Security.
20. Housekeeping.
21. Working hours.
22. Contract Compliance Officer.
23. Insurance.
24. Environmental Health and Safety.

25. Substantial Completion, Administrative Closeout and Contract Completion requirements and procedures.

26. Procedures for Mandatory Dispute and Claim Resolution.

D. OWNER shall prepare and issue meeting minutes to attendees and interested parties no later than five calendar days after the meeting date.

3.02 PRE-INSTALLATION CONFERENCES

A. CONTRACTOR shall coordinate and conduct pre-installation conferences at the Project site as required by related Sections of the Contract Documents.

B. CONTRACTOR, manufacturers, and fabricators involved in or affected by the installation and its coordination or integration with other pre-ceding and/or subsequent installations of Work shall attend the meeting. CONTRACTOR shall advise OWNER, INSPECTOR, and ARCHITECT of scheduled meeting dates in order to secure their attendance.

1. CONTRACTOR shall review the progress of construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:

a. Contract Documents.

b. Options.

c. Related Construction Directives and Change Orders.

d. Purchases.

e. Deliveries.

f. Shop Drawings, Product Data, and quality-control samples.

g. Review of mockups.

h. Possible conflicts.

i. Compatibility problems.

j. Time schedules.

k. Weather limitations.

l. Manufacturer's recommendations.

m. Warranty requirements.

n. Compatibility of materials.

o. Acceptability of substrates.

p. Temporary facilities.

q. Space and access limitations.

r. Governing regulations.

s. Safety.

t. Inspecting and testing requirements.

u. Required performance results.

v. Recording requirements.

w. Protection.

2. CONTRACTOR shall record significant discussions and directives received from each conference. CONTRACTOR shall, within three (3) calendar days after the meeting date, distribute the minutes of the meeting to all concerned parties, including but not limited to, OWNER, INSPECTOR, and ARCHITECT.

3.03 PROGRESS MEETINGS

A. Progress meetings will be held at the Project site at regular intervals, typically weekly, as determined by the OWNER.

B. In addition to representatives of CONTRACTOR, OWNER, and ARCHITECT, each Subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of the Work shall, if requested by OWNER, be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude all matters relating to the Work.

C. Failure of CONTRACTOR to be so represented at any progress meeting which is held at a mutually agreed time or for which a written notice is given, shall not relieve CONTRACTOR from abiding by any and all OWNER determinations or directives issued at such meeting.

D. ARCHITECT will review and correct or approve minutes of the previous progress meeting and will review other significant items affecting progress. Topics for discussion as appropriate to the status of the Project include but are not limited to:

1. Interface requirements.
2. Construction Schedule.
3. Sequence and coordination.
4. Status of submittals / RFCs.
5. Deliveries.
6. Off-site fabrication.
7. Access.
8. Site utilization.
9. Temporary Construction Facilities and Controls.
10. Hours of work.
11. Hazards and risks.
12. Housekeeping.
13. Quality of materials, fabrication, and execution.
14. Unforeseen conditions.
15. Testing and Inspection.
16. Defective Work.
17. Construction Directive.
18. Request for Proposal.
19. Change Order Proposals and Change Orders.
20. Documentation of information for payment requests.
21. Application for Payment.
22. Other items as required or as brought forth..

E. No later than three (3) calendar days after each progress meeting, ARCHITECT will prepare and distribute minutes of the meeting to each present and absent party including a brief summary, in narrative form, of progress, decisions, directives, actions taken, and all other issues since the previous meeting and report.

1. Schedule Updating: CONTRACTOR shall revise the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized, and issue the revised schedule at the next scheduled progress meeting.

3.04 ADDITIONAL MEETINGS

A. OWNER, upon giving notice to the intended parties and without further obligation, may require additional meetings to discuss Work and/or Project related activities.

END OF SECTION

SECTION 01 3300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Administrative and procedural requirements for submittals required for the Work, including but not limited to; Shop Drawings, Product Data, Samples, material lists, and quality control items.

B. Throughout the Contract Documents, the minimum acceptable quality of materials, fabrication, and execution have been defined by the name and catalog number of a manufacturer and by reference of recognized industry standards.

C. To ensure that specified products are furnished and installed in accordance with the design intent, procedures have been established for submittal of design data and for its review by ARCHITECT, OAR and others.

1.02 RELATED REQUIREMENTS

A. Section 01 1216: Phasing of the Work.

E. Section 01 3113: Project Coordination.

G. Section 01 3239: Project Forms.

H. Section 01 4523: Testing and Inspection.

J. Section 01 5000: Construction Facilities and Temporary Controls.

L. Section 01 7329: Cutting and Patching.

PART 2 – PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 PROCEDURES

A. CONTRACTOR is required to review and approve every submittal and shop drawing prior to transmittal and delivery to ARCHITECT. Should CONTRACTOR determine a submittal contains errors, or does not meet the requirements of the contract, CONTRACTOR shall immediately return the

submittals and shop drawings to the producer and expedite the corrections prior to transmitting the submittal to ARCHITECT. Submittals shall not be used by CONTRACTOR to request clarifications or submit questions. CONTRACTOR will affix stamp to each submittal certifying CONTRACTOR has performed, at minimum, the following:

1. Verified the submittal is complete in all respects and follows the requirements of the Contract Documents without variance.

2. Confirmed that no substitutions have been included. If substitutions are included, CONTRACTOR shall eliminate them from the submittal and process them in accordance with Section 00 7000 General Conditions Article 4.9.2.

3. Identified any variances from the requirements of the Contract Documents and confirmed that the identified variance meets, but does not exceed the allowable limitations or tolerances as defined in these specifications.

4. Verified that all submitted materials, dimensions and tolerances are compatible with existing or planned conditions of the Work in order to erect, fabricate, or install the submitted assembly in conformance with the requirements of the Contract Documents.

5. Coordinated and verified that the dimensions match CONTRACTOR measured field or installation conditions.

6. Coordinated and verified that the products of separate manufacturers required within any field produced assembly are compatible in all respects for such assembly.

7. Packaged together all related submittals or shop drawings where such is necessary for a comprehensive ARCHITECT review.

B. CONTRACTOR shall package each submittal appropriately for transmittal and handling. Transmittal format shall be as required by OWNER. CONTRACTOR shall transmit and deliver six sets of each submittal or re-submittal to ARCHITECT, two of which shall be returned to CONTRACTOR. Some specifications may require additional copies be provided. CONTRACTOR shall provide the OWNER additional copies as specified or as requested by OAR. ARCHITECT will not accept submittals received from sources other than from CONTRACTOR.

C. After ARCHITECT'S review, ARCHITECT will transmit submittals to OAR and OAR shall further distribute to CONTRACTOR, INSPECTOR and others as required. Work shall not commence, unless otherwise approved by OAR, until approved submittals are transmitted to CONTRACTOR.

D. CONTRACTOR shall clearly identify any deviations from the Contract Documents on each submittal. Any deviation not so noted even though stamped reviewed is not acceptable.

E. CONTRACTOR shall coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities requiring sequential activity.

F. Timing of Submittals:

1. In accordance with General Conditions, CONTRACTOR shall submit to ARCHITECT, with copy of transmittal to the OAR, those Shop Drawings, Product Data, diagrams, materials lists, Samples and other submittals required by the Contract Documents.

2. The scheduling of submittals shall be sequenced to support the progress of the Work, and shall be:

   a. Submitted sufficiently in advance of construction, fabrication or installation in order to allow time for transmittal, review, modification, correction, (and resubmission and re-review when required.)

   b. Phased with adequate time between submittals in order to allow for proper review by the ARCHITECT without negative impact to the Milestones Schedule.

3. CONTRACTOR shall coordinate submittal of related items and ARCHITECT reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received by ARCHITECT.

4. CONTRACTOR shall revise, update and submit submittal schedule to ARCHITECT and OAR on the first of each month, or as required by OAR.

5. CONTRACTOR shall allow in the Construction Schedule, at least sixteen days for ARCHITECT review following ARCHITECT receipt of submittal. For mechanical, plumbing, electrical, low voltage, fire sprinklers, door and hardware, and other submittals requiring joint review with OAR, CONTRACTOR shall allow a minimum of eighteen days following ARCHITECT receipt of submittal. Deferred approval items shall be allowed additional time for DSA review.

6. No adjustments to the Contract Time or Milestones will be authorized because of a failure to transmit submittals to ARCHITECT sufficiently in advance of the Work to permit review and processing or where

CONTRACTOR fails to provide ARCHITECT submittals on related items.

7. In case of product substitution, Shop Drawing preparation shall not commence until such time as OWNER accepts or rejects the proposed substitution in accordance with the procedures described in the General Conditions.

G. If required, resubmit submittals in a timely manner. Resubmit as specified for initial submittal but identify as such. Review times for re-submitted items shall be as per the time frames for initial submittal review.

H. Shop Drawing preparation shall not commence until such time as CONTRACTOR receives Product Data acceptance.

I. ARCHITECT will stamp each submittal with a uniform, action stamp. ARCHITECT will mark the stamp appropriately to indicate the action taken, as follows:

1. Final Unrestricted Release: When ARCHITECT marks a submittal "Reviewed" the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

2. Final-But-Restricted Release: When ARCHITECT, or authorized agent, marks a submittal "Reviewed as Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.

3. Returned for Re-submittal: When ARCHITECT, or authorized agent, marks a submittal "Rejected, Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat as necessary to obtain different action mark. In case of multiple submittals covering same items of Work, CONTRACTOR is responsible for any time delays, schedule disruptions, out of sequence Work, or additional costs due to multiple submissions of the same submittal item. Do not use, or allow others to use, submittals marked "Rejected, Revise and Resubmit" at the Project site or elsewhere where Work is in progress.

4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, ARCHITECT, or authorized agent, will return the submittal marked "Action Not Required ".

3.02 SHOP DRAWINGS

A. Shop Drawings are original drawings prepared by CONTRACTOR, Sub-contractor, supplier, or distributor illustrating some portion of Work by showing fabrication, layout, setting, or erection and shall not be based on reproduced Contract Documents or copied standard information.

B. Produce Shop Drawings to an accurate scale that is large enough to indicate all pertinent features and methods. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.

C. Shop Drawings shall 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 by sheet and detail number.

3. Compliance with specified standards.

4. Notation of coordination requirements.

5. Notation of dimensions established by field measurement.

D. Provide a space of approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record CONTRACTOR and ARCHITECT review, and the action taken. Include the following information on the label for processing and recording action taken:

1. Project name.

2. Date.

3. Name and address of ARCHITECT.

4. Name and address of CONTRACTOR.

5. Name and address of Subcontractor.

6. Name and address of supplier.

7. Name and address of manufacturer.

8. Name and title of appropriate Specification section.

9. Drawing number and detail references, as appropriate.

E. Unless otherwise agreed to or indicated in individual Specification sections, submit a sufficient number of sets to allow for adequate distribution to CONTRACTOR, Sub-Contractor, supplier, manufacturer and fabricators plus four (4) sets (two sets to be retained by ARCHITECT, one set to the INSPECTOR and one set to OAR).

3.03 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of Work or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, wiring diagrams, schedules, illustrations, or performance curves.

1. Mark each copy to show or delineate pertinent materials, products, models, applicable choices, or options. Where Product Data includes information on several products that are not required, clearly mark copies to indicate the applicable information. Include the following information:

a. Manufacturer's printed recommendations.

b. Compliance with trade association standards.

c. Compliance with recognized testing agency standards.

d. Application of testing agency labels and seals.

e. Notation of dimensions verified by field measurement.

f. Notation of coordination requirements.

g. Notation of dimensions and required clearances.

h. Indicate performance characteristics and capacities.

i. Indicate wiring diagrams and controls.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed by CONTRACTOR.

C. Required Copies and Distribution: Same as denoted in Article 3.02.E.

3.04 SAMPLES

A. Procedure:

1. Submit Samples of sufficient size, quantity, cured and finished and physically identical to the proposed product or material. Samples include partial or full sections or range of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches denoting color, texture, and/or pattern.

   a. Mount or display Samples in the manner to facilitate review of qualities indicated. Include the following:

      1) Specification section number and reference.

      2) Generic description of the Sample.

      3) Sampling source.

      4) Product name or name of manufacturer.

      5) Compliance with recognized standards.

      6) Availability and delivery time.

2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

   a. Where variations in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show the approximate limits of the variations.

   b. Refer to other Specification sections for requirements for Samples that illustrate materials, fabrication techniques, assembly details, connections, operation, and similar construction characteristics.

   c. Refer to other sections for Samples to be returned to CONTRACTOR for incorporation into the Work. Such Samples must be undamaged at time of installation. On the transmittal

indicate special requests regarding disposition of Sample submittals.

d. Samples not incorporated into the Work, or otherwise not designated as Owner property, remain the property of CONTRACTOR and shall be removed from the Project site prior to Substantial Completion.

3. Color and Pattern: Whenever a choice of color or pattern is available in a specified product, submit accurate color chips and pattern charts to OAR for review and selection.

4. Number Required: Submit six, minimum, of each. Two will be returned to CONTRACTOR.

B. When specified, erect field Samples and mock-ups at the Project site to illustrate products, materials, fabrications, or execution and to establish standards by which completed Work shall be judged.

C. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of the Work. Sample sets may be used to obtain final acceptance of the Work associated with each set.

3.05 QUALITY CONTROL SUBMITTALS

A. Submit quality control submittals, including design data, certifications, manufacturer's field reports, and other quality control submittals as required under other sections of the Contract Documents.

B. When other sections of the Contract Documents require manufacturer's certification of a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

C. Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the represented company.

D. Requirements for submittal of inspection and test reports are specified in other sections of the Contract Documents.

END OF SECTION

SECTION 01 3546

INDOOR AIR QUALITY PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. CONTRACTOR's requirements and actions to ensure that the building and the mechanical system are free of Volatile Organic Compounds (VOCs), moisture, dust, mold, and microbes prior to achieving Substantial Completion.

2. CONTRACTOR requirements for temporary construction ventilation, dust protection, preconditioning of materials, protection of materials, sequencing, and duct protection.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 1216 - Phasing of the Work.

3. Section 01 5000 - Construction Facilities and Temporary Controls.

4. Section 01 6000 - Product Requirements.

5. Division 23 – Mechanical Systems

C. Referenced Standards:

1. ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality.

2. ASHRAE 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

D. VOC-Emitting Materials. Related Sections:

1. Section 06 2000 - Finish Carpentry.

2. Section 06 4000 - Architectural Woodwork.

3. Section 07 9200 - Joint Sealants.

4. Section 09 2900 - Gypsum Board.

5. Section 09 6513 - Rubber Base.

6. Section 09 6518 - Rubber Floor Covering.

7. Section 09 6519 - Vinyl Composition Tile.

8. Section 09 6566 - Synthetic Athletic Flooring.

9. Section 09 6813 - Tile Carpeting.

10. Section 09 9000 - Painting and Coating.

E. VOC-Emitting Furnishings and Equipment. Related Sections:

1. Section 06 4000 - Architectural Woodwork.

2. Section 10 2113 - Plastic Toilet Compartments.

3. Section 11 5213 - Projection Screens.

4. Section 11 6500 - Athletic Equipment – protective wall padding.

5. Section 12 2113 - Window Blinds.

F. Porous and Fibrous Materials. Related Sections:

1. Section 07 2100 - Thermal Insulation.

2. Section 09 5113 - Acoustical Panel Ceilings.

3. Section 09 6813 - Tile Carpeting.

1.02 SUBMITTALS

A. CONTRACTOR shall develop and submit to the OWNER for review and approval a Construction Indoor Air Quality (IAQ) Plan using the blank form provided after the end of this Section. Plan shall be submitted within 120 days of Notice to Proceed (NTP). Implementation of the approved IAQ Plan shall be included in the project Construction Schedule.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

3.01 QUALITY CONTROL

A. CONTRACTOR shall conduct inspections to confirm that measures proposed in the Construction IAQ Plan are followed during construction and shall report on the progress of the Plan during the progress meetings described in Section 01 3119: Project Meetings.

3.02 PROJECT CONDITIONS

A. During construction, prior to Substantial Completion and Building Flush Out, systems designed with particle filters shall not be operated at any time without filters in place. Filters used during construction shall have a minimum rating of MERV 8. Following construction completion, replace filters per Section 23 8000, Heating, Ventilating, and Air Conditioning Equipment.

B. Following completion of building envelope maintain continuous Temporary Construction Ventilation of interior areas where VOC-Emitting Materials and VOC-Emitting Furnishings and Equipment, identified in Paragraphs 1.01.D and 1.01.E of this Section, areas are installed.

1. Temporary Construction Ventilation may be supplied via the building's HVAC system and shall comply with the following requirements:

   a. Return air grilles shall be sealed or temporary MERV 8 air filters shall be installed.

   b. Provide MERV 8 air filters to filter the outside air.

   c. Provide a minimum of three air changes per hour of outside air while maintaining the building interior temperature between 60 degrees F and 85 degrees F with the relative humidity not to exceed 60 percent.

2. The Temporary Construction Ventilation specified requirements for building interior temperature and/or relative humidity may be exceeded only when the building HVAC unit is operating at 100 percent capacity.

3. Temporary Construction Ventilation may be supplied via temporary ducts and fans, sufficient to provide no less than three air changes per hour, and exhausted directly to the outside/outdoors while maintaining the building

interior temperature between 60 degrees F and 85 degrees F with the relative humidity not to exceed 60 percent.

4. Maintain continuous Temporary Construction Ventilation for a minimum period of 72 hours after installation of the VOC-Emitting Materials unless otherwise indicated elsewhere in these Specifications.

C. Temporary Construction Ventilation shall be provided for post-building-flush-out, post-occupancy touch-up, or punch list activities involving VOC-Emitting materials. Touch-up activities involving VOC-Emitting Materials shall not occur when students or staff are present.

D. Prior to installation, allow VOC-Emitting Furnishings and Equipment, identified in Paragraph 1.01.E of this Section, to off-gas in dry, well-ventilated space for 14 calendar days.

1. Remove containers and packaging to maximize off-gassing of VOCs.

2. Precondition products in ventilated warehouse or other ventilated building. Preconditioning at the project site is acceptable, provided that Temporary Construction Ventilation and Sequencing measures are taken as described in Paragraph 3.02.B and Article 3.03 of this Section.

3. Products requiring preconditioning include, at a minimum, VOC-Emitting Furnishings and Equipment that contain vinyl or other flexible plastics, resins, adhesives, foam rubber, and fiberboards with urea-formaldehyde binders. Products bearing CHPS-approval as low- emitting materials GREENGUARD Certification, Indoor Advantage Gold Certification, Green Label Plus Certification, or other OWNER-approved certification shall be excluded from this preconditioning requirement.

3.03 SEQUENCING

A. Where VOC-Emitting Materials identified in Paragraph 1.01.D of this Section are applied on-site, apply the VOC-Emitting Materials prior to installation of any Porous and Fibrous Materials identified in Paragraph 1.01.F of this Section. Maintain the continuous Temporary Construction Ventilation requirements described above for a period of 72 hours before installation of porous and fibrous materials.

1. Where this sequencing requirement is not possible, protect porous materials with polyethylene vapor retarders. Tape polyethylene edges to insure a complete seal. Maintain continuous ventilation per temporary construction ventilation requirements described above for a period of 72 hours before removing polyethylene.

B. Completion: Complete interior finish material installation prior To Building Flush-Out as described in Paragraph 3.05.C of this Section.

3.04 PROTECTION

A. Moisture Protection:

1. Protect materials specified in Paragraphs 1.01.D, 1.01.E and 1.01.F of this Section from water intrusion or penetration.

2. Weatherproof enclosures shall be temporarily constructed to store and protect the materials from moisture sources.

3. Materials shall be covered to protect them from rain and other moisture sources and, if resting on the ground, shall use spacers to allow air to circulate between the ground and the materials.

4. Materials including porous or fibrous materials with visible mold and microbial growth shall not be installed.

a. Non-porous materials with minor visible mold and microbial growth shall be decontaminated.

B. Duct Protection:

1. Seal ducts during transportation and delivery, per Section 23 3000, Air Distribution.

2. Seal ducts during construction to prevent accumulation of dust and debris. If seals must be removed for temporary construction ventilation purposes, they shall be resealed upon conclusion of the required ventilation period. Remove seals prior to HVAC system start-up.

3. During dust producing activities in enclosed buildings, such as drywall installation and finishing, sanding, cutting, or grinding, CONTRACTOR shall turn HVAC ventilation system off and protect HVAC system supply and return openings from dust infiltration. Separate dust-producing activities from the rest of the construction area using plastic sheathing. Provide temporary ventilation.

3.05 CLEANING

A. Just prior to Substantial Completion, vacuum carpeted and soft surfaces with a Green Label certified vacuum.

B. Duct Cleanliness:

1. Before shipment to site ensure ducts are clean and duct openings protected with a self-adhering film.

2. Just prior to Substantial Completion and prior to using any ducts to circulate air, ensure that the ducts are free of dust and dirt.

C. Building Flush-Out:

1. At construction completion, prior to occupancy and with all interior finishes installed, replace filtration media with new per HVAC equipment schedule and perform a building flush-out. Flush-out shall supply a total air volume of 14,000 cubic feet of outdoor air per square foot of floor area while maintaining an internal temperature of at least 60 degrees Fahrenheit and relative humidity no higher than 60%.

2. If OWNER elects to partially use and/or occupy the Work prior to completion of the flush-out, the space may be occupied following delivery of a minimum of 3,500 cubic feet of outdoor air per square foot of floor area. Once the space is occupied, it shall be ventilated at a minimum rate of 0.30 cubic feet per minute (cfm) per square foot of outside air. During each day of the flush-out period, ventilation shall begin a minimum of 3 hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cubic feet per square foot of outside air has been delivered to the space.

3. During building flush-out, when required to perform touch-up or punch list activities involving VOC-Emitting Materials as described in Article 1.01 of this Section, extend Building Flush-Out by a minimum of four days continuously after the touch-up or punch list activities at the maximum tempered outside air rate for 24 hours per day in the space where the touch-up or punch list activities occurred.

4. If Continuous Construction Ventilation is not possible, non-continuous flush-out shall total an equivalent of air as described in Paragraph 3.05-C.2 above.

5. Return ventilation system to normal operation following flush-out period to minimize energy consumption.

END OF SECTION

CONSTRUCTION INDOOR AIR QUALITY (IAQ) PLAN

Contractor shall complete and submit this Plan to the OWNER no later than one hundred twenty (120) days after receipt of Notice to Proceed.

GENERAL CONTRACTOR:

Name: _____ Title: _____

Telephone: _____ Fax: _____

Email: _____

I have read and understood and will implement the following Construction IAQ Plan.

Signature: _____ Date: _____

I. CONSTRUCTION VENTILATION (Per paragraphs 3.02.A through C)

List project materials requiring Construction Ventilation per Part 1 of this Section. Attach additional sheet if necessary.	
Circle the following Temporary Construction Ventilation approach to be used.	
3.02.B	Ventilation will be supplied via building's HVAC system. • ___ Return air grilles are sealed. Exhaust is provided via open windows or doors. OR: • Return air grilles are used for exhaust. HVAC will provide a minimum 35 percent outside air. Air filters with a minimum MERV rating of 8 will be provided at return air grilles. • Building HVAC will be turned off during dust generating activities.
3.02.B.3	Ventilation will be accomplished via open windows, temporary ducts, and temporary fans ducted directly to the outdoors. • Supply air diffusers, return air grilles, and/or open ducts will be sealed. Make-up air will be provided through open windows or doors or other transfer air devices. • HVAC system will provide make-up air. Return air grilles will be sealed.

Required	• Ventilation will provide no less than three air changes per hour. • Ventilation will be continuous for a period no less than 72 hours after completion of installation of VOC-emitting materials. • Filters used during Construction Ventilation will be replaced prior to Substantial Completion

II. PRECONDITIONING (Per paragraph 3.02.D)

List project materials requiring Preconditioning per Part 1 of this Section. Attach additional sheet if necessary.

Circle the following Preconditioning approach to be used.

A	Preconditioning will occur in dry and well-ventilated offsite location. Where is the offsite location?
B	Preconditioning will occur onsite. Check the applicable approach. ☐ Ventilation will be supplied via building's HVAC system. See paragraph 3.02.B above. ☐ Ventilation will be accomplished via open windows, temporary ducts, and temporary fans. See paragraph 3.02.B.3 above.
Required	• Containers and packaging will be removed prior to Preconditioning. • Preconditioning will occur for fourteen (14) continuous days prior to installation

III. SEQUENCING (Per Article 3.03)

List project porous and fibrous materials requiring Sequencing consideration per Part 1 of this Section. Attach additional sheet if necessary.	
Required	• Previously installed Porous or Fibrous Materials located in a room where VOC-Emitting Materials are to be installed will be protected with polyethylene vapor retarder. Polyethylene will not be removed until completion of a 72-hour ventilation period. • Installation of interior finish materials will complete fourteen (14) days prior to Substantial Completion

IV. PROTECTION (Per Article 3.04)

List project materials requiring Protection per Part 1 of this Section. Attach additional sheet if necessary.	
Required	• Weatherproof enclosures shall be temporarily constructed to store and protect the materials from moisture sources. Materials shall be covered from rain and other moisture sources and if resting on the ground, use spacers to allow air to circulate between the ground and the materials. • Materials including porous or Fibrous Materials with visible microbial growth shall not be installed. • Materials that are not defined as Porous or Fibrous with visible microbial growth shall be decontaminated prior to installation. Lumber exhibiting a minor amount of "lumberyard mold" need not be discarded. • Temporary ventilation shall be provided during dust producing activities. See Item I Construction Ventilation above. Supply air diffusers and return air grilles shall be covered. • Ducts shall be sealed during transportation, delivery, and construction.

END OF CONSTRUCTION INDOOR AIR QUALITY PLAN

SECTION 01 4213

ABBREVIATIONS, SYMBOLS AND ACRONYMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. List of abbreviations, symbols, and acronyms of societies, institutes, and associations generally appearing in the Contract Documents.

1.02 RELATED REQUIREMENTS

A. Division 01 - General Requirements

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 ABBREVIATIONS

ac	Alternating current
amp	ampere
C	Degrees Centigrade, Celsius
Cat 6	Category 6, unshielded twisted pair cabling
CFC	Chlorofluorocarbon
cfh	Cubic feet per hour
cfm	Cubic feet per minute
cm	Centimeter
Co.	Company
Corp.	Corporation
d	Penny
db.	Decibel
DB	Dry bulb
dc	Direct current
ePTZ	Digital Pan Tilt Zoom
F	Degrees Fahrenheit
fpm	Feet per minute
FPS	Frames per Second
ft	Foot or feet

GA	Gage
gph	Gallons per hour
gpm	Gallons per minute
HP	Horsepower
Hz	Hertz
ID	Inside Diameter
Inc.	Incorporated
IP	Internet Protocols
IR light	Infrared light
Kbps	Kilobits per Second
KHz	Kilohertz
Kip	thousand pounds
Ksf	Thousand pounds per square foot
Ksi	Thousand pounds per square inch
Kv	Kilovolt
KVA	Kilovolt amperes
KW	Kilowatt
KWH	Kilowatt hour
LED	Light Emitting Diode
LF	Linear foot
Lb(s)	Pound(s)
LCD	Liquid Crystal Display
Lux	A standard unit of illumination measurement
Max	Maximum
MBH	1000 BTUs per hour
MHz	Mega hertz
mil	Thousandth of an inch
Min	Minimum
mm	Millimeter
mph	Miles per hour
NA	Not Applicable
NIC	Not in Contract
OC	On Center
OD	Outside Dimension
oz.	Ounce
PCF	Pounds per cubic foot
pH	Acidity-alkalinity balance

PoE	Power Over Ethernet – A standard for providing power over network cable
psf	Pounds per square foot
psi	Pounds per square inch
psig	Pounds per square inch, gage
PTS	Pan–Tilt–Zoom
PVC	Polyvinylchloride
QoS	Quality of Service
RF	Radio frequency
rpm	Revolutions per minute
SDK	Software Development Kit
SF	Square foot
SIP	Session Initiation Protocol
SMA	Software Maintenance Agreement
SS	Stainless Steel
SSL	Secure Sockets Layer
SSM	Server Software Module
SY	Square yard
TCP	Transmission Control Protocol
TLS	Transport Layer Security
UI	User Interface
Unicast	Communication between a single sender and single receiver on network
UPnP	Universal Plug and Play
V	Volts
VBR	Variable Bit Rate
VMS	Video Management System
W	Watts
WB	Wet bulb
WDR	Wide dynamic range

3.02 SYMBOLS

#	Number or pound
'	Foot or feet
"	Inch(es)
%	Percent
°	Degree (Angle or Temperature)

3.03 ACRONYMS

AA	The Aluminum Association, Inc
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ACS	Access Control System
AEC	Automatic Echo Cancellation
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AFF	Above Finish Floor
AGC	Automatic Gain Control
ALPR	License Plate Recognition
AGA	American Gas Association
AGC	Automatic Gain Control
AGCIH	American Conference of Governmental Industrial Hygienists
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association, Inc.
ANI	Automatic Number Identification
ANSI	American National Standards Institute
AOR	Architect of Record
APA	APA – The Engineered Wood Association
API	Application Programming Interface
ARI	Air-Conditioning and Refrigeration Institute
ARS	Automated Route Selection
ARP	Address Resolution Protocol
ATSC	Advanced Television Systems Committee
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATBCB	Architectural & Transportation Barriers Compliance Board

AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BBS	Backbone Switch
BGP	Border Gateway Protocol
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America
BICSI	Building Industry Consulting Services, International
BRI	Basic Rate Interface
BOOTP	Bootstrap Protocol
BTU	British thermal unit
CAL/OSHA	California Occupational Safety and Health Administration
CAC	Call Admission Control
CAS	Channel Associated Signaling
CAT 5e	Category 5e
CBC	California Building Code
CCR	California Code of Regulations
CCK	Complementary Code Keying
CDR	Call Detail Record
CEC	California Electrical Code
CESM	Compact Edge Switch-Managed
CFR	Code of Federal Regulations
CIF	Common Intermediate Format
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CLI	Command Line Interface
CLID	Calling Line Identification
CMAS	California Multiple Award Schedule
CMC	California Mechanical Code
CNG	Comfort Noise Generation
CNID	Calling Party Name Identification
CQC	California Quality Control (CMA Standards)
Codec	Coder/Decoder
COP	Coefficient of performance
COS	Class of Service
CPC	California Plumbing Code

CRA	California Redwood Association
CSA	Client Software Application
CRI	Carpet and Rug Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards, U.S. Department of Commerce
CS	Communications Server
CSFM	California State Fire Marshal
CSI	Construction Specifications Institute
Cx	Commissioning
CxA	Commissioning Agent
CxP	Commissioning Plan
CTIOA	Ceramic Tile Institute of America
CTI	Cooling Tower Institute
DHCP	Dynamic Host Configuration Protocol
DHI	Door and Hardware Institute
DHCP	Dynamic Host Configuration Protocol
DGM	Dynamic Graphical Map
DNS	Domain Name System
DSA	Division of the State Architect
DTV	Digital Television
DSS	Direct Station Selection
DTMF	Dual Tone Multiple Frequency
DVD	Digital Video Disc
EER	Energy efficiency ratio
EIA	Electronic Industries Alliance
EIS	Electronic Image Stabilization
ESM	Edge Switch-Managed
E&M	Ear and Mouth
FAT	Field Acceptance Testing
FEP	Front End Processor
FEP	Fluorinated Ethylene Propylene
FPS	Frames per Second
FTP	File Transfer Protocol
FXS	Foreign Exchange Station
EPA	Environmental Protection Agency
ETL	ETL Testing Laboratories
FCC	Federal Communication Commission
FDA	Food and Drug Administration

FECC	Far End Camera Control
FPS	Frames per Second
FM	Factory Mutual
FPS	Frames per Second
FPT	Functional Performance Test
FS	Federal Specifications
FTP	File Transfer Protocol
FXO	Foreign Exchange Office
FXS	Foreign Exchange Station
GA	Gypsum Association
GANA	Glass Association of North America
GBIC	Gigabit Interface Converter
GUI	Graphical User Interface
GigE	Gigabit Ethernet
HMMA	Hollow Metal Manufacturer's Association
HPVA	Hardwood Plywood & Veneer Association
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol over SSL
HVAC	Heating, Ventilation, and Air Conditioning
IACS	International Annealed Copper Standards
IAMPO	International Association of Plumbing and Mechanical Officials
IC	Intercom
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers Association
ICMP	Internet Control and Message Protocol
ID	Identifier
IDF	Intermediate Distribution Frame
IEEE	Institute of Electrical & Electronic Engineers, Inc.
IDS	Intrusion Detection System
IEC	International Electro technical Commission
IES	Illuminating Engineering Society
IMI	International Masonry Institute
IOR	Inspector of Record
IP	Internet Protocol
IP Router	Internet Protocol Router
IPVC	Internet Protocol Video Conferencing
IPX	Internetwork Packet Exchange
IRI	Industrial Risk Insurers

ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ISA	Industry Standard Architecture
ISDN	Integrated Services Digital Network
ISM	Intermediate Switch-Managed (Fiber Switch)
ISMS	Integrated Security Monitoring and Management System
ISP	Internet Service Provider
ITD	OWNER, Information Technology Division
ITU	International Telecommunication Union
IVR	Interactive Voice Response
JPEG	Joint Photographic Experts Group (image format)
Kbps	Kilobits per Second
LAN	Local Area Network
LCD	Liquid Crystal Display
LDC	Local Distribution - Cabinet
LDF	Local Distribution Frame
LED	Light Emitting Diode
LIU	Light Interconnection Unit
MAC	Media Access Control
MAN	Metropolitan Area Network
MBR	Maximum Bit Rate
MCU	Multipoint Conference Unit
MDF	Main Distribution Frame
MDF-BBS	Main Distribution Frame Backbone Switch
MIB	Management Information Base
MIC	Message Integrity Check
MLD	Multicast Listener Discovery
MLSFA	Metal Lath/Steel Framing Association
MPOE	Main Point of Entry
MPEG	Moving Picture Experts Group
MP-BGP	Multi-Protocol Border Gateway Protocol
M&O	Maintenance and Operations
MOS	Mean Opinion Scale
MSS	Manufacturers Standardization Society of the Valve & Fittings Industry.
NAAMM	National Association of Architectural Metal Manufacturers
NAT	Network Address Translation
NAT-PT	NAT Protocol Translation

NAS	Network Attached Storage
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEBB	National Environmental Balancing Bureau
NEBS	Network Equipment Building System
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NEC	National Electrical Code
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NIC	Network Interface Card
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NMP	Simple Network Management Protocol
NOFMA	National Oak Flooring Manufacturers Association
NPCA	National Paint and Coatings Association
NPDES	National Pollutant Discharge Elimination System
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NTP	Network Time Protocol
NTSC	National Television System Committee
NTMA	National Terrazzo & Mosaic Association
NTSC	National Television System Committee
NUSIG	National Uniform Seismic Installation Guidelines
NWMA	National Woodwork Manufacturers Association
OAR	OWNER Authorized Representative
ODI/BOD	Owner's Design Intent/Basis of Design
OC-3	Optical Carrier Level-3 (~155 Mbps)
OEHS	Office of Environmental Health and Safety (LAUSD's)
OFNR	Optical Fiber Non-Conductive Riser
OFNP	Optical Fiber Non-Conductive Plenum
OID	Object Identifier
OPX	Off Premise Extension
OSHA	Occupational Safety & Health Administrations
OSI	Open Systems Interconnection

OSPF	Open Shortest Path First
OTDR	Optical Time Domain Reflectometer.
ONVIF	Open Video Interface Forum
OWAN	OWNER's Wide Area Network
OWNER	Los Angeles Unified School District
PA	Public Address
PABX	Private Auxiliary Branch Exchange
PA/IC	Public Address/Intercommunications
PAL	Phase Alternating Line
PAT	Port Address Translation
PBX	Private Branch Exchange
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PCM	Pulse Code Modulation
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PEC	Pre-functional Equipment Checklist
PHB	Per Hop Behavior (DiffServ)
PI	Project Inspector
PIC	PBX Integration Card
PIM	Protocol-Independent Multicast
PING	Packet Internet Groper
PINX	Private Integrated Services Network Exchange
PIP	Picture in Picture
PMO	Project Management Office
PoE	Power-over-Ethernet
POP	Point of Presence
POTS	Plain Old Telephone System
PRI	Primary Rate Interface
PS	Product Standard, U.S. Department of Commerce
PSIP	Program and System Information Protocol
PSTN	Public Switched Telephone Network
PZM	Pressure Zone Microphone
QA	Quality Assurance
QCIF	Quarter CIF – See CIF
QoS	Quality of Service
QSIG	Q-Signaling

RADIUS	Remote Access Dial-In User Service
RIP	Routing Information Protocol
RIPng	Routing Information Protocol Next Generation
RIS	Redwood Inspection Service
RMON	Remote Network Monitoring
RMON2	Remote Network Monitoring Version 2
SAN	Storage Area Network
SCAQMD	South Coast Air Quality Management District
SCSI	Small Computer System Interface
SDEI	Steel Deck Institute
SDI	Steel Door Institute
SFM	State Fire Marshal
SFP	Small Form-factor Pluggable transceiver
SFP+	Enhanced Small Form-factor Pluggable transceiver
SFPA	Southern Forest Products Association
SIF	Source input format (NTSC)
SIP	Session Initiation Protocol
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SLC	Small Learning Community
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMDI	Simple Message Desk Interface
SMI	Structure of Management Information
SMTP	Simple Mail Transfer Protocol
SMPTE	Society of Motion Picture and Television Engineers
SNA	Systems Network Architecture
SNMP	Simple Network Management Protocol
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Socket Layer
SSPC	Steel Structures Painting Council
S/P DIF	Sony/Philips Digital InterFace
SWI	Steel Window Institute
TAB	Testing, Adjusting and Balancing
TEHO	Tail End Hop Off
TCA	Tile Council of America
TCP	Transmission Control Protocol

TFTP	Trivial File Transfer Protocol
TIA	Telecommunications Industry Association
TKIP	Temporal Key Integrity Protocol
TLS	Transport Layer Security
TOS	Type of Service
UBPPA	Uni-Bell PVC Pipe Association
UCI	Uniform Construction Index
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters' Laboratories, Inc.
UM	Unified Messaging
UPS	Uninterruptible Power Supply
UPnP	Universal Plug and Play
URL	Uniform Resource Locator
USDA	United State Department of Agriculture
UTC	Coordinated Universal Time
UTP	Unshielded Twisted Pair
UPS	Uninterruptible Power Supply
USP	Unified Security Platform
USW	Unified Web Client
VAD	Voice Activity Detection
VBR	Variable Bit Rate
VLAN	Virtual Local Area Network
VM	Voice Mail
VSS	Video Surveillance System
VoD	Video on Demand
VFD	Vacuum Fluorescent Display
VTC	Video Teleconference
WAN	Wide Area Network
WDR	Wide dynamic range
WLAN	Wireless Local Area Network
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window and Door Manufacturers Association
WWPA	Western Wood Products Association

END OF SECTION

SECTION 01 4523

TESTING AND INSPECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Testing and inspection services to meet requirements of the California Building Code (CBC) and the Division of the State Architect (DSA).

B. Related Requirements:

1. Section 03 2000 – Concrete Reinforcing.
2. Section 03 3000 – Cast-in-Place Concrete.
3. Section 05 1200 – Structural Steel Framing.
4. Section 07 8116 – Cementitious Fireproofing

1.02 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 318 – Building Code Requirements for Structural Concrete and Commentary.

B. American Institute of Steel Construction (AISC):

1. AISC 360 – Specification for Structural Steel Buildings.
2. AISC 341 – Seismic Provisions for Structural Steel Buildings.

C. ASTM International (ASTM):

1. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
2. ASTM A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
3. ASTM A706 – Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

4. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

5. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

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

7. ASTM C1140 - Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panels.

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

9. ASTM C1604 - Standard Test Method for Obtaining and Testing Drilled Cores of Shotcrete.

10. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.

11. ASTM E488 - Standard Test Methods for Strength of Anchors in Concrete Elements.

12. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.

13. ASTM E605 - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.

14. ASTM E1444 - Standard Practice for Magnetic Particle Testing.

15. ASTM F606 - Standard Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets.

D. Association of the Wall and Ceiling Industry (AWCI):

1. AWCI Technical Manual 12-B - Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials; an Annotated Guide.

E. American Welding Society (AWS):

1. AWS D1.1 – Structural Welding Code.

2. AWS D1.4 – Structural Welding Code – Reinforcing Steel.

3. AWS D1.8 – Structural Welding Code – Seismic Supplement.

F. Division of the State Architect (DSA) Interpretation Regulations (IR):

1. DSA IR 17-2 – Nondestructive Testing (N.D.T.) of Welds.

2. DSA IR 17-3 – Structural Welding Inspection.

3. DSA IR 17-8 – Sampling and Testing of High Strength Bolts, Nuts and Washers.

4. DSA IR 17-9 – High Strength Bolting Inspection.

5. DSA IR 17-10 – Sampling, Testing and Tagging of Reinforcing Bars.

6. DSA IR 17-11 – Identification, Sampling and Testing of Threaded Steel Anchor Bolts and Anchor Rods.

1.03 REGULATORY REQUIREMENTS

A. Laboratories performing testing shall have DSA's Laboratory Evaluation and Acceptance Program approval prior to providing material testing or special inspection services.

B. Tests of materials and inspections shall be in accordance to Section 4-213 through 4-219 of the California Building Standards Commission's, California Administrative Code.

C. Required material testing, inspections and special inspections are indicated on the DSA approved DSA-103, Listing of Structural Tests & Special Inspections (T&I List). OWNER will provide CONTRACTOR copy of DSA-103.

1.04 TESTS

A. OWNER will contract with a DSA approved testing laboratory to perform the testing indicated on the Contract Documents, including the Tests and Special Inspections (T&I) list.

B. Selection of material to be tested shall be by the Testing Laboratory and not by CONTRACTOR.

C. Any material shipped from the source of supply prior to having satisfactorily passed such testing and inspection, or prior to the receipt of notice from Project

Inspector such testing and inspection is not required, shall not be incorporated into the Work.

D. OWNER will select, and directly reimburse, the Testing Laboratory for costs of all DSA required tests and inspections; however, the Testing Laboratory may be reimbursed by CONTRACTOR for such costs as specified or noted in related sections of the Contract Documents.

E. The Testing Laboratory is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.

F. The Testing Laboratory shall not perform any duties of CONTRACTOR.

G. CONTRACTOR shall provide an insulated curing box with the capacity for twenty concrete cylinders and will relocate said box and cylinders as rapidly as required in order to provide for progress of the Work.

1.05 TEST REPORTS

A. Test reports shall include all tests performed, regardless of whether such tests indicate the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations, when and as required, shall also be reported. Reports shall indicate the material (or materials) was sampled and tested in accordance with requirements of CBC, Title 24, Parts 1 and 2, as indicated on the Contract Documents. Test reports shall indicate specified design strength and specifically state whether or not the material (or materials) tested comply with the specified requirements.

1.06 VERIFICATION OF TEST REPORTS

A. Each Testing Laboratory shall submit to the Division of the State Architect, in duplicate, a verified report covering all tests required to be performed by that agency during the progress of the Work. Such report, covering all required tests, shall be furnished prior to Substantial Completion and/or, when construction on the Work is suspended, covering all tests up to the time of Work suspension.

1.07 INSPECTION BY OWNER

A. OWNER, and its representatives, shall have access, for purposes of inspection, at all times to all parts of the Work and to all shops wherein the Work is in preparation. CONTRACTOR shall, at all times, maintain proper facilities and provide safe access for such inspection.

B. OWNER shall have the right to reject materials and/or workmanship deemed defective Work and to require correction. Defective workmanship shall be corrected in a satisfactory manner and defective materials shall be removed from the premises and legally disposed of without charge to OWNER. If CONTRACTOR does not correct such defective Work within a reasonable time, fixed by written notice and in accordance with the terms and conditions of the Contract Documents, OWNER may correct such defective Work and proceed in accordance with related Articles of the Contract Documents.

C. CONTRACTOR is responsible for compliance to all applicable local, state, and federal regulations regarding codes, regulations, ordinances, restrictions, and requirements.

1.08 PROJECT INSPECTOR

A. A Project Inspector will be employed by OWNER in accordance with requirements of Title 24 of the California Code of Regulations with their duties specifically defined therein. Additional DSA Special Inspectors may be employed and assigned to the Work by OWNER in accordance with the requirements of the CBC and DSA.

B. Inspection of Work shall not relieve CONTRACTOR from any obligation to fulfill all terms and conditions of the Contract Documents.

C. CONTRACTOR shall be responsible for scheduling times of inspection, tests, sample taking, and similar activities of the Work.

1.09 STRUCTURAL TESTS AND SPECIAL INSPECTIONS

A. Soils:

1. General: Periodic inspection by Geotechnical Engineer for verification of the following construction activities in conformance to CBC Table 1705A.6:

a. Site has been prepared properly prior to placement of controlled fill and/or excavations for foundations.

b. Foundation excavations are extended to proper depth and have reached proper material.

c. Materials below footings are adequate to achieve the design bearing capacity.

2. Compacted Fills: Testing and inspections shall be in conformance to Table 1705A.6:

   a. Geotechnical Engineer will continuously verify the use of proper materials and inspect lift thicknesses, placement, and compaction during placement of fill.

   b. Testing Laboratory under the supervision of the Geotechnical Engineer will:

      1) Perform qualification testing of fill materials.

      2) Test the compaction of fill.

3. Retaining Walls:

   a. Continuous inspections by Geotechnical Engineer:

      1) Placement, compaction and inspection of soil per CBC Section 1705A.6.1 for fills supporting foundations.

   b. Concrete Retaining Walls: Provide tests and inspections as indicated on paragraphs below for concrete.

B. Concrete:

1. Cast in Place Concrete: Inspection and testing in conformance to CBC Table 1705A.3:

   a. Inspection of reinforcement, including prestressing tendons and verification of placement, per ACI 318, sections 25.2, 25.2, 25.5.1 through 26.5.3.

   b. Reinforcing bar welding: Inspect per AWS D1.4, ACI 318 26.5.4.

      1) Verification of weldability of reinforcing bars other than ASTM A706.

      2) Inspect single-pass fillet welds, maximum 5/16".

      3) Inspect all other welds.

   c. Inspect anchors cast in concrete per ACI 318, section 17.8.2.

   d. Inspect anchors post-installed in hardened concrete members:

1) Continuous inspection of adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads, per ACI 318, section 17.8.2.4.

2) Mechanical anchors and adhesive anchors, not defined in previous paragraph, per ACI 318, section 17.8.2.

e. Design Mix:

1) Verify use of required mix, per ACI 318, chapter 19 and sections 26.4.3 and 26.4.4.

2) Batch Plant Inspection: The quality and quantity of materials used in transit-mixed concrete and in batched aggregates shall be continuously inspected as required by CBC section 1705A.3.2. If approved by DSA, batch plant inspection may be reduced to periodic if plant complies with CBC section 1705A3.3.1, item 1, and requires first batch inspection, weightmaster, and batch tickets.

f. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete, per ASTM C172, ASTM C31, ACI 318, sections 26.4.5 and 26.12.

g. Verify maintenance of specified curing temperature and techniques per ACI 318 sections 26.4.7 through 26.4.9 and CBC section 1908.9.

h. Sampling and testing of reinforcing steel per ASTM A370, DSA IR 17-10 and CBC section 1910A.2. CONTRACTOR shall submit mill certificate indicating compliance with requirements for reinforcement, anchors, ties, and metal accessories.

2. Post-installed Anchors:

a. Special Inspector will inspect installation of post-installed anchors in hardened concrete members as required by CBC table 1705A.3, item 4.

1) Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads, per ACI 318, section 17.8.2.4.

2) Mechanical anchors and adhesive anchors not defined above, per ACI 318, section 17.8.2.

b. Testing Laboratory will test post-installed anchors in conformance to CBC section 1905A and ASTM E488.

C. Structural Steel:

1. Special inspector will verify that all materials are properly marked in conformance with AISC 360, Section 3.3 and applicable ASTM standards.

a. Mill certificates indicating material properties that comply with requirements.

b. Materials, sizes, types and grades complying with requirements.

2. Testing Laboratory will test unidentified materials in conformance with ASTM A370.

3. Special inspector will examine seam welds of HSS shapes in conformance with DSA IR-17-3.

4. Special inspections and non-destructive testing of structural steel elements shall be in conformance to CBC section 1705A.2.1.

D. High Strength Bolts:

1. Special inspector will verify identification markings and manufacturer's certificates of compliance conform to ASTM standards specified in the Contract Documents, per DSA IR 17-9.

2. Testing Laboratory will test high-strength bolts, nuts and washers in conformance with ASTM F606, ASTM A370 and DSA IR 17-8.

3. Special inspector will inspect bearing-type ("snug tight") bolt connections in conformance with AISC 360, section M2.5 and DSA IR 17-9.

4. Special inspector will inspect slip-critical bolt connections in conformance with AISC 360, section M2.5.

E. Welding:

1. Verification of Materials, Equipment and Welders:

a. Special inspector will verify weld filler material identification markings per AWS designation listed on the Contract Documents and the WPS.

b. Special inspector will verify material manufacturer's certificate of compliance.

c. Special inspector will verify WPS, welder qualifications and equipment in conformance to DSA IR 17-3.

2. Shop Welding: Special inspector will inspect the following, per CBC 1705A.2.1, AISC 360 (and AISC 341, as applicable) and DSA IR 17-3:

a. Groove, multi-pass fillet welds larger than 5/16", plug and slot welds.

b. Single-pass fillet welds equal or less than 5/16".

c. Inspect welding of stairs and railing systems.

d. Verification of reinforcing steel weldability.

e. Welding of reinforcing steel, per AWS D1.4.

3. Field Welding: Special inspector will inspect the following, per CBC 1705A.2.1, AISC 360 (and AISC 341, as applicable) and DSA IR 17-3:

a. Groove, multi-pass fillet welds larger than 5/16", plug and slot welds.

b. Single-pass fillet welds equal or less than 5/16".

c. End welded studs (ASTM A108) installation, including bend test.

d. Floor and roof deck welds.

e. Welding of structural cold-formed steel.

f. Welding of stairs and railing systems.

g. Verification of reinforcing steel weldability.

h. Inspect welding of reinforcing steel.

4. Non-Destructive Testing: Testing Laboratory will test perform ultrasonic and magnetic particle testing in conformance to AISC 360 section N5.5, AISC 341 appendix Q5.2, AWS D1.1, AWS D1.8, ASTM E543, ASTM E1444, ASTM E164 and DSA IR 17-2.

F. Steel Joists and Trusses: Continuous inspection, special inspector will verify size, type and grade for all chord and web members as well as connectors and weld filler material, verify joist profile, dimensions and chamber (if applicable); verify all weld locations, lengths and profiles; mark or tag each joist, in conformance with CBC section 2207.1 and DSA IR 22-3.

G. Fire-Proofing:

1. Spray Applied:

a. Project inspector will examine structural steel surface conditions, inspect application, take samples, measure thickness, and verify compliance of all aspects of application with Construction Documents, in conformance with CBC sections and ASTM E.605.

b. Testing Laboratory will test bond strength in conformance with ASTM E605, per CBC section 1705A.14.6.

c. Testing Laboratory will test density in accordance with ASTM E605, per CBC section 1705A.14.5.

H. Anchor Bolts, Anchor Rods and Other Steel:

1. Testing Laboratory will sample and test not readily identifiable anchor bolts and anchor rods in accordance with DSA IR 17-11.

2. Testing Laboratory will sample and test not readily identifiable threaded rod not used for foundation anchorage per procedures noted in DSA IR 17-11.

END OF SECTION

SECTION 01 5000

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities, construction facilities and temporary controls to be provided, maintained, relocated, and removed by CONTRACTOR.

B. Temporary office furnishings and office equipment.

C. Project signage.

1.02 QUALITY ASSURANCE

A. CONTRACTOR shall comply with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building Code requirements.
2. Division of the State Architect.
3. Health and safety regulations.
4. Utility company regulations.
5. Police, fire department and rescue squad requirements.
6. Environmental protection regulations.

B. CONTRACTOR shall arrange for the inspection and testing of each temporary utility prior to use. Obtain required certifications and permits and transmit to OWNER.

C. CONTRACTOR provided facilities are to be in place and available for OWNER use and occupancy within 30 calendar days following the date of issue of the Notice to Proceed and shall remain in place and available for OWNER use and occupancy throughout the full term of the Contract.

1.03 SUBMITTALS

A. Temporary Utilities: Submit to OWNER reports of tests, inspections, meter readings, certifications, permits and similar procedures performed on temporary utilities.

B. Project Signage / Banner: Submit to OWNER for review and approval.

1. Shop Drawings: Elevation showing the text, OWNER sign and color of project signage, jointing, fittings and location of grommets.

2. Certification: Submit certification attesting fabric is certified as flame retardant, in accordance to NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.04 PROJECT IDENTIFICATION SIGNAGE / BANNER

A. CONTRACTOR shall furnish and install two Project Signs / Banners on the Project site at a location established by OWNER. OWNER will provide the information to be posted on the sign. A draft of the proposed sign shall be submitted to OWNER for review before fabrication.

1. Sign Size: eight feet wide by four feet high, tie wire grommets to fence / barricade.

2. The following shall be listed on the sign:

a. OWNER: Ventura County Community College District.

b. Name of School and project

c. Name of District Chancellor.

d. Alphabetical listing of other Board Members.

e. Name of the Architect/Engineer.

f. Name of CONTRACTOR.

B. Products of the following manufacturers form the basis for design and quality intended: 3M, MACtac North America, or equal, and shall meet the following requirements:

1. Flame retardant, heavy duty durable vinyl material, super smooth, minimum 16 ounces per layer.

2. Banners shall be cut with accurate angles and straight edges. Edges of banner shall be heat welded on four sides without causing fabric separation or otherwise damaging the work.

3. Banners shall have on both sides a clear, permanent, anti-graffiti coating that shall be durable and last a minimum of two years. Cleaning or removal of

graffiti shall not cause damage to the anti-graffiti coating or image, or cause it to flake, yellow, bubble, peel or fade.

4. Ink used in the printing process shall be of the highest quality OEM inks, and have integral UV protective components.

5. Banners shall be provided with ½ inch diameter grommets along the top and the bottom edges, spaced not more than 30 inches on center. Grommets shall be 4 inches, minimum, from the edges of the banner.

C. No other signs shall be displayed without approval of OWNER. At CONTRACTOR'S expense and without limitation remove and/or relocate Project signage and related facilities as rapidly as required in order to provide for progress of the Work.

D. CONTRACTOR shall remove Project Signage / Banner at Substantial Completion of the Work.

1.05 TEMPORARY UTILITIES

A. CONTRACTOR shall coordinate with the appropriate utility company to install temporary services. Where the utility company provides only partial service, CONTRACTOR shall provide and install the remainder with matching compatible materials and equipment.

B. CONTRACTOR shall furnish, install and pay for all necessary permits, inspections, move ins/out, temporary lines, connections and fees, extensions and distribution, metering devices and use charges, deliveries/pickups, rentals, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other miscellaneous items for the temporary utility systems. CONTRACTOR shall pay to utility companies for the consumption of the following temporary utility services:

1. Temporary Water service.

2. Temporary Electrical service.

3. Temporary Gas service.

4. Temporary Telephone and Data.

C. Maintain, extend and/or relocate temporary utility systems as rapidly as required in order to provide for progress of the Work.

1. Water distribution piping and outlet devices shall be of the size and required flow rates in order to provide service to all areas of the Project site.

2. Furnish, install, maintain, extend and distribute temporary electric area distribution boxes, so located that individual trades can obtain adequate power and artificial lighting, at all points required for the Work, for inspection and for safety.

   a. Provide 20 foot candles minimum lighting levels inside building(s) and 5 foot candles outside for safety and security.

   b. Ensure welding equipment is supplied by electrical generators.

3. Provide temporary Heating, Ventilation and Air Conditioning. OWNER will not accept utilization of the permanent HVAC system for temporary HVAC until Substantial Completion. CONTRACTOR shall maintain manufacturer required levels of room and/or space temperature, humidity and ventilation necessary to install products, materials and/or systems, cure materials, disperse humidity, remove fumes, and prevent accumulation of dust, irritants, or gases.

4. Provide temporary phone, data service and distribution to Project site temporary offices.

D. Upon Substantial Completion of the Work, remove temporary systems, devices and appurtenances.

1.06 TEMPORARY OFFICES

A. CONTRACTOR shall provide Project Site temporary office facilities for his own use, and in addition shall provide and maintain a minimum of one **12 x 40** construction trailer on the Project site for use by OWNER for the duration of the Work. Construction trailer shall be accessible by OWNER and/or INSPECTOR on a 7 day a week 24-hour basis. CONTRACTOR shall provide the necessary materials and labor to provide the trailer with access for disabled persons on request by the OWNER. Trailer shall include, at a minimum, the following:

1. Conference room with a table and adequate seating for twelve.

2. An open work area with devising partitions as required by OWNER.

3. Two enclosed, separate offices with windows and lockable doors.

B. Trailer shall be furnished with two exterior entrance doors with one located in a separate office. Each door shall be furnished with 'Smart Key' technology on both the dead bolt and cylinder lock. Provide six keys for each locking device. Exterior doors and windows shall be provided with exterior mounted burglar bars. Windows shall be provided with operable window shades. Security of trailer and contents is a continuous obligation of CONTRACTOR and shall be equipped with local sounding security system.

C. Trailer shall have ample headroom, 8-foot minimum, and shall be lighted, heated, ventilated, and air-conditioned.

D. The separate offices shall each be approximately 120 square feet in size and shall be furnished with a minimum of four 120 volt single phase convenience outlets.

E. CONTRACTOR shall coordinate floor plan and location of electrical, telephone, data outlets with OWNER prior to ordering and delivering the trailer.

F. At CONTRACTOR'S expense and without limitation remove and/or relocate temporary office(s) and related facilities as rapidly as required in order to provide for progress of the Work.

G. CONTRACTOR shall remove waste bin trash from OWNER's trailer, vacuum trailer floors and/or mop trailer floors once per week. Provide trailer with bathroom paper goods, soap, broom, mop and doormats.

H. Trailer shall remain property of CONTRACTOR. CONTRACTOR shall remove such property upon Substantial Completion of Work or as otherwise determined in writing by OWNER.

1.07 FURNISHINGS

A. CONTRACTOR shall provide **new or used** furnishings in the following quantities, shall set in rooms and shall position as directed by OWNER upon delivery:

1. **10** rolling mid-back task chairs, with arms and shall remain as CONTRACTOR's property.

2. **2** desks, 30 by 66 by 30 inches and shall remain as CONTRACTOR's property.

3. **2** resin folding tables, 29 by 30 by 72 and shall remain as CONTRACTOR's property.

4. Provide and install **2** "Plan-Hold" wall-mounted 42-inch wide plan racks with 36 individual plan holders each.

5. Provide and install **1** large white board in one conference room, 48 by 72 inches, Quartet melamine dry-erase board or equal. (Similar to Staples Cat. # 789834/Model: S538).

6. Provide and install **1** large tack board in the other conference room, 48 by 72 inches, Quartet cork bulletin board or equal. (Similar to Staples Cat. # 789842/Model: QRT2308).

B. Unless otherwise noted in this Section, furniture shall remain property of CONTRACTOR. CONTRACTOR shall remove such property upon Substantial Completion of Work or as otherwise determined in writing by OWNER.

1.08 TELEPHONE & DATA AND TRANSMISSION LINES

A. Provide business class Broadband data service. Broadband data service is defined as a minimum of 25 Mbps download.

B. Provide, install, and maintain the following specified equipment:

1. Provide wireless Internet access.

C. Printer/Copier/Scanner/Fax: Provide, install, configure and maintain for network connectivity one HP LaserJet MFP M880z+ (or latest HP equivalent model at time of bid) with the following features and accessories:

1. B/W and Color.

2. Speed:

a. Copy: 46 ppm.

b. Scan: 70 ppm.

c. Print: 46 ppm.

3. Network capable.

4. Three paper trays integral with the equipment including 8 ½ by 11, 8 ½ by 14 and 11 by 17.

5. Additional 3500 sheet paper feed pedestal or drawer.

6. 2 GB Image Memory, 160 GB hard disk drive.

7. 600 by 600 dpi.

8. Zoom, Reduction and enlargement from 25 percent to 400 percent.

9. Maintenance: CONTRACTOR shall repair and service machine as necessary. Repair calls shall be responded to within 24 hours of placement.

10. Supplies: CONTRACTOR shall provide THE FOLLOWING:

a. All toner supplies and consumables, including enough supplies to maintain two spares of each color toner.

b. All staples and other printer-related consumables, including enough supplies to maintain one spare staple cartridge.

D. CONTRACTOR shall be responsible for maintaining all transmission lines, equipment and related devices. If equipment and/or transmission equipment becomes inoperable and downtime exceeds two days, CONTRACTOR shall replace and/or provide equivalent interim equipment.

E. Electronic/office equipment shall be new at the commencement of the project.

1.09 TEMPORARY SANITARY FACILITIES

A. CONTRACTOR shall provide portable chemical toilet facilities. Quantity of portable chemical toilet facilities shall be based on total number of workers and shall be in accordance with CAL/OSHA standards.

B. Portable chemical toilet facilities shall be maintained with adequate supplies and in a clean and sanitary condition and shall be removed from the Project site upon Substantial Completion of the Work. CONTRACTOR shall keep both OWNER chemical toilet facilities and OWNER trailer restroom clean and operational at all times.

C. CONTRACTOR employees shall not use school toilet facilities.

D. At CONTRACTOR'S expense and without limitation remove and/or relocate portable chemical toilet facilities as rapidly as required in order to provide for progress of the Work.

E. CONTRACTOR will contain their breaks and lunch periods to the areas designated by OWNER or any public area outside the Project site. CONTRACTOR shall provide a suitable container within the break/lunch area for the placement of trash. Areas used for break/lunch must be maintained clean and orderly. Once finish flooring has been installed in a particular area, no food or beverages will be permitted in that area.

1.10 TEMPORARY SECURITY FENCE / BARRICADE

A. CONTRACTOR shall install temporary Project site security barricade(s) indicated on Drawings or as required for safety and as specified herein. New or used material may be furnished. Security of Project site and contents is a continuous obligation of CONTRACTOR.

B. Unless otherwise indicated or specified, security fence shall be constructed of 8-foot high chain link fencing with an 8-foot high windscreen. Space posts not to exceed ten feet on centers. Posts shall be of following nominal pipe dimensions: terminal, corner, and gatepost 2 ½-inch, line posts 2-inch. Chain link fence shall

be not less than #13 gauge, 2-inch mesh, and in one width. Posts, fence and accessories shall be galvanized and as follows:

1. Shall have galvanized steel pipe bases with rounded corners and anchored with snadbags or other weights to keep them securely in place, unless required otherwise in writing by OWNER.

2. Fence fabric shall be attached to posts with #14 gauge tie wire at 16 inches on center. A #6 gauge steel tension wire with turnbuckles shall be installed at top and bottom of barricade fencing. Wire tie fabric to tension wires at 18" centers.

3. Windscreen shall be attached to fence fabric and steel tension wires at 18-inch centers with a minimum of #14 gauge tie wire. Windscreen shall be maintained and all rips, tears, missing sections shall be corrected upon notification by OWNER.

4. Chain link fencing shall be free from barbs, icicles or other projections resulting from galvanizing process. Fence having such defects will be replaced even if it has been installed.

5. Gates shall be fabricated of steel pipe with welded corners, and bracing as required. Fence and fabric to be attached to frame at 12-inch centers. Provide all gate hardware of a strength and quality to perform satisfactorily until barricade is removed upon Substantial Completion of the Work. Each gate shall have a chain and padlock. Provide two gate keys to OWNER. At Substantial Completion of the Work, remove barricade from Project site, backfill and compact fence footing holes. Existing surface paving that is cut into or removed shall be patched and sealed to match surrounding areas.

6. At CONTRACTOR'S expense and without limitation remove or relocate fencing, fabric and barricades or other security and protection facilities as rapidly as required in order to provide for progress of the Work.

1.11 OTHER TEMPORARY ENCLOSURES AND BARRICADES

A. Provide lockable, temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, to allow for temporary heating and for security.

B. Provide protective barriers around trees, plants and other improvements designated to remain.

C. Temporary partitions shall be installed at all openings where additions connect to existing buildings, and where to protect areas, spaces, property, personnel, students and faculty and to separate and control dust, debris, noise, access, sight,

fire areas, safety and security. Temporary partitions shall be as designated on the Drawings or as specified by ARCHITECT. At CONTRACTOR'S expense and without limitation remove and/or relocate enclosures, barriers and temporary partitions as rapidly as required in order to provide for progress of the Work.

D. Since the Work of this Project may be immediately adjacent to existing occupied structures and vehicular and pedestrian right of ways, CONTRACTOR shall, in his sole judgment and in accordance with applicable safety standards, provide temporary facilities, additional barricades, protection and care to protect existing structures, occupants, property, pedestrians and vehicular traffic. CONTRACTOR is responsible for any damage, which may occur to the property and occupants of the property of OWNER or adjacent private or public properties which in any way results from the acts or neglect of CONTRACTOR.

E. CONTRACTOR shall be responsible for cleaning up all areas adjacent to the construction site which have been affected by the construction; and for restoring them to at least their original condition- including landscaping; planting of trees, sod, and shrubs damaged by construction; and raking and disposal of debris such as roofing shingles, paper, nails, glass sheet metal, bricks, and waste concrete. Construction debris shall be removed and properly disposed of. Culverts and drainage ditches with sediment from the construction area shall be cleared routinely to maintain proper drainage and re-cleaned prior to completion of the contract.

F. CONTRACTOR shall ensure sediment does not block storm drains. CONTRACTOR shall be responsible for cleaning storm drains blocked due to erosion or sediment from the work area.

1.12 TEMPORARY STORAGE YARDS

A. CONTRACTOR shall fence and maintain storage yards in an orderly manner.

B. Provide storage units for materials that cannot be stored outside.

C. At CONTRACTOR'S expense and without limitation remove and/or relocate storage yards and units as rapidly as required in order to provide for progress of the Work.

1.13 TEMPORARY DE-WATERING FACILITIES AND DRAINAGE

A. For temporary drainage and de-watering facilities and operations not directly associated with construction activities included under individual sections, comply with de-watering requirements of applicable Division 01 sections. CONTRACTOR shall maintain the Work, Project site and related areas free of water.

B. For temporary drainage and de-watering facilities and operations directly associated with new buildings, additions or other construction activities, comply with Divisions 01 and 33 Sections. CONTRACTOR shall be responsible for, but not limited to, de-watering of excavations, trenches and below grade areas of buildings, structures, the Project site and related areas.

1.14 TEMPORARY PROTECTION FACILITIES INSTALLATION

A. CONTRACTOR shall not change over from using temporary facilities and controls to permanent facilities until Substantial Completion, except as permitted by OWNER.

B. Until permanent fire protection needs are supplied and approved by authorities having jurisdiction, CONTRACTOR shall provide, install and maintain temporary fire protection facilities of the types needed in order to adequately protect against fire loss. CONTRACTOR shall adequately supervise welding operations, combustion type temporary heating and similar sources of fire ignition.

C. CONTRACTOR shall provide, install and maintain substantial temporary enclosures of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Where materials, tools and equipment are stored within the Work area, CONTRACTOR shall provide secure lock up to protect against vandalism, theft and similar violations of security. OWNER accepts no financial responsibility for loss, damage, vandalism or theft.

D. CONTRACTOR operations shall not block, hinder, impede or otherwise inhibit the use of required exits and/or emergency exits to the public way, except as approved by OWNER. CONTACTOR shall maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for firefighting equipment and/or personnel.

E. With approval of OWNER and at the earliest feasible date in each area of the Work, complete installation of the permanent fire protection facilities including connected services and place into operation and use. Instruct OWNER personnel in use of permanent fire protection facilities.

F. In the event of an emergency drill or an actual emergency, designated by the sounding of the fire alarm and/or other sounding device, all construction activities must cease. CONTRACTOR shall evacuate the Work area and remain outside the Work area until permitted to return. No Work shall be conducted during the evacuation of a building or during an emergency.

1.15 TEMPORARY SECURITY AND SAFETY MEASURES

A. During performance of the Work in existing facilities and/or on a Project Site occupied by students, CONTRACTOR shall provide, install and maintain substantial temporary barriers and/or partitions separating all Work areas from areas occupied by students, faculty and/or administrative staff.

B. During performance of the Work in existing facilities or on a Project site occupied by students and where temporary barriers or partitions are not physically feasible, CONTRACTOR shall provide an employee meeting the requirements of Education Code Section 45125.2.(2) to continually supervise and monitor all employees of CONTRACTOR and Subcontractor. For the purposes of this Section, CONTRACTOR employee shall be someone whom the Department of Justice has ascertained has not been convicted of a violent or serious felony as listed in Penal Code Section 667.5(c) and/or Penal Code Section 1192.7(c). To comply with this Section, CONTRACTOR shall have his employee submit his or her fingerprints to the Department of Justice pursuant to Education Code Section 45125.1(a).

C. Penal Code Sections 290 and 290.4 commonly known as "Megan's Law", require, among other things, individuals convicted of sexually oriented crimes, to register with the chief of police where the convicted individual resides or with a county sheriff or other law enforcement officials. CONTRACTOR shall check its own employees and require each Subcontractor to check its employees and report to CONTRACTOR if any such employees are registered sex offenders. CONTRACTOR shall check monthly during the life of the Contract to ascertain this information and report same to OWNER. Before starting the Work, and monthly thereafter during the life of Contract, CONTRACTOR shall notify OWNER in writing if any of its employees and/or if any Subcontractor's employees is a registered sex offender. If so, CONTRACTOR shall proceed in accordance with paragraph B above.

D. CONTRACTOR shall employ and maintain sufficient security and safety measures to effectively prevent vandalism, vagrancy, theft, arson, and all other such negative impacts to the Work. Any impacts to the progress of the Work of CONTRACTOR, OWNER, or OWNER'S forces, due to loss from inadequate security, will be the responsibility of CONTRACTOR.

E. Until Substantial Completion of the Work, CONTRACTOR shall employ appropriate means to remove all graffiti from buildings, equipment, fences and all other temporary and/or permanent improvements on the Project site within twenty-four (24) hours from the date of report or forty-eight (48) hours of each occurrence.

1.16 TEMPORARY ACCESS ROADS AND STAGING AREAS

A. Due to the limited amount of on and off Project site space for the parking of staff and school visitor's vehicles there will be no parking of CONTRACTOR vehicles

in areas designated for school use only. CONTRACTOR shall provide legal access to and maintain CONTRACTOR designated areas for the legal parking, loading, off-loading and delivery of all vehicles associated with the Work. CONTRACTOR shall be solely responsible for providing and maintaining these requirements whether on or off the Project site. CONTRACTOR shall provide and maintain ample on-site parking spaces designated for the exclusive use of OWNER. CONTRACTOR shall erect signs as required by OWNER each of these spaces and prevent all unauthorized vehicles from parking in the OWNER-reserved spaces.

B. Temporary access roads are to be installed and maintained by CONTRACTOR to all areas of the Project site.

C. CONTRACTOR will be permitted to utilize existing facility campus roads as designated by OWNER. CONTRACTOR shall only utilize those entrances and exits as designated by OWNER and CONTRACTOR shall observe all traffic regulations of OWNER.

D. CONTRACTOR shall maintain roads and walkways in a clean condition including removal of debris and/or other deleterious material on a daily basis.

1.17 DIRECTIONAL SIGNAGE AND ADVERTISEMENT POSTING

A. CONTRACTOR shall provide and install signage to provide directional, identification, and contact information to construction personnel and visitors as follows and as reviewed by OWNER.

1. For construction traffic control/flow at entrances/exits, and as designated by OWNER.

2. To direct visitors.

3. For construction parking.

4. To direct deliveries.

5. For Warning Signs as required.

6. In accordance with CAL/OSHA standards as necessary.

7. For trailer identification and Project site address.

8. For "No Smoking" safe work site at designated locations.

9. Emergency contact information and phone number of CONTRACTOR.

10. Emergency contact information and phone number of local police, fire, and emergency personnel.

11. For Labor Compliance Program (LCP) as required under the General Conditions (Prevailing wage rates and Notice of LCP)

12. Employee benefits payments paid to trust funds are required under the General Conditions.

B. OWNER has established a program authorizing vendors to post advertisements and billboards along the perimeter of project site. CONTRACTOR shall provide access and shall allow advertising signage to be placed on top of temporary, perimeter, security barricade and/or fences.

1.18 TRENCHES

A. Open trenches for installation of utility lines (water, gas, electrical and similar utilities) and open pits outside barricaded working areas shall be barricaded at all times in a legal manner determined by CONTRACTOR. Trenches shall be backfilled and patch-paved within twenty-four (24) hours after approval of installation by authorities having jurisdiction or shall have "trench plates" installed. Required access to buildings shall be provided and maintained. CONTRACTOR shall comply with all applicable statutes, codes and regulations regarding trenching and trenching operations. Open trenches deeper than 3'-6", and not located within a public street access, shall be enclosed within an 8'-0" high chain-link fence.

1.19 DUST CONTROL

A. CONTRACTOR is responsible for dust control on and off the Project site. When Work operations produce dust the Project site and/or streets shall be sprinkled with water to minimize the generation of dust. CONTRACTOR shall clean all soils and debris from construction vehicles and cover both earth and debris loads prior to leaving the Project site. CONTRACTOR shall, on a daily basis, clean all streets and/or public improvements within the right of way of any and all debris, dirt, mud and/or other materials attributable to operations of CONTRACTOR.

1.20 WASH OUT

A. CONTRACTOR shall provide and maintain a minimum of four (4) wash out boxes of sufficient size and strength to provide for concrete mixer wash out. CONTRACTOR shall locate and relocate both the wash out boxes and wash out areas in order to accommodate the progression of the Work. The wash out area shall be located as to minimize the amount of potential run off onto adjacent private and/or public property. CONTRACTOR shall legally dispose of the

contents of the wash out boxes and area on an as needed basis or as required by OAR.

1.21 WASTE DISPOSAL

A. CONTRACTOR shall provide and maintain trash bins on the Project site. Trash bins shall be serviced on an as needed basis and CONTRACTOR is responsible for the transportation of and the legal disposal of all contents.

1.22 ADVERSE WEATHER CONDITIONS

A. Should warnings of adverse weather conditions such as heavy rain and/or high winds be forecasted, CONTRACTOR shall provide every practical precaution to prevent damage to the Work, Project site and adjacent property. CONTRACTOR precautions shall include, but not be limited to, enclosing all openings, removing and/or securing loose materials, tools, equipment and scaffolding.

B. CONTRACTOR shall provide and maintain drainage away from buildings and structures.

C. CONTRACTOR shall implement all required storm water mitigation measures as required under related Division 01 Sections.

1.23 DAILY AND MONTHLY REPORTS

A. CONTRACTOR shall provide and maintain in the Project site office of CONTRACTOR, a daily sign in sheet for use by all employees of CONTRACTOR and all Subcontractors at whatever tier. At the beginning of each work day, the foreman, project manager, superintendent of CONTRACTOR and/or Subcontractors shall visit the site office of CONTRACTOR and shall enter onto the daily sign in sheet: all employee names; trade classification; and represented company. The completed sign in sheet shall serve as the basis of and shall be submitted with the daily construction report as set forth in Paragraph B below.

B. By the end of each workday, CONTRACTOR shall submit to OWNER and INSPECTOR a daily construction report denoting the daily manpower counts and a brief description/location of the workday activities. Manpower shall be broken down by trade classification such as foreman, journeyman or apprentice. The report shall also note the date, day of the week, weather conditions, deliveries, equipment on the Project site whether active and/or idle, visitors, inspections, accidents and unusual events, meetings, stoppages, losses, delays, shortages, strikes, orders and requests of governing agencies, Construction Directive and/or Change Orders received and implemented, services disconnected and/or connected, equipment start up or tests and partial use and/or occupancies.

CONTRACTOR shall also include on the daily construction report the above information for all Subcontractors at whatever tier.

C. CONTRACTOR shall submit on a monthly basis the forms found in Sections 01 3239 and 01 7416 certifying CEQA Mitigations and Storm Water Pollution Prevention (SWPP) compliances.

1.24 FIELD OFFICE SUPPLIES

A. CONTRACTOR shall provide the field office supplies.

B. Expendable field office support items specified elsewhere, including, but not limited to, furnishing toner cartridges and equipment maintenance are to be supplied and paid for by CONTRACTOR.

PART 2 – PRODUCTS – Not Used

PART 3 – EXUTION – Not Used

END OF SECTION

SECTION 01 7329

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies procedural requirements for cutting and patching.

1.02 RELATED REQUIREMENTS

A. Section 02 4116 - Demolition.

1.03 SUBMITTALS

A. The word "cutting" as used in the Contract Documents includes, but is not limited to, cutting, drilling, chopping, and other similar operations and the word "patching" includes, but is not limited to, patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing, or other similar operations.

B. Cutting and Patching Proposal: CONTRACTOR shall submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Contract Documents requires approval of these procedures before proceeding. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Denote how it will be performed and indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance or other significant visual elements.

3. List products to be used and firms or entities that will perform this Work.

4. Indicate dates when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching operations will disturb or affect. List utilities to be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.

7. Review by ARCHITECT and DSA prior to proceeding with cutting and patching does not waive ARCHITECT right to later require complete removal and replacement of defective Work.

1.04 QUALITY ASSURANCE

A. Requirements for structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. Obtain approval from ARCHITECT and DSA of the cutting and patching proposal before cutting and patching the following structural elements:

a. Foundation construction.

b. Bearing and retaining walls.

c. Structural concrete.

d. Structural steel.

e. Lintels.

f. Timber and primary wood framing.

g. Structural decking.

h. Stair systems.

i. Miscellaneous structural metals.

j. Exterior curtain-wall construction.

k. Equipment supports.

l. Piping, ductwork, vessels, and equipment.

m. Structural systems of special construction in Division 13 Sections.

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safely.

1. Obtain review of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:

   a. Primary operational systems and equipment.

   b. Air or smoke barriers.

   c. Water, moisture, or vapor barriers.

   d. Membranes and flashings.

   e. Fire protection systems.

   f. Noise and vibration control elements and systems.

   g. Control systems.

   h. Communication and/or data systems.

   i. Conveying systems.

   j. Electrical wiring systems.

   k. Operating systems of special construction in Division 13 Sections.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the opinion of ARCHITECT, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1. If possible, retain the original installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.

   a. Firestopping.

   b. Finished wood flooring.

   c. HVAC enclosures, cabinets, or covers.

1.05 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

A. Temporary support: Provide adequate temporary support of existing improvements or Work to be cut.

B. Protection: Protect existing improvements and Work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of existing improvements or Work that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Where the Work requires sandblasting of existing surfaces in order to receive new materials secured by cementitious, adhesive or chemical bond, completely remove existing finishes, stains, oil, grease, bitumen, mastic and adhesives or other substances deleterious to the new bonding or fastening of new Work. Utilize wet sand blasting for interior surfaces and for exterior surfaces where necessary to prevent objectionable production of dust.

3.03 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Carefully remove existing Work to be salvaged and/or reinstalled. Protect and store for reuse into the Work. Verify compatibility and suitability of existing substrates before starting the Work.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining Work. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or a diamond-core drill. Saw cut reinforcing bars and paint ends with bituminous paint except where bonded into new concrete. When cutting concrete paving, cut and remove to nearest existing joint line.

4. Comply with requirements of applicable Sections of Divisions 31, 32, and 33 where cutting and patching requires excavating, backfill, and recompaction.

5. Woodwork: Cut and or remove to a panel or joint line.

6. Sheet Metal: Remove back to joint, lap, or connection. Secure loose or unfastened ends or edges and seal watertight.

7. Glass: Remove cracked, broken, or damaged glass and clean rebates and stops of setting materials.

8. Plaster: Cut back to sound plaster on straight lines, and back bevel edges of remaining plaster. Trim existing lath and prepare for new lath.

9. Gypsum Wallboard: Cut back on straight lines to undamaged surfaces with at least two opposite cut edges centered on supports.

10. Acoustical ceilings: Remove hanger wires and related appurtenances where ceilings are not scheduled to be installed.

11. Tile: Cut back to sound tile and backing on joint lines.

12. Flooring: Completely remove flooring and clean backing of prior adhesive. Carefully remove wood flooring for patching and repairing of existing wood flooring scheduled to remain.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with required tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation. Verify conditions of existing substrates prior to executing Work.

2. Restore exposed finishes of patched areas and extend finish restoration into retaining adjoining construction in a manner that will eliminate all evidence of patching and refinishing.

3. Concrete: Maintain cut edges in a moist condition for twenty four hours prior to the placement of new concrete. In lieu of this an epoxy adhesive may be provided. Finish placed concrete to match existing unless noted otherwise. Concrete shall have a compressive strength of 3,000 psi where installed to repair and match existing improvements, unless noted otherwise.

4. Metal Fabrications: Items to remain exposed shall have their edges cut and ground smooth and rounded.

5. Sheet Metal: Replace removed or damaged sheet metal items for new Work.

6. Glass: Install matching glass and re-seal exterior window assemblies.

7. Lath and Plaster: Install new lath materials to match existing and fasten to supports at 6-inch centers. Provide a 6-inch lap where new lath to adjoins existing lath. Fasten new lath as required for new Work. Restore paper backings as required. Apply a bonding agent on cut edges of existing plaster. Apply three coat plaster of the type, thickness, finish, texture, and color to match existing.

8. Gypsum Wallboard: Fasten cut edges of wallboard. Install patches with at least two opposite edges centered on supports and secure at 6-inch centers. Tape and finish joints and fastener heads. Patching shall be non-apparent when painted or finished.

9. Acoustical Ceilings: Comply with the requirements for new Work specified in related sections of the Contract Documents.

10. Resilient Flooring: Completely remove flooring and prepare substrate for new material.

11. Painting: Prepare areas to be patched, patch and paint as specified under related sections of the Contract Documents.

3.04 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged coverings to their original condition.

END OF SECTION

SECTION 01 7417

BMP IMPLEMENTATION PLAN
(FOR SITES WITH LAND DISTURBANCE OF LESS THAN ONE ACRE)

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Storm water permitting and certification as required by local regulations.
2. Preparation, implementation, upkeep and monitoring of BMP Implementation Plan.
3. Control runoff and pollutants from the site during construction activities.

B. Related Requirements:

1. Division 01 – General Requirements.
2. Section 33 4000 – Storm Drainage Utilities.

1.02 ACRONYMS AND DEFINITIONS

BMP	Best Management Practice.
CAN	Corrective Action Notice.
CASQA	California Stormwater Quality Association.
CGP	NPDES General Permit for Storm Water Discharges Associated with Construction Activities.
DWQ	Division of Water Quality.
LARWQCB	Los Angeles Regional Water Quality Control Board.
NPDES	National Pollutant Discharge Elimination System.
QRE	Qualifying Rain Event, is an event that produces 0.5 inches of precipitation with a 48 hour or more period between rain events.
QSD	Qualified SWPPP Developer.
QSP	Qualified SWPPP Practitioner.

RISK LEVEL	As defined by CGP.
SWPPP	Storm Water Pollution Prevention.
SWRCB	State Water Resources Control Board.
WPCD	Water Pollution Control Drawing.

1.03 REQUIREMENTS

A. CONTRACTOR shall assign a QSP and QSD for the Work of this Section.

B. Prior to start of Construction, CONTRACTOR shall:

1. Submit QSP and QSD qualifications.
2. Develop a BMP implementation, inspection, and maintenance plan, certified by QSD, in accordance with CGP Attachment C - Risk Level 1 Requirements, which shall include:
   a. Provide WPCD to reflect proposed construction staging, phasing, schedule and other construction activities.
   b. Good Site Management "Housekeeping".
   c. Erosion, Sediment, Tracking, and Wind Erosion Control BMPs.
   d. Non-storm Water Control BMPs.
   e. Waste Management BMPs.
3. Incorporate BMP activities into the Project Schedule.
4. Secure and pay for deposits, permits inspections.
5. Inform CONTRACTOR and Subcontractors personnel on the BMP procedures to prevent pollutants from entering the storm drain system, before they start construction activities.

C. During Construction:

1. Implement, install and maintain BMPs. Insure that BMPs are designed to protect all exposed portions of the site.
2. Conduct and document storm water training of CONTRACTOR site personnel and provide records of training to OWNER. See Attachment "D" for sample training log. Keep personnel informed of the BMP implementation process and changes.
3. Conduct site inspection of pollution prevention controls and provide Site Monitoring Reports:
   1) At least weekly.
   2) Within 48 hours prior to a QRE.

3) Within 48 hours after a QRE, conduct a post-storm event inspection to identify whether BMPs are adequately designed, implemented, and effective. Identify additional BMPs necessary and revise the BMP Implementation Plan accordingly.

4) Before and after a QRE.

5) At least once each 24 hours during extended storm events.

6) Conduct quarterly non-storm water inspection (per Attachment "C").

4. Prepare and maintain, at the Project site, a log of each inspection using Site Monitoring Report forms (Attachment "A", at the end of this Section.

5. Conduct quarterly non-storm water inspection (per Attachment "C").

6. Provide verification annually, no later than July 15, that construction activities are in compliance with BMP Implementation Plan (Attachment "B"). Non-compliance shall be reported to OWNER immediately.

7. Provide to OWNER Site Inspection reports, BMP plan revisions, and Compliance Certifications.

8. Participate in quarterly BMP inspections with representative from OWNER. Correct CAN items issued by OWNER representative.

9. Update Post Construction BMP Installation and Maintenance Log per Section 33 4000, Storm Drainage Utilities.

10. Markup the Post-Construction BMP Maintenance Plan provided by the ARCHITECT to reflect as-built conditions and submit to OWNER.

11. Retain the BMP Implementation Plan on site and keep it updated until Substantial Completion.

12. Pay fines and penalties from regulatory agencies against OWNER due to CONTRACTOR'S non-compliance with storm water regulations. OWNER shall recover costs of fines and penalties by appropriate OWNER assessment. Review of the BMP Implementation Plan and inspection log by OWNER shall not relieve CONTRACTOR from liabilities arising from non-compliance of storm water pollution regulations.

D. At Substantial Completion:

1. Handover maintenance log and maintenance plan to OWNER.

2. Provide Site Monitoring Reports, BMP Implementation Plan revisions, Annual Compliance Certifications and related documents to OWNER.

3. Conduct Post-Construction BMP training of OWNER personnel.

4. Notify OWNER to schedule a meeting to confirm Substantial Completion of BMP Implementation Plan.

5. Submit to OWNER Substantial Completion Certification that the Project has met all of the conditions of the BMP implementation Plan (Attachment "B"). Post-construction storm water operation and management plan as mentioned in the compliance certifications are considered to be in place at Substantial Completion.

E. OWNER:

1. OWNER'S Project Inspector will conduct inspection and examination of the BMP Implementation Plan.
2. OWNER Maintenance and Operations will maintain prevention controls left in place after CONTRACTOR receives Substantial Completion.

1.04 SUBMITTALS

A. BMP Implementation Plan:

1. Submit two compact disks of BMP Implementation Plan.
2. Provide the following documentation to OWNER:
   a. BMP material quality, grade, type as specified in the CASCA BMP Handbook.
   b. QSP and QSD training and qualifications.
   c. Electronic copy of weekly and quarterly inspection reports and annual compliance certifications.
   d. Training records of CONTRACTOR site personnel.
   e. BMP implementation schedule.
   f. WPCD revisions.

B. Closeout Documents: At Substantial Completion provide one hard copy and two CD's with electronic files in PDF format of the documents listed below to OWNER. OWNER will forward records electronically to OWNER Supervising Civil Engineer for retention period of three years.

1. BMP implementation and Monitoring Program.
2. Inspection Records.
3. Annual Compliance Certifications and Check Lists.
4. Training Records for CONTRACTOR and OWNER personnel.
5. Maintenance records for post construction BMP.
6. Post Construction BMP Maintenance Plan.
7. Substantial Completion Certification.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following requirements:

1. National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Lands Disturbance Activities; ORDER NO. 2009-0009-DWQ; NPDES NO. CAS000002, adopted by the State Water Resources Control Board.
2. Regulations of the California Environmental Protection Agency, State Water Resources Control Board; Los Angeles Regional Water Control Board, and local ordinances.
3. CASQA Stormwater Best Management Practice Handbook for Construction Activity (BMP Handbook) current adopted edition.

B. CONTRACTOR's QSP/QSD shall meet the following qualifications:

1. Current certification as a CASQA Qualified SWPPP Practitioner/Developer.
2. Two years minimum experience in erosion and sediment control and knowledgeable in the requirements of SWPPP, Best Management Practices and CGP.

1.06 STORAGE AND PROTECTION

A. Provide proper storage of materials and equipment to prevent rain and storm water runoff to come in contact with pollutants, such as soil stabilizers, paint or fluids from vehicles.

1.07 TRAINING OF OWNER PERSONNEL (Not used)

1.08 ATTACHMENTS

A. The following attachments are included at the end of this Section:

1. Attachment "A" - Site Monitoring Report.
2. Attachment "B" - Compliance Certification and Checklist.
3. Attachment "C" – Quarterly Non-Storm Water Form.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide quality, grade and type of materials as specified in CASQA Stormwater Best Management Practice, Handbook.

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. Install perimeter controls prior to starting Work at the Project site.

B. Implement BMP plan to contain on-site storm water on the Project site. Provide storm drain inlet protection. Do not drain on-site water directly into the storm drain without proper BMP in place.

C. Prevent pollutant discharges into the storm drain system. Prevent storm water from coming into contact with pollutants, such as sediment, material spills, or leakage from storage tanks, waste containers or transfer areas. In the event contamination is found CONTRACTOR shall immediately notify OWNER.

D. Protect exposed dirt, such as stockpiles, landscaping areas, and hillsides.

E. Properly manage non-storm water discharges such as ground water, broken utility lines and fire hydrant testing per BMP Implementation Plan.

F. Adjust BMP's locations and layouts in accordance to construction progress to assure compliance to regulations.

G. Conduct inspections of pollution prevention controls and provide Site Monitoring Report to OWNER immediately if pollutants are discharged into the site runoff. CONTRACTOR shall remediate contaminated water.

H. Upon Substantial Completion: Maintain and leave post-construction storm water pollution prevention controls in place and remove those that are not needed as determined by the QSD and OWNER.

3.02 CLOSEOUT

A. Verify the following prior to Substantial Completion:

1. Elements of the BMP Implementation Plan have been completed.
2. Final stabilization of site has been demonstrated.
3. There is no potential for construction related storm water pollutants to be discharged into site runoff.
4. Construction related equipment and temporary BMP have been removed from site.
5. Rubbish, debris, and waste materials have been removed and legally disposed of off the Project site.

6. OEHS CAN items have been closed and signed-off.
7. Post-Construction BMP Maintenance plan has been established.

END OF SECTION

_____ OWNER Project Number	**Moorpark College** **As OWNER** ATTACHMENT "A" **STORM WATER POLLUTION PREVENTION SITE MONITORING REPORT**	STATE OF CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

School Name: _____ _____

Project Description: Contract Number

I. **Type of Examination:** (Use one form for each type of examination):

☐ Prior to Anticipated Storm Event ☐ After Actual Storm Event ☐ Weekly

Date Examined: _____

II. **Check the response for each** BMP Implementation Plan **question below**:

	YES	NO
1. Do you have an updated Storm Water Pollution Prevention Plan (BMP Implementation Plan) and a BMP Handbook on the Project site?	☐	☐
2. Does your BMP Implementation Plan incorporate an up-to-date erosion control plan?	☐	☐
3. Is the erosion control installed per plan?	☐	☐
4. Is the Work at a stage where the erosion control plan can not be constructed, is the erosion control at the Maximum Extent Practicable for the stage you are in?	☐	☐
5. Did you observe the presence of any floating materials such as oil, grease, pieces of wood, paper, etc., odor, toxics, and/ or sediments?	☐	☐

6. If yes, what is it that you observed? _____

III. Check the status of the following items as observed:

	BMP Implementation Plan Items	Not Applicable	Acceptable	Not Acceptable		Repairs Required	Date Repairs Completed
1.	De-silting Basins (Cleaned)	☐	☐	☐	--	☐	
2.	Water Quality Basin	☐	☐	☐	--	☐	
3.	Silt Fences	☐	☐	☐	--	☐	
4.	Hay bales/ Check dams/ Sandbags	☐	☐	☐	--	☐	
5.	Berms and Dikes	☐	☐	☐	--	☐	
6.	Sand/Gravel Inlet	☐	☐	☐	--	☐	
7.	Slope Protection - Polymer and Mulch	☐	☐	☐	--	☐	
8.	Vegetation / Re-vegetation	☐	☐	☐	--	☐	
9.	Dust Control	☐	☐	☐	--	☐	
10.	Surface Erosion	☐	☐	☐	--	☐	
11.	Slope Instability	☐	☐	☐	--	☐	
12.	Storage	☐	☐	☐	--	☐	
13.	Disposal	☐	☐	☐	--	☐	
14.	Spills	☐	☐	☐	--	☐	
15.	Clean-up	☐	☐	☐	--	☐	
16.		☐	☐	☐	--	☐	
17.		☐	☐	☐	--	☐	

IV. Describe any problems or required repairs checked above and the necessary actions needed:

Item	Description of Problem or Required Repair	Action Needed

Examination Performed by CONTRACTOR:

_____ _____

By (Print Name and Title) Date

Verified by Inspector:

_____ _____

By (Print Name and Title) Date

Detailed Storm Water Quality Construction Site Inspection Checklist

ATTACHMENT "A" (Cont.)

GENERAL INFORMATION				
Project Name				
Project Number				
Contractor				
Inspector's Name				
Inspector's Title				
Signature				
Date of Inspection				
Inspection Type (Check Applicable)	❒ Prior to forecast rain		❒ After a rain event	
	❒ 24-hr intervals during extended rain		❒ Other _____ Weekly or Quarterly _____	
Season (Check Applicable)	❒ Rainy		❒ Non-Rainy	
Storm Data	Storm Start Date & Time:		Storm Duration (hrs):	
	Time elapsed since last storm (Circle Applicable Units)	Min. Hr. Days	Approximate Rainfall Amount (inches)	

PROJECT AREA SUMMARY AND DISTURBED SOIL AREA (DSA) SIZE		
Total Project Area	_____	Acres
Field Estimate of Active DSAs	_____	Acres
Field Estimate of Non-Active DSAs	_____	Acres

INSPECTION OF BMP - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Preservation of Existing Vegetation				
Is temporary fencing provided to preserve vegetation in areas where no construction activity is planned?				
Location:				
Location:				
Location:				
Location:				
Erosion Control				
Does the applied temporary erosion control provide 100% coverage for the affected areas?				
Are any non-vegetated areas that may require temporary erosion control?				
Is the area where erosion controls are used required free from visible erosion?				
Location:				
Location:				
Location:				
Location:				
Temporary Linear Sediment Barriers (Silt Fence, Fiber Rolls, Sandbag Barriers, etc.)				
Are temporary linear sediment barriers properly installed, functional and maintained?				
Are temporary linear sediment barriers free of accumulated litter?				
Is the built-up sediment less than 1/3 the height of the barrier?				
Are cross barriers installed where necessary and properly spaced?				
Location:				
Location:				
Location:				
Location:				
Location:				
Storm Drain Inlet Protection				
Are storm drain inlets internal to the project properly protected?				
Are storm drain inlet protection devices in working order and being properly maintained?				
Location:				
Location:				
Location:				
Location:				

INSPECTION OF BMP - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Location:				
Sediment Basins				
Are basins designed in accordance with the requirements of the General Permit?				
Are basins maintained to provide the required retention/detention?				
Are basin controls (inlets, outlets, diversions, weirs, spillways, and racks) in working order?				
Location:				
Location:				
Location:				
Location:				
Stockpiles				
Are all locations of temporary stockpiles, including soil, hazardous waste, and construction materials in approved areas?				
Are stockpiles protected from run-on, run-off from adjacent areas and from winds?				
Are stockpiles located at least 15 m from concentrated flows, downstream drainage courses and storm drain inlets?				
Are required covers and/or perimeter controls in place?				
Location:				
Location:				
Location:				
Location:				
Concentrated Flows				
Are concentrated flow paths protected and free from visible erosion?				
Location:				
Location:				
Location:				
Location:				
Tracking Control				
Is the entrance stabilized to prevent tracking				
Is the stabilized entrance inspected daily to ensure that it is working properly				
Are points of ingress/egress to public/private roads inspected and swept and vacuumed as needed?				
Are all paved areas free of visible sediment tracking or other particulate matter?				
Location:				

INSPECTION OF BMP - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Location:				
Location:				
Location:				
Wind Erosion Control				
Is dust control implemented?				
Location:				
Location:				
Location:				
Location:				
Dewatering Operations				
Are all one-time dewatering operations covered by the General Permit inspected before and as they occur and BMP implemented as necessary during discharge?				
Is ground water dewatering handled in conformance with the dewatering permit issued by the LARWQCB?				
Is required treatment provided for dewatering effluent?				
Location:				
Location:				
Location:				
Location:				
Vehicle & Equipment Fueling, Cleaning, and Maintenance				
Are vehicle and equipment fueling, cleaning and maintenance areas reasonably clean and free of spills, leaks, or any other deleterious material?				
Are vehicle and equipment fueling, cleaning and maintenance activities performed on an impermeable surface in dedicated areas?				
If no, are drip pans used?				
Are dedicated fueling, cleaning, and maintenance areas located at least 15 m away from downstream drainage facilities and watercourses and protected from run-on and runoff?				
Is wash water contained for infiltration/ evaporation and disposed of appropriately?				
Is on-site cleaning limited to washing with water (no soap, soaps substitutes, solvents, or steam)?				
On each day of use, are vehicles and equipment inspected for leaks and if necessary, repaired?				
Location:				
Location:				
Location:				

INSPECTION OF BMP - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Location:				
Waste Management & Materials Pollution Control				
Are material storage areas and washout areas protected from run-on and runoff, and located at least 15 m from concentrated flows and downstream drainage facilities?				
Are all material handling and storage areas clean; organized; free of spills, leaks, or any other deleterious material; and stocked with appropriate clean-up supplies?				
Are liquid materials, hazardous materials, and hazardous wastes stored in temporary containment facilities?				
Are bagged and boxed materials stored on pallets?				
Are hazardous materials and wastes stored in appropriate, labeled containers?				
Are proper storage, clean-up, and spill-reporting procedures for hazardous materials and wastes posted in open, conspicuous and accessible locations adjacent to storage areas?				
Are temporary containment facilities free of spills and rainwater?				
Are temporary containment facilities and bagged/boxed materials covered?				
Are temporary concrete washout facilities designated and being used?				
Are temporary concrete washout facilities functional for receiving and containing concrete waste and are concrete residues prevented from entering the drainage system?				
Do temporary concrete washout facilities provide sufficient volume and freeboard for planned concrete operations?				
Are concrete wastes, including residues from cutting and grinding, contained and disposed of off-site or in concrete washout facilities?				
Are spills from mobile equipment fueling and maintenance properly contained and cleaned up?				
Is the site free of litter?				
Are trash receptacles provided in the yard, field trailer areas, and at locations where workers congregate for lunch and break periods?				
Is litter from work areas collected and placed in watertight dumpsters?				
Are waste management receptacles free of leaks?				
Are the contents of waste management receptacles properly protected from contact with storm water or from being dislodged by winds?				
Are waste management receptacles filled at or beyond capacity?				
Location:				
Location:				
Location:				

INSPECTION OF BMP - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Location:				
Temporary Water Body Crossing or Encroachment				
Are temporary water body crossings and encroachments constructed appropriately?				
Does the project conform to the requirements of the 404 permit and/or 1601agreement?				
Location:				
Location:				
Location:				
Location:				
Illicit Connection/ Discharge				
Is there any evidence of illicit discharges or illegal dumping on the project site?				
If yes, has the Owner/Operator been notified?				
Location:				
Location:				
Location:				
Location:				
Discharge Points				
Are discharge points and discharge flows free from visible pollutants?				
Are discharge points free of any significant sediment transport?				
Location:				
Location:				
Location:				
Location:				
BMP Implementation Plan Update				
Does the BMP Implementation Plan and Project Schedule adequately reflect the current site conditions and contractor operations?				
Are all BMP shown on the Erosion Control Plans installed in the proper location(s) and according to the details in the BMP Implementation Plan?				
Location:				
Location:				
Location:				
Location:				
General				

INSPECTION OF BMP - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Are there any other potential concerns at the site?				
Location:				
Location:				
Location:				
Location:				
Storm Water Monitoring				
Does storm water discharge directly to a water body listed in the General Permit as impaired for sediment/sedimentation or turbidity?				
If yes, were samples for sediment/sedimentation or turbidity collected pursuant to the sampling and analysis plan in the BMP Implementation Plan?				
Did the sampling results indicate that the discharges are causing or contributing to further impairment?				
If yes, were the erosion/sediment control BMP improved or maintained to reduce the discharge of sediment to the water body?				
Were there any BMP not properly implemented or breaches, malfunctions, leakages or spills observed which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water?				
If yes, were samples for non-visually detectable pollutants collected pursuant to the sampling and analysis plan during rain events?				
If sampling indicated pollution of the storm water, were the leaks, breaches, spills, etc. cleaned up and the contaminated soil properly disposed of?				
Were the BMP maintained or replaced?				
Were soil amendments (e.g., gypsum, lime) used on the project?				
If yes, were samples for non-visually detectable pollutants collected pursuant to the sampling and analysis plan in the BMP Implementation Plan?				
If sampling indicated pollution of the storm water by the use of the soil amendments, is there a contingency plan for retention onsite of the polluted storm water?				
Did storm water contact stored materials or waste and run off the construction site? (Materials not in watertight containers, etc.)				
If yes, were samples for non-visually detectable pollutants collected pursuant to the sampling and analysis plan in the BMP Implementation Plan?				

_____ OWNER Project Number	**Moorpark College** **Ventura County Community College District** **As OWNER** **ATTACHMENT "B"**	STATE OF CALIFORNIA STATE WATER BOARD WDID NO.

COMPLIANCE CERTIFICATION

School Name: _____ _____
Project Description: Contract Number

ANNUAL CERTIFICATION

I certify the Project has met the following conditions: All elements of the BMP Implementation Plan are in place; construction materials and equipment maintenance waste have been disposed of properly; and the Project site is in compliance with all local storm water management requirements including erosion/sediment control requirements, and the appropriate use permits have been obtained.

CONTRACTOR: _____

Print Name: _____ Title: _____

Signature: _____ Date: _____

SUBSTANTIAL COMPLETION CERTIFICATION

I certify the Project has been completed and the following conditions have been met: All elements of the BMP Implementation Plan have been completed; construction materials and equipment maintenance waste have been disposed of properly; the Project site is in compliance with all local storm water management requirements including erosion/sediment control requirements and the appropriate use permits have been obtained; and a post-construction storm water operation, and management plan is in place.

CONTRACTOR: _____

Print Name: _____ Title: _____

Signature: _____ Date: _____

Moorpark College
Ventura County Commuinty College District

REPORT DATE

ATTACHMENT "B" (CONT.)

CERTIFICATION CHECK LIST

SITE _____
PROJECT NUMBER _____

IS BMP IMPLEMENTATION PLAN ONSITE AND UPDATED	[ ] YES	[ ] NO
TRAINING RECORDS	[ ] YES	[ ] NO
CONSTRUCTION SCHEDULE	[ ] YES	[ ] NO
EROSION CONTROL PLAN	[ ] YES	[ ] NO
Property Line Dileanated	[ ] YES	[ ] NO
Active / Inactive Areas	[ ] YES	[ ] NO
Drainage Patterns	[ ] YES	[ ] NO
Discharge Points	[ ] YES	[ ] NO
Sampling Points	[ ] YES	[ ] NO
BMPs with legend	[ ] YES	[ ] NO
Staging Areas, Stockpiles, entrance exit	[ ] YES	[ ] NO
Vehicle Storage, concrete wahsout	[ ] YES	[ ] NO
WEEKLY REPORTS FILED	[ ] YES	[ ] NO
WEATHER REPORTS	[ ] YES	[ ] NO
QUARTERLY NON-STORM	[ ] YES	[ ] NO
	LATEST DATED: _____	
BMP IMPLEMENTATION PLAN REVISIONS DOCUMENTED	[ ] YES	[ ] NO
PERMIT FEES PAID AND REPORTS FILED	[ ] YES	[ ] NO
	LATEST DATED: _____	
DATE OF LAST OEHS INSPECTION VISIT	LATEST DATED: _____	
WERE OEHS RECOMMENDATION IMPLEMENTED	[ ] YES	[ ] NO

CERTIFICATION OF CONTRACTORS QSP

Name _____
Agency _____
Number _____
Expiration Date _____
Email _____
Phone _____

COMMENTS

OAR NAME	CONTRACTOR NAME
SIGNATURE	SIGNATURE
DATE	DATE

Moorpark College
Ventura County Community College District

Attachment "C"
Quarterly / Annual Non-Storm Water Form

I. WDID NO. _____

II. FACILITY OPERATOR INFORMATION

Facility Name _____ Contact Person _____

Mailing Address _____ Title _____

City _____ State **CA** Zip _____ Phone _____

III. FACILITY SITE INFORMATION

Facility Name _____ Contact Person _____

Location _____ Title _____

City _____ State **CA** Zip _____ Phone _____

IV. PERMIT LANGUAGE

All dischargers are required to conduct quarterly, non-storm water visual inspections. For these inspections, the discharger must visually observe each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

CGP Section II.E describes authorized non-storm water discharges including those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water

ATTACHMENT "C" (Cont.)

dewatering, and other discharges not subject to a separate general NPDES permit adopted by a region. Additionally, authorized non-storm water discharges must not be used to clean up failed or inadequate construction or post-construction BMP designed to keep materials onsite. Authorized non-storm water dewatering discharges may require a permit because some Regional Water Boards have adopted General Permits for dewatering discharges. The General Permit prohibits the discharge of storm water that causes or threatens to cause pollution, contamination, or nuisance.

Non-storm water discharges directly connected to receiving waters or the storm drain system have the potential to negatively impact water quality. The discharger must implement measures to control all non-storm water discharges during construction, and from dewatering activities associated with construction. Examples include; properly washing vehicles in contained areas, cleaning streets, and minimizing irrigation runoff.

Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

V. <u>DOCUMENT CHECKLIST</u> (Please check each item to verify that the documents are attached)

☐ Did Authorized Discharge take place

☐ Did Unauthorized Discharge take place

☐ Form 2 Attached

☐ Form 3 Attached

☐ Complete Form 1 once a Quarter and prior to fire hydrant testing or other authorized discharges.

Attachment "C" (Cont.)
FORM 1

Structural Best Management Practices Housekeeping for Non-Visible Pollutants	**BMP Conditions E, NM, N/A YES OR NO**	**Actions Taken or BMP Added**
Drainage Areas		
Free of Floating & Suspended Material		
Free of Sheen/Discoloration		
Free of Turbidity		
Free of Odor		
Construction Materials Storage Areas		
Materials Properly Stored		
Pollutants Covered		
Pollutants Bermed		
Construction Waste Management		
Containment Stockpiled Waste		
Containment Sanitary Facilities		
Containment Waste Watertight Containers		
Vehicle Storage/Fueling/Spill Prevention		
Fueling Procedures/Designated Areas		
Vehicle Storage with Containment		
Spill Kit Onsite		
Concrete Residuals & Washouts Wastes		
Properly Placed Washout		
Secondary Containment		
Landscape Materials		
Stored Away from Flow Lines		
Containment Fertilizers/Soil Amendments		
Secondary Containment Plants		
Observations/Comments:		
E-EFFECTIVE N/M-NEEDS MAINTENANCE N/A-NOT APPLICABLE YES or NO		

Attachment "C" (Cont.)

REPORT – PART A FORM 2 QUARTERLY VISUAL OBSERVATIONS OF AUTHORIZED NON STORM WATER DISCHARGES (NSWDs)

- Quarterly dry weather visual observations are required of each authorized NSWD.
- Observe each authorized NSWD source, impacted drainage area, and discharge location.
- Authorized NSWDs must meet the conditions provided in Section D (pages 5-6), of the General Permit.
- Make additional copies of this form as necessary.

QUARTER: **JULY-SEPT.** DATE: _	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs DISCHARGED DURING THIS QUARTER?** **YES** ☐ If **YES**, complete Part B of this form. **NO** ☐
QUARTER: **OCT.-DEC.** DATE: _	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs DISCHARGED DURING THIS QUARTER?** **YES** ☐ If **YES**, complete Part B of this form. **NO** ☐
QUARTER: **JAN.-MARCH** DATE: _	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs DISCHARGED DURING THIS QUARTER?** **YES.** ☐ If **YES**, complete Part B of this form. **NO** ☐
QUARTER: **APRIL-JUNE** DATE: _	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs DISCHARGED DURING THIS QUARTER? NO** **YES** ☐ If **YES**, complete Part B of this form. **NO** ☐

Attachment "C" (Cont.)

REPORT
FORM 2 – QUARTERLY VISUAL OBSERVATIONS OR AUTHORIZED NON-STORM WATER DISCHARGES (NSWDs)

DATE/TIME OF OBSERVATION	SOURCE AND LOCATION OF AUTHORIZED NSWD Example: Air conditioner Units on Building C	NAME OF AUTHORIZED NSWD Example: Air conditioner condensate	DESCRIBE AUTHORIZED NSWD CHARACTERISTICS Indicate weather authorized NSWD is clear, cloudy, or discolored, causing staining, contains floating objects or an oil sheen, has odors, etc.		DESCRIBE ANY REVISED OR NEW BMP's AND PROVIDE THEIR IMPLEMENTATION DATE
			At the NSWD Source	At the NSWD Drainage Area and Discharge Location	
_____ _____ ☐ AM ☐ PM					
_____ _____ ☐ AM ☐ PM					
_____ _____ ☐ AM ☐ PM					
_____ _____ ☐ AM ☐ PM					
_____ _____ ☐ AM ☐ PM					

Attachment "C" (Cont.)

REPORT – PART A FORM 3 QUARTERLY VISUAL OBSERVATIONS OF UNAUTHORIZED NON STORM WATER DISCHARGES (NSWDs)

- Unauthorized NSWDs are discharges (such as wash or rinse waters) that do not meet the conditions provided in Section D (pages 5-6) of the General Permit.
- Quarterly visual observations are required to observe current and detect prior unauthorized NSWD.
- Quarterly visual observations are required during dry weather and at all facility drainage areas.
- Each unauthorized NSWD source, impacted drainage area, and discharge location must be identified and observed.
- Unauthorized NSWDs that can not be eliminated within 90 days of observation must be reported to the OWNER in accordance with Section A.10.e of the General Permit.
- Make additional copies of this form as necessary.

QUARTER: **JULY-SEPT.** **DATE/TIME OF OBSERVATIONS** ☐ **AM** ☐ **PM** _____	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs OBSERVED?** **YES** ☐ **NO** ☐ **WERE THERE INDICATIONS OF PRIOR UNAUTHORIZED NAWDS?** **YES** ☐ **NO** ☐ If **YES**, complete Part B of this form.
QUARTER: **OCT.-DEC.** **DATE/TIME OF OBSERVATIONS** ☐ **AM** ☐ **PM** _____	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs OBSERVED?** **YES** ☐ **NO** ☐ **WERE THERE INDICATIONS OF PRIOR UNAUTHORIZED NAWDS?** **YES** ☐ **NO** ☐ If **YES**, complete Part B of this form.
QUARTER: **JAN.-MARCH** **DATE/TIME OF OBSERVATIONS** ☐ **AM** ☐ **PM** _____	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs OBSERVED?** **YES** ☐ **NO** ☐ **WERE THERE INDICATIONS OF PRIOR UNAUTHORIZED NAWDS?** **YES** ☐ **NO** ☐ If **YES**, complete Part B of this form.
QUARTER: **APRIL-JUNE** **DATE/TIME OF OBSERVATIONS** ☐ **AM** ☐ **PM** _____ _	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs OBSERVED?** **YES** ☐ **NO** ☐ **WERE THERE INDICATIONS OF PRIOR UNAUTHORIZED NAWDS?** **YES** ☐ **NO** ☐☐ If **YES**, complete Part B of this form.

Attachment "C" (Cont.)

REPORT
FORM 3 – QUARTERLY VISUAL OBSERVATIONS OR UNAUTHORIZED NON-STORM WATER DISCHARGES (NSWDs)

OBSERVATION DATE (FROM REVERSE SIDE)	NAME OF UNAUTHORIZED NSWD Example: Vehicle Wash Water	SOURCE AND LOCATION OF AUTHORIZED NSWD Example: NW Corner of Parking Lot	DESCRIBE UNAUTHORIZED NSWD CHARACTERISTICS Indicate weather unauthorized NSWD is clear, cloudy, or discolored, causing stains, contains floating objects or an oil sheen, has odors, etc.		DESCRIBE CORRECTIVE ACTIONS TO ELIMINATE UNAUTHORIZED NSWD AND TO CLEAN IMPACTED DRAINAGE AREAS. PROVIDE UNAUTHORIZED NSWD ELIMINATION DATE
			AT THE UNAUTHORIZED NSWD SOURCE	AT THE UNAUTHORIZED NSWD DRAINAGE AREA AND DISCHARGE LOCATION	
_____ ☐ AM ☐ PM					
_____ ☐ AM ☐ PM					
_____ ☐ AM ☐ PM					
_____ ☐ AM ☐ PM					
_____ ☐ AM ☐ PM					

END OF ATTACHMENTS

SECTION 01 7419

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Preparation and implementation, including reporting and documentation, of a Waste Management Plan for reusing, recycling, salvage or disposal of non-hazardous waste materials generated during demolition and new construction (Construction and Demolition (C&D) Waste), to foster material recovery and re-use and to minimize disposal in land fills.

B. Related Requirements

1. Section 01 3300 - Submittal Procedures.

2. Section 01 5000 - Construction Facilities and Temporary Controls.

3. Section 01 7700 - Contract Closeout.

1.02 REFERENCES

A. California Integrated Waste Management Act of 1989 (AB 939).

B. California Code of Regulations Title 14, Section 18700 et seq.

C. California Green Building Standards Code.

1.03 SYSTEM DESCRIPTION

A. Collection and separation of all C&D waste materials generated on-site, reuse or recycling on-site, transportation to approved recyclers or reuse organizations, or transportation to legally designated landfills, for the purpose of recycling salvaging and reusing a minimum of 75 percent of the C&D waste generated.

1.04 SUBMITTALS

A. C&D Waste Management Plan (Exhibit 1): Within 10 calendar days after the Notice to Proceed and prior to any waste removal, submit the following to the OAR for review and approval. Update quarterly. Include:

1. Materials to be recycled, reused, or salvaged, either onsite or offsite.

2. Estimates of C&D waste quantity (in tons) by type of material. (If waste is measured by volume, give factors for conversion to weight in tons.)

3. Procedures for recycling and reuse program.

4. Permit or license and location of Project waste-disposal areas.

5. Site plan for placement of waste containers.

B. C&D Waste Management Monthly Progress Report (Exhibit 2): Summary of waste generated by Project, monthly with Application for Payment. Include:

1. Firms accepting the recovered or waste materials.

2. Type and location of accepting facilities (landfill, recovery facility, used materials yard, etcetera). If materials are reused or recycled on the Project site, location should be designated as "on-site reuse and recycling".

3. Type of materials and net weight (tons) of each.

4. Value of the materials or disposal fee paid.

5. Attach weigh bills and other documentation confirming amount and disposal location of waste materials.

C. C&D Waste Management Final Compliance Report: Final update of Waste Management Plan to provide summary of total waste generated by Project.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. Implement approved Waste Management Plan including collecting, segregating, storing, transporting and documenting each type of waste material generated, recycled or reused, or disposed in landfills.

B. Designate an on-site person to be responsible for instructing workers and overseeing the sorting and recording of waste/ recyclable materials.

C. Include waste management and recycling in worker orientation and as an agenda item for regular Project meetings.

D. Recyclable and waste bin areas shall be limited to areas approved on the Waste Management Plan. Keep recycling and waste bins neat and clearly marked to avoid contamination of materials.

3.02 ATTACHMENTS

A. Exhibit 1: Waste Management Plan

B. Exhibit 2: Waste Management Monthly Progress Report.

EXHIBIT 1

WASTE MANAGEMENT PLAN
CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS

PROJECT NAME: **«PROJECTTITLE» «CONTRACTTITLE»**
PROJECT NO: **«Project Number»**
NAME OF COMPANY:
CONTACT PERSON:
TELEPHONE:
PROJECT SITE LOCATION:
PROJECT TYPE: ☐ NEW CONSTRUCTION ☐ DEMOLITION
☐ MAINTENANCE/ALTERATION PROJECTS
PROJECT SIZE (SQ. FT.):
DATE & ESTIMATED PERIOD

(1) Material Type	(2) Tons Estimated Recycle	(3) Tons Estimated Reuse	(4) Tons Estimated Salvage	(5) Tons Estimated Landfill	(6) Proposed Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
Total					
Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]					=

Signature	Title	Date

Column 1 "Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.

Columns 2 thru 4 "Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.

Column 5 "Estimated Landfill" - Enter quantities (tons) of materials to be disposed in landfill.

Column 4 "Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.

General : (1) Attach proposed Recycling and Waste Bin Location Plan.

(2) Attach name and contact data for each recycling or disposal destination to be used.

EXHIBIT 2

WASTE MANAGEMENT PROGRESS REPORT
CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS

PROJECT NAME: **«PROJECTTITLE» «CONTRACTTITLE»**
PROJECT NO: **«Project Number»**
NAME OF COMPANY:
CONTACT PERSON:
TELEPHONE:
PROJECT SITE LOCATION:
PROJECT TYPE: ☐ NEW CONSTRUCTION ☐ DEMOLITION
☐ MAINTENANCE/ALTERATION PROJECTS
PROJECT SIZE (SQ. FT.):
PERIOD to

(1) Material Type	(2) Tons Actual Recycle	(3) Tons Actual Reuse	(4) Tons Actual Salvage	(5) Tons Actual Landfill	(6) Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
Total					
Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]					=

Signature	Title	Date

Column 1 "Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.

Columns 2 thru 4 "Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.

Column 5 "Estimated Landfill" - Enter quantities (tons) of materials disposed.

Column 4 "Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.

General : (1) Attach proposed Recycling and Waste Bin Location Plan.
(2) Attach name and contact data for each recycling or disposal destination to be used.

END OF SECTION.

SECTION 01 7900

MAINTENANCE AND OPERATIONS STAFF DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Administrative and procedural requirements for training OWNER's personnel.

1. Demonstration of operations of systems, subsystems and equipment.

2. Training in operation and maintenance of systems, subsystems, and equipment.

1.02 RELATED REQUIREMENTS

A. Project Commissioning Plan (CxP).

B. CAL/OSHA Minimum Ventilation Standard, Title 8, Section 5142.

C. California Building Code, Chapter 12.

D. Division 01 - General Requirements.

E. Division 22 - Plumbing.

F. Division 23 – Heating Ventilating and Air Conditioning.

G. Division 26 - Electrical.

1.03 SUBMITTALS

A. Submittals, including training modules, require the Commissioning Agent's (CxA's) review and OWNER acceptance prior to implementation.

B. Instruction Program:

1. Ninety days prior to Startup and Testing, submit a draft outline of the instructional program for demonstration and training, including the training module objectives and outline for each training module, schedule of proposed training dates, training times, length of instruction time and instructors' names for each training module. Submittal(s) shall be on a CD-ROM in a MS Word format file. CxA, OWNER and Project Inspector will review and OWNER accept, based on their recommendation, CONTRACTOR's proposed Instruction Program or comment and return to CONTRACTOR for revision and incorporation of comments within 30 days of receipt.

2. Revise and resubmit finalized Instruction Program 45 days prior to Startup and Testing. CxA, OWNER and Project Inspector will review CONTRACTOR's revised Instruction Program and OWNER, based on their recommendation, accept or return for further revision and incorporation of unaddressed revisions and/or comments or unacceptable revisions within five days of receipt.

3. Revise and incorporate comments and resubmit to OWNER within five days of receipt. CxA, OWNER and Project Inspector will review CONTRACTOR's revised Instruction Program and OWNER, based on their recommendation, accept the revised Instruction Program within five days of receipt or require CONTRACTOR to meet with OWNER and CxA within five days of receipt to revise and incorporate unaddressed revisions and/or comments. CONTRACTOR shall be assessed reasonable fees and expenses incurred by CxA for these meetings.

C. Upon completion of training, submit two complete training manuals for OWNER's use and one CD-ROM including materials in the complete training manual in the Adobe PDF format. Each manual shall contain specific training and instruction manuals and hand-outs for the following designated end-users:

1. School Faculty and Administration.

2. School Plant Manager.

3. OWNER Maintenance and Operations (M&O) Personnel.

D. Qualification Data: Three weeks prior to start of training, CONTRACTOR shall submit Letters of Qualifications and Project Lists for persons and firms providing instruction including:

1. Training Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel and end-users in training program similar to that required for this Project, and who has a record of successful training performance.

2. Training Instructor Qualifications: Instructor shall be factory-authorized service representative, experienced in operation and maintenance procedures and training for each system, subsystem or piece of equipment.

3. References: The name of owner and the name and telephone number of the plant manager and maintenance supervisor on three similar projects for reference.

E. Attendance Record: For each training module, submit the proposed list of participants, sign in sheets and length of instruction time a minimum of 15 days prior to start of training of the module.

F. Evaluations: For each participant and for each training module, submit results and documentation of performance-based tests a minimum of seven days following completion of training of each module.

1.04 COORDINATION

A. Coordinate instruction schedule with the OWNER, CxA, and OWNER's M&O personnel. Adjust schedule as required to reasonably accommodate the schedules of participants and to minimize disrupting OWNER operations.

B. Coordinate with instructors, including providing notification of scheduled dates, times, length of instruction time and course content.

C. Coordinate content of training modules with content of approved Emergency Manual and Operations and Maintenance Manual. Do not submit instruction program until manual has been reviewed and accepted by the OWNER.

1.05 INSTRUCTION PROGRAM

A. Program Structure: Develop instruction program that includes individual demonstration and training modules for the operation, maintenance, minor repair (completion in under two hours) and calibration of systems and components in the system as required by Section 01 9113, Divisions 22, 23 and Division 26 and as specified in Part 3 of this Section, "DEMONSTRATION AND TRAINING".

B. Training Modules: Develop learning objective and teaching outline for each module, specific and as applicable, for the following OWNER personnel:

1. School Faculty and Administration.

2. School Plant Manager.

3. Operations and Maintenance.

C. Include description of specific skills and knowledge that participant is expected to master.

D. For each module, include instruction for the following:

1. Basis of System Design (for OWNER Operations and Maintenance Personnel), Operational Requirements and Criteria, including, but not limited to:

a. System, subsystem and equipment descriptions.

b. Performance and design criteria if CONTRACTOR is delegated design responsibility.

c. Operating standards.

d. Regulatory requirements.

e. Equipment function.

f. Operating characteristics.

g. Limiting conditions.

h. Performance curves.

2. Documentation (for OWNER Operations and Maintenance Personnel and School Plant Manager): Review in detail the following documentation:

a. Emergency manuals.

b. Operations manuals.

c. Maintenance manuals.

d. Project Record Documents.

e. Identification systems.

f. Warranties.

g. Maintenance service agreements and similar continuing commitments.

3. Emergencies (for OWNER Operations and Maintenance Personnel and School Plant Manager): Review, without limitation, the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.

b. Instructions on stopping.

c. Shutdown instructions for each type of emergency.

d. Operating instructions for conditions outside of normal operating limits.

e. Sequences for electric or electronic systems.

f. Special operating instructions and procedures.

4. Operations (for OWNER Operations and Maintenance Personnel and School Plant Manager): Review, without limitation, the following as applicable:

a. Startup procedures.

b. Equipment or system break-in procedures.

c. Routine and normal operating instructions.

d. Regulation and control procedures.

e. Control sequences.

f. Safety procedures.

g. Instructions on stopping.

h. Normal shutdown instructions.

i. Operating procedures for system, subsystem or equipment failure.

j. Seasonal and weekend operating instructions.

k. Required sequences for electric or electronic systems.

l. Special operating instructions and procedures.

5. Adjustments (for OWNER M&O Personnel): Review, without limitation, the following as applicable:

a. Alignments.

b. Checking adjustments.

c. Noise and vibration adjustments.

d. Economy and efficiency adjustments.

6. Troubleshooting (for OWNER M&O Personnel): Review, without limitation, the following as applicable:

a. Diagnostic instructions.

b. Test and inspection procedures.

7. Maintenance (for OWNER M&O Personnel and Plant Manager): Review, without limitation, the following, as applicable:

a. Inspection procedures.

b. Types of cleaning agents to be used and methods of cleaning.

c. List of cleaning agents and methods of cleaning detrimental to product.

d. Procedures for routine cleaning.

e. Procedures for preventative maintenance.

f. Procedures for routine maintenance.

g. Instruction on use of special tools.

8. Repairs (for OWNER M&O Personnel): Review, without limitation, the following as applicable:

a. Diagnostic instructions.

b. Repair instructions.

c. Disassembly; component removal, repair and replacement and reassembly instructions.

d. Instructions for identifying parts and components.

e. Review of parts needed for operation and maintenance.

9. Faculty Member Training:

a. Manual for the basic operation/control of the HVAC room sensor/thermostat and lighting controls.

b. Organizational chart structure, to be completed by OWNER, for repair or emergency requests for the systems including contact information of the Plant Manager.

1.06 PREPARATION

A. Training Facilitator: Engage qualified training facilitator no later than 120 days prior to start of training to prepare instruction program and training modules, to coordinate instructors, and to coordinate between CONTRACTOR, OWNER and CxA for number of participants, instruction times and location.

B. Training Instructor: Engage qualified training instructors to instruct OWNER's personnel to adjust, operate and maintain systems, subsystems and equipment not part of a system no later than 30 days prior to start of training of assigned modules.

C. Scheduling: Provide instruction at mutually agreed on times.

1. Schedule training with OWNER with at least two weeks advance notice.

2. Schedule training to conform to personnel availability at Site.

3. Conduct training(s) after the execution of commissioning Pre-functional and Functional Tests are completed.

4. Provide adequate duration of training to familiarize Maintenance and Operations Personnel with operational requirements of Equipment and Systems listed in section 1.08

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of oral, written, demonstration, or combination of oral, written, and demonstration based testing.

E. In addition to technical training, attendees shall be trained on how to provide future training for new employees.

F. Familiarize OWNER staff regarding CAL/OSHA Title 8, section 5142 Requirements.

G. Cleanup: Collect excess copies of educational materials and give to OWNER. Remove instruction equipment. Restore systems and equipment to condition existing just before commencing training.

1.07 OPERATIONS AND MAINTENANCE MANUALS

A. CONTRACTOR shall direct Subcontractors to compile and prepare M&O Manuals and other required documentation for the equipment and systems that are provided and/or installed per their scope of work for submittal to OWNER prior to project closeout.

B. The OAR shall receive a copy of the Operations and Maintenance manuals prior to initiation of demonstration and training for review and acceptance or rejection.

C. Operations and Maintenance manuals shall meet the respective requirements of Divisions 22, 23 and Division 26 and comply with the following:

1. Quantity: Two.

2. Format: 8 ½ by 11 loose leaf binders. Each binder shall be clearly labeled on the spine and meet Contract Closeout requirements. Dividers shall be made of card stock with permanently marked index tabs to separate each section and sub section. Tab labels shall not be handwritten. Binders will meet other formatting requirements as outlined in DIVISIONS 02 to 33, as applicable.

3. Contents: There shall be a title page and table of contents at the beginning of each binder. The table of contents shall be an outline that identifies the equipment or systems documentation included in the binder and references the specification sections relating to the equipment and systems that are being included in each part of the binder. Each part of the binder shall contain the information described below, in the following order.

a. CONTRACTOR. The first page shall contain the name, address, and telephone number of the manufacturer and installing CONTRACTOR,

as well as the 24-hour number for emergency service for each piece of equipment identified in this section.

b. Preventive Maintenance Instructions. This section shall list the location of preventative maintenance instructions. The list shall show the piece of equipment, the Operations and Maintenance document name, and the O&M document page number that contains the instructions.

c. Submittal and Product Data. This section shall include product data not covered by manufacturer's Operations and Maintenance instructions and associated shop drawings.

d. Warranty and Service Contracts. This section shall include the following for each piece of equipment, as applicable:

1) Copy of the equipment warranty information.

2) Additional Warranties in accordance with Warranty requirements in DIVISIONS 02 to 33, as applicable. Equipment Warranties shall clearly list requirements to maintain the Warranty in effect, conditions or acts that would invalidate or void the Warranty, and Warranty expiration date.

3) Service contracts issued. Contracts shall clearly indicate contract dates and scope of work included.

e. Operation and Maintenance Instructions. These shall be the written manufacturer's maintenance and operating instructions with the model number and features of the installed equipment or system clearly identified. This section shall include applicable data on the following:

1) Installation, startup, and break-in instructions.

2) Starting, normal shutdown, emergency shutdown, manual operation, seasonal changeover and normal operating procedures and data, including any special limitations.

3) Operations and Maintenance and installation instructions that were shipped with the unit.

4) Preventative maintenance and service procedures and schedules.

5) Troubleshooting procedures.

6) A parts list, edited to omit reference to items which do not apply to this installation.

7) A list of any special tools required to service or maintain the equipment.

8) Performance data, ratings, and curves.

f. Control Drawings. This section contains controls drawings and the final sequence of operations, set points, and schedules as set during the Commissioning Process. If shop drawings, portions of the project manual, or record drawings clearly show this information, a copy of this information may be inserted. Otherwise, original drawings shall be generated and included in this section.

D. Division 23 Special Water and Air Balance Documentation. The Balancing Subcontractor will compile and submit the following with other documentation that may be specified elsewhere in the Project Specifications.

1. Final report containing an explanation of the methodology, assumptions, test conditions, and the results in a clear format with designations of all uncommon abbreviations and column headings.

2. The Balancing Subcontractor shall mark on the drawings where all traverse and other critical measurements were taken and cross reference the location in the Test and Balance report.

1.08 DEMONSTRATION AND TRAINING SCHEDULE

A. Provide adequate duration of demonstration and training to District Maintenance and Operations Personnel for the following topics:

1. Heat Generation:

a. Boilers

b. Feedwater Equipment:

c. Pumps:

d. Water Distribution Piping:

2. Refrigerant Systems:

a. Chillers:

b. Cooling Towers:

c. Condensers:

d. Pumps:

e. Distribution Piping:

3. HVAC Systems:

a. Air-handling Equipment:

b. Air Distribution Systems:

c. Terminal Equipment and Devices:

4. HVAC Instrumentation and Controls:

5. Lighting Systems and Controls:

PART 2 – PRODUCTS – N/A

PART 3 – EXECUTION – N/A

END OF SECTION

SECTION 01 9113

GENERAL COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section defines the Contractor's responsibilities with respect to Commissioning. The Contractor shall include this scope in the bid. This includes administrative and procedural requirements as well as a detailed execution of Commissioning. This Section supplements Section -23 0593 Testing, Adjusting, and Balancing for HVAC, as well as the Divisions 22 - Plumbing, Division 23 – Mechanical, and Division 26 – Electrical sections which specify testing procedures. This Section also defines the systems and equipment to be commissioned The Commissioning Agent (CxA) will be the engineer of record and part of the Owner's Quality Assurance (QA) Team and participate in the review and execution of the Project Construction Quality Control (CQC) plan, along with the Contractor, Owner's Authorized Representative (OWNER), Project Inspector (PI), and Architect of Record (AOR).

1.02 DEFINITIONS

A. Commissioning (Cx): A systematic process which verifies that the building systems perform according to the Owner's Design Intent/Basis of Design (ODI/BOD). Commissioning includes system documentation, equipment startup, control system calibration, Testing, Adjusting and Balancing (TAB) verification, performance testing, and training.

B. Commissioning Agent (CxA): A District appointed entity that plans and coordinates all activities which implement Commissioning as outlined by the Owner's Design Intent/Basis of Design (ODI/BOD). The CxA has overall responsibility for planning and coordinating Commissioning. Commissioning activities that take place during construction shall be based on the Contractor's construction schedule.

C. Commissioning Plan (CxP): A contract document that identifies the project Commissioning goals, Owner's Design Intent/Basis of Design, commissioning milestones, coordination requirements, and project specific Pre-functional Equipment Checklists and Functional Performance Test Checklists. The CxP shall be incorporated by Contractor into the Construction Quality Control Plan.

D. Pre-functional Equipment Checklist (PEC): A form for each piece of equipment referenced in '1.08 SYSTEMS TO BE COMMISSIONED' that must be completed by the Contractor as a prerequisite to the equipment's Functional Performance Test (FPT). The checklists and forms are completed by the Contractor and verified by the CxA.

E. Functional Performance Test (FPT): A documented test designed by the Commissioning Agent (CxA) that verifies the dynamic functioning and operation of equipment and systems with the goal of verifying that the Owners' Design Intent/Basis of Design (ODI/BOD) is met. Sample testing requirements and forms are included in the CxP. Test procedures are performed by the Contractor and witnessed by the INSPECTOR and CxA.

F. Acceptance - A formal action, taken by a person with appropriate authorization, to declare that some aspect of the project meets defined requirements – thereby permitting subsequent activities to proceed.

G. Checklists - Documents that are developed and used during all phases of commissioning to verify that the ODI/BOD is being achieved. This includes checklists for general verification, testing, training, and other specific requirements. Various checklists are prepared by the CxA and the contractor to document completion of testing and/or commissioning of equipment and systems.

I. Coordination Drawings - Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.

K. Control system – A component of an environmental, HVAC, electrical, lighting, or energy management system for the reporting, monitoring and/or issuing of commands to and/or from field devices.

L. Data logging -The monitoring and recording of flows, currents, status, pressures, etc., of equipment using stand-alone data recorders separate from the installed control system or the trending capabilities of those control systems.

M. Deficiency - A condition that is not in compliance with the contract documents relative to the installation or function of a component, piece of equipment, or system.

N. Factory Testing - Testing of equipment at the factory or on-site by factory personnel with, or without, an owner's representative present.

O. Issues Log - A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the commissioning team during the course of commissioning.

P. Seasonal Performance Tests - Tests that are performed when weather conditions are comparable to the design conditions based or the design conditions can be simulated.

R. Simulated Condition - Condition that is created for the purpose of testing the response of a system (for example: raising/lowering the set point of a thermostat to see the response in a VAV box).

S. Startup - The initial starting or activating of dynamic equipment.

T. Systems Manual - A system-focused composite document that includes the operation manual, maintenance manual, manufacturer's technical diagrams and additional information of use to the owner during facility occupancy and operation.

U. Test Procedure - A written protocol that defines methods, procedures, personnel, and expected outcomes for tests conducted on components, equipment, assemblies, systems, and interfaces among systems. The test procedures are specified in the Commissioning Plan and Technical Specifications sections of the contract documents and the CxP.

V. Training Plan - A written document that details the expectations, schedule, budget, and deliverables of commissioning activities related to the training of facility operating and maintenance personnel, users, and occupants.

X. Verification - The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Design Intent/Basis of Design. Verification testing is performed per the prescribed test procedure(s) by the contractor and witnessed by the INSPECTOR and CxA.

Y, Trending – The analysis of system performance gathered over a period of time by a building management system or other electronic data gathering equipment.

1.03 RELATED REQUIREMENTS

A. Section 01 1216 – Phasing of the Work.

B. Section 01 3113 – Project Coordination.

C. Section 01 3119 – Project Meetings.

D. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

E. Section 01 7900 – Maintenance & Operation Staff Demonstration and Training.

F. Section 23 0900 – Instrumentation and Control for HVAC

G. Section 26 0030 – Tests and Identification.

1.04 REFERENCES

A. Guideline 1.1-2007 -- HVAC&R Technical Requirements for the Commissioning Process.

B. Associated Air Balance Council Commissioning Guidelines.

C. CHPS Best Practices Manual, Volume V: Commissioning.

1.05 COORDINATION

A. Items listed below require coordination between the Contractor, OWNER , INSPECTOR, and CxA. Details regarding each item are provided through out this Section and/or Sections 01 7900.

1. Cx Schedule and Meeting Venue.

2. Commissioning Meeting Attendance.

3. Completion of Pre-functional Equipment Checklists (PEC).

4. Functional Performance Testing (FPT).

5. Operations & Maintenance Manual Submittal and Training.

6. Documentation of Pre-functional Equipment Checklists (PEC) & Functional Performance Testing (FPT) Inspections.

1.06 SUBMITTALS

A. Provide the manufacturer and model number, the manufacturer's printed installation and detailed startup procedures, full sequences of operation, O&M data, performance data, any performance test procedures, and control drawings. Control drawings shall include all components such as sensors, thermostats, transformers, relays, wire, actuators, and fuses. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted. All such documentation will be included by subcontractors in their O&M manual submittals.

B. The CxA will review and recommend acceptance or any required revision to the OWNER for all submittals related to the commissioned equipment for conformance with the contract documents as they relate to commissioning, performance of the equipment, and their adequacy of test procedures. This review is intended primarily to aid in the development of performance procedures and only secondarily to verify compliance with equipment specifications. The CxA will notify the OWNER of items missing or areas that are not in conformance with contract documents and which require resubmission.
Submittal of O&M manual documentation does not constitute compliance. The CxA will review all such document submittals and recommend to OWNER their acceptance or any required revisions.

1.07 CONTRACTOR RESPONSIBILITIES

A. The general responsibilities of Contractor and Subcontractors in commissioning are defined in this section. The specific responsibilities are in the Division 22 and 23 and Division 26 Technical Specifications. All parties shall:

1. Follow the Commissioning Plan.

2. Attend commissioning meetings.

B. Contractor, its design team, subcontractors and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform required commissioning activities including, but not limited to, providing all tools, or the use of tools, to start, check-out and test equipment and systems, except for specified testing with portable data recorders which shall be supplied and installed by the CxA. Contractor and subcontractors shall:

1. Facilitate coordination of Commissioning.

2. Incorporate Commissioning activities (the CxP) into the Project Schedule.

3. Coordinate and direct Commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.

4. Participate in up to three meetings specifically for Commissioning-related items as scheduled by the OWNER .

5. Review and accept construction checklists developed by the CxA.

6. Provide information required to perform commissioning tasks, including O&M materials, contractor startup and checkout lists.

7. No later than 60 days prior to startup of the first piece of major equipment, meet with the CxA and OWNER to finalize the detailed commissioning procedures and schedule.

8. Before startup, provide detailed startup procedures including current control sequences and interlocks to comply with the detailed functional test plans.

9. Develop and coordinate a startup and initial systems checkout plan with subcontractors and ensure that all subcontractors and vendors execute their commissioning responsibilities according to the contract documents.

10. Review TAB execution plan.

11. Oversee sufficient testing of the control system before TAB is executed so that all equipment is functional for testing and balancing.

12. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.

13. Coordinate retesting as necessary until satisfactory performance is achieved

14. Complete checklists as work is completed and provide to OWNER on a weekly basis.

15. Review equipment warranties to ensure that the owner's responsibilities to keep warranties in force are clearly defined.

16. Oversee and coordinate the training of the owner's personnel.

17. Review and approve the preparation of the O&M manuals including clarifying and updating of original sequences of operation to as-built/as-tested conditions.

18. Coordinate development of a systems manual

1.08 SYSTEMS TO BE COMMISSIONED

A. Systems and equipment to be commissioned for this project include, but are not limited to, those for which Specifications are included in Contract Documents and as listed below:

1. Air handlers, chiller, hydronic system boilers, pumps, backflow preventers, split system, valves, dampers, actuators, duct smoke detectors, and duct systems.

2. All flushometers, faucets, drinking fountain, pressure regulators, backflow preventers, pumps, domestic hot water boilers, trap primers, ice machines, washing machine and clothes dryers.

PART 2 – PRODUCTS

2.01 TEST EQUIPMENT

A. Standard testing equipment required to perform startup and initial checkout and required performance testing shall be provided by the contractor for the equipment being tested. This includes, but is not limited to, two-way radios and meters, etc. Testing specified as requiring portable data recorders will be performed with data recorders supplied and installed by the CxA.

B. Testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances specified in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a current certified calibration to an accuracy of 0.5 degree F and a resolution of plus or minus 0.1 degree F. Pressure sensors shall have an accuracy of plus or minus 2.0 percent of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 – EXECUTION

3.01 MEETINGS

A. Commissioning Kick-off Meeting: Following completion of Demolition, the OWNER will schedule a Construction Quality Control kick-off meeting. The INSPECTOR, Cx team and Contractor Quality Control representative will be in attendance. CxA shall prepare and distribute a list of commissioning topics to be placed on the meeting agenda. Attendance at this meeting and participation in the Commissioning topics is mandatory for the following Contractor personnel:

1. Contractor's Quality Control Engineer and Commissioning Representative.

2. Contractor's Project Scheduling personnel.

3. Mechanical Subcontractors.

4. Electrical Subcontractors.

5. TAB Subcontractor.

6. Controls Subcontractors.

3.02 STARTUP, CONSTRUCTION CHECKLISTS, AND INITIAL CHECKOUT

A. The following procedures apply to all equipment/systems to be commissioned:

1. General: Contractor shall use PECs to verify that the equipment and systems are fully connected and operational. PECs for a given system must be successfully completed and accepted prior to startup and formal performance testing of equipment or subsystems of the given system.

2. Startup and Checkout Plan: The CxA will assist the project commissioning team members responsible for startup of any equipment. The primary role of the CxA in this process is to ensure that there is written documentation and that each of the manufacturer-recommended procedures has been completed. The CxA shall provide all the required pre-functional checklists and forms to be completed by Contractor in the CxP. The CxA will ensure that the INSPECTOR is informed as to the planned and scheduled startup and checkout procedures.

a. Sample Pre-Functional checklists are provided as an attachment to the CxP. These checklists indicate required procedures to be executed prior to equipment startup.

b. Contractor shall determine which trade is responsible for executing and documenting each of the line item tasks and transmit the checklists to

the responsible subcontractors. Each form may have more than one trade responsible for its execution.

c. The contractor/subcontractor responsible for the purchase and/or installation of the equipment shall develop a comprehensive startup plan (with assistance from the CxA) by combining the manufacturer's detailed startup and checkout procedures and the pre-functional checklists.

d. The contractor/subcontractor shall submit the full startup plan to the CxA for review and approval.

e. INSPECTOR will review and accept, based on CxA recommendation, the procedures and the documentation format for reporting. The CxA will return the procedures and the documentation format to Contractor through the OWNER .

f. Contractor shall transmit the full startup plan to the subcontractors for their review and use.

B. Sensor and Actuator Calibration. All field-installed temperature, relative humidity, CO, CO_2, refrigerant, O_2, and/or pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated. Verify that all locations are appropriate and away from causes of erratic operation. Submit to the CxA through the OAR the calibration methods and results. All test instruments shall have had a current certified calibration record. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated. Contractor to field verify all installed sensors.

1. Sensor Calibration Methods:

a. All Sensors: Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2 degrees F of each other for temperature and within a tolerance equal to 2 percent of the reading of each other for pressure.

b. Sensors Without Transmitters: Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

c. Sensors With Transmitters: Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify

that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS and calibrate or replace sensor.

2. Tolerances, Standard Applications:

Sensor	Required Tolerance (+/-)
Cooling coil, chilled and condenser water temps	0.4F
AHU wet bulb or dew point	2.0F
Hot water coil and boiler water temp	1.5F
Outside air, space air, duct air temps	0.4F
Watthour, voltage & amperage	1 percent of design
Pressures, air, water and gas	3 percent of design
Flow rates, air, water	10 percent of design
Flow rates, water Relative humidity	4 percent of design
Combustion flue temps	5.0F
Oxygen or CO_2 monitor	0.1 percent pts
CO monitor	0.01 percent pts
Natural gas and oil flow rate	1 percent of design
Barometric pressure	0.1 inch of Hg

3. Valve and Damper Stroke Setup and Check EMS Readout: For all valve and damper actuator positions checked, verify the actual position against the BAS readout. Set pumps or fans to normal operating mode. With the command calve and damper closed, visually verify that the command valve or damper is closed and adjust output zero signal as required. With the command valve or damper open, visually verify that the position is full open and adjust output signal as required. Set command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, repair or replace actuator.

4. Closure for heating coil valves (NO): Set heating set point 20 degrees F above room temperature. Visually observe valve open. Set heating set point to 20 degrees F below room temperature. Visually observe the valve close. Restore to normal.

5. Closure for cooling coil valves (NC): Set cooling set point 20 degrees F above room temperature. Visually observe the valve close. Set cooling set point to 20°F below room temperature. Visually observe valve open. Restore to normal.

C. Execution of Construction Checklists and Startup:

1. Four weeks prior to the scheduled startup, Contractor shall coordinate startup and checkout with the INSPECTOR and CxA. The execution and approval of the PECs, startup, and checkout shall be directed and performed by Contractor, subcontractor or vendor. Signatures are required of the applicable subcontractors for verification of completion of their work.

2. The INSPECTOR shall observe, as a minimum, the procedures performed for each piece of primary equipment, unless there are multiple units; in which case a sampling strategy may be used. The CxA shall observe all testing.

3. For lower-level components of equipment, (e.g., sensors, controllers), the CxA shall observe a sampling of the startup procedures.

4. Pre-functional checklist documentation, identified in the CxP, is to be used by the sub-contractor to document that equipment is ready for startup.

5. The subcontractors and vendors shall execute startup and provide the CxA, through the OWNER , with a signed and dated copy of the completed startup and construction checklists.

6. Only individuals of the contractor or sub-contractor (technicians, engineers, manufacturer's representatives/vendors, supervisors, etc.) who have direct knowledge and have witnessed that a line item task on the construction checklist was actually performed shall check off that item.

D. Deficiencies, Non-Conformance, and Approval in Checklists and Startup (Issues Log):

1. The contractor shall ensure that the subcontractors clearly list any outstanding items of the initial startup and construction checklist procedures that were not completed successfully, on an attached sheet. The form and any outstanding deficiencies shall be provided, through the INSPECTOR, to the CxA within two days of test completion.

2. The CxA will review the report and issue either a non-compliance report or acceptance form, through the INSPECTOR, to Contractor. The installing subcontractors or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, shall notify the INSPECTOR as soon as outstanding items have been corrected, and resubmit an updated startup report with a Statement of Correction on the original non-compliance report.

When satisfactorily completed, the CxA will recommend approval of the execution of the checklists and startup of each system.

3. Items left incomplete, which later cause deficiencies or delays during performance testing, may result in assessments to Contractor. Refer to Paragraph 3.05, herein, for details.

3.03 GENERAL REQUIREMENTS FOR TESTING

A. Complete the following at least two weeks prior to Functional Performance Testing:

1. Arrange for Commissioning observations to be performed by the CxA.

2. Completion and acceptance of the Start-up Plan by the CxA.

3. Correction of deficiencies identified during start-up.

4. Recording of pretest set points.

3.04 FUNCTIONAL PERFORMANCE TESTING (FTP)

A. Undertake functional testing after the testing requirements listed in Paragraph 3.02 are completed.

B. Equipment: Refer to Part 2 of this Section for test equipment requirements.

C. Perform FPT under the observation of the CxA who will verify the results of the functional test procedures documented by Contractor.

D. Perform all specified tests according to approved testing procedures / plan.

1. Verify and test performance using actual conditions whenever possible.

2. Simulate conditions when it is not practical to test under actual conditions or when required seasonal testing conditions are not present. The procedure to be used shall be submitted to the OWNER for INSPECTOR and CxA review and acceptance at least one week before simulated testing is to occur. After test, return settings to normal operating conditions.

3. Alter set points when simulating conditions is not practical and when written approval to do so is received from OWNER .

4. Override sensor values with a signal generator when actual or simulated conditions and altering set points are not practical. Do not use the sensor to act as the signal generator to simulate conditions or override values.

E. Functional Performance Testing (FPT) Documentation: This Section specifies the general description of the minimum Divisions 22, 23 and 26 Functional Performance

Testing documentation requirements that the Contractor shall provide. The CxA will develop testing procedures in accordance to the requirements of this Section and incorporate into the Cx Plan that Contractor must follow and document. The testing documentation must include the following information:

1. Test number.

2. Date and time of the test.

3. Indication of whether the record is for a first test or retest following correction of a problem or issue.

4. Identification of the system, subsystem, assembly, or equipment.

5. Conditions under which the test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of the test.

6. Expected performance of the systems and assemblies at each step of the test.

7. Narrative description of observed performance of the system, equipment, or assembly.

8. Notation to indicate whether the observed performance at each step meets the expected results.

9. Issue number, if any, generated as the result of the test.

10. Dated signatures of the person performing the test and a witness.

F. The CxA and INSPECTOR will review and OWNER , if applicable, accept functional testing results. Deficiencies found during testing shall be submitted to the OWNER and, if required, based on the recommendation of INSPECTOR, by the OWNER, corrected by the Contractor and retested. Where there is a dispute over a deficiency, OWNER, based on the recommendation of ARCHITECT and INSPECTOR, shall be the final authority.

G. Problem Solving: The burden of responsibility to solve, correct and retest problems is with the Contractor and the design team with OWNER, based on the recommendations of the ARCHITECT, CxA and INSPECTOR, having final responsibility for acceptance of the Work.

H. Substantial Completion: All testing, retesting, and acceptance of Functional Performance Testing shall be completed prior to issuing the Certificate of Substantial Completion. FPT may be conducted following building occupancy; however, all associated and reasonable additional costs incurred by the CxA shall be assessed against Contractor Retention or Withhold funds.

I. Deficiencies in the Cx Plan Functional Performance Test Checklist: If there is any Functional Performance Test Checklist missing for any particular piece of equipment, the Contractor shall inform the CxA and ask for an updated Functional Performance Test Checklist.

3.05 RETESTING

A. Retesting shall be required when a specific Pre-functional Checklist or Start-up test item, reported to have been successfully completed by Contractor or determined during functional testing to be faulty or incomplete, is identified.

B. Contractor shall be provided one retest opportunity at no additional cost when Contractor can effect corrections within two hours of identification of the need to retest. Costs for retesting beyond one retest, or when Contractor cannot effect corrections within two hours of identification of the need to retest, will be assessed against Contractor funds if OWNER determines, based upon the recommendation of the INSPECTOR and CxA, that the Contractor is responsible for the deficiency. These costs shall include all reasonable expenses incurred by the CxA.

C. For a deficiency identified during functional testing, but not included in the approved Start-up Plan, OAR will direct retesting of the equipment with no costs assessed against Contractor for this initial retesting. Costs for retesting, when Contractor cannot effect corrections within two hours of identification of the need to retest, will be assessed against Contractor funds if OWNER determines, based upon the recommendation of the INSPECTOR and CxA, that the Contractor is responsible for the deficiency. These costs shall include all reasonable expenses incurred by the CxA.

D. Retesting shall not be considered a reason for a claim of delay or for a time extension by the Contractor.

3.06 DEFERRED TESTING

A Unforeseen Deferred Tests: Checks or tests not completed due to the incomplete Work, required occupancy conditions, or other conditions may be delayed upon approval of the OWNER based upon the recommendation of the INSPECTOR and CxA. These tests may be conducted in the same manner as the seasonal tests.

B. Seasonal Testing: Complete seasonal testing, when weather or other testing conditions do not emulate the system's design conditions, employing simulated conditions acceptable to OWNER based upon the recommendation of the INSPECTOR and CxA. The OAR will coordinate with Contractor, and CxA validate, this activity. Tests shall be executed, documented and deficiencies corrected by the Contractor, with the INSPECTOR and the CxA witnessing. The Contractor shall make adjustments to the Operations and Maintenance Data, as necessary.

3.07 DOCUMENT REVIEW

A. General: See paragraph 1.06 for submittal requirements.

B. Operations and Maintenance Manuals: Refer to Section 01 7900 for specific requirements.

3.08 OPERATOR TRAINING

A. The CxA, under the direction of the OWNER, coordinates and verifies training completion as shown in Section 01 7900. Forms and procedures are also described in the CxP.

Sample Pre-Functional Checklist
Boiler

OK	Check	Comments
	General appearance good, no apparent damage	
	Site sufficiently clean for testing	
	Equipment label affixed	
	Required service clearances provided	
	Unit anchored properly	
	Flue properly installed	
	Combustion air source in place	
	System filled	
	Gages and thermometers installed and calibrated	
	Boiler interlock controls installed	
	Gas connection installed with proper gas pressure. Detail gas pressure	
	Hydronic piping complete and tested with treatment	
	Hydronic system flushed and strainers cleaned	
	Flow direction arrows installed, valves labeled	
	Expansion tank charged	
	Air vents functional	
	Power to unit completed	
	Connection to EMS completed and functional	
	Sensors calibrated	

Sample Functional Test – Boiler System

#	Spec/Dwg Ref	Test Procedure	Results	Pass
1		Verify communication with EMS		
2		Initiate a call for heating. Verify flow switch functionality		
3		Disable Lead boiler and test for 2nd boiler to start and alarm to be shown on EMS		

4		Test boiler sequencing by opening heating valves at air handlers and imposing full load on system.		
5		Test alarm functions within boiler per Manufacturer's manual. Verify alarms display on EMS graphics		
6		Test hot water temperature reset interface with BMS		

END OF SECTION

SECTION 02 4116

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Furnishing labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, or required for completion of the Work. Includes items such as the following:

1. Protection of existing improvements to remain.
2. Cleaning existing improvements to remain.
3. Disconnecting and capping utilities.
4. Removing debris, waste materials, and equipment.
5. Removal of items for performance of the Work.
6. Salvageable items to be retained by the Owner.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 1100 - Summary of Work.
3. Section 01 5000 - Construction Facilities and Temporary Controls.
4. Section 01 7329 - Cutting and Patching.
5. Section 01 7419 - Construction and Demolition Waste Management.
6. Division 22 — Plumbing.
7. Division 23 — HVAC.
8. Division 26 — Electrical.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating the extent of items and systems to be removed. Indicate items to be salvaged or items to be protected during demolition. Indicate locations of utility terminations and the extent of abandoned lines to be removed. Include details indicating methods and location of utility terminations.

1.03 QUALITY ASSURANCE

A. Perform the Work of this section by workers skilled in the demolition of buildings and structures. Perform the Work of this section under direct superintendence at all times.

B. Prior to commencement of Work, schedule a walkthrough with the OWNER, to confirm Owner property items have been removed from scheduled Work areas. Identify and mark remaining property items and schedule their removal.

C. Coordinate demolition for the correct sequence, limits, and methods. Schedule demolition Work to create least possible inconvenience to the public and facility operations.

D. Related Standards:

1. ANSI/ASSE A10.6.
2. CBC Chapter 33.
3. CFC Chapters 11 and 33.
4. NFPA 241

1.04 PROJECT CONDITIONS

A. Drawings may not indicate in detail all demolition Work to be performed. Examine existing conditions to determine the full extent of required demolition.

B. Repair damage to existing improvements or damage due to excessive demolition.

C. Provide all measures to avoid excessive damage from inadequate or improper means and methods, improper shoring, bracing or support.

D. If conditions are encountered that varies from those indicated, promptly notify the Architect for clarification before proceeding.

PART 2 - PRODUCTS

2.01 HANDLING OF MATERIALS

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

B. Items scheduled for reuse shall be stored on the Project site and protected from damage, theft and other deleterious conditions.

PART 3 - EXECUTION

3.01 GENERAL

A. Protection:

1. Do not commence demolition until safety partitions, barricades, warning signs and other forms of protection are installed. Refer to Section 01 5000 - Construction Facilities and Temporary Controls.

2. Provide safeguards, including warning signs, lights and barricades, for protection of workers, occupants, and the public.

B. If safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the OWNER.

3.02 DEMOLITION

A. Do not throw or drop materials. Furnish ramps or chutes as required by the Work.

B. Remove existing construction only to extent necessary for proper installation of Work and interfacing with existing construction. Cut back finished surfaces to straight, plumb or level lines as required for a smooth transition.

C. Where openings are cut oversize or in improper locations, replace or repair to required condition.

3.03 CUTTING EXISTING CONCRETE

A. Cutting of existing concrete shall be performed by skilled workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Do not damage concrete intended to remain.

B. Extent of cutting of structural concrete shall be as indicated on Drawings. Cutting of non-structural concrete shall be as indicated on Drawings or as reviewed by the Architect or structural engineer. Replace concrete demolished in excess of amounts indicated.

C. Prior to cutting or coring concrete, determine locations of hidden utilities or other existing improvements and provide necessary measures to protect them from damage.

3.04 REMOVAL OF EXISTING PLUMBING AND ELECTRICAL EQUIPMENT AND SERVICES

A. Remove existing plumbing and electrical equipment fixtures and services not indicated for reuse and not necessary for completion of the Work. Remove abandoned lines and cap unused portions of existing lines.

3.05 REMOVAL OF OTHER MATERIALS

A. Masonry: Cut back to joint lines and remove mortar without damaging units to remain. Allow space for repairs to backing where applicable.

B. Woodwork: Cut or remove to a joint or panel line.

C. Roofing: Remove as required, including accessory components such as insulation and flashings. At penetrations through existing roofing, trim cut edges back to sound roofing with openings restricted to the minimum size necessary to receive Work.

D. Sheet Metal: Remove back to joint, lap, or connection. Secure loose and unfastened ends or edges and provide a watertight condition. Re-seal as required.

E. Glass: Remove broken or damaged glass and clean rebates and stops of glazing channels.

F. Modular materials such as acoustical ceiling panels, resilient tile, or ceramic tile: Remove to a natural joint without leaving damaged or defective Work where joining new Work. After flooring removal, clean substrates to remove setting materials and adhesives.

G. Gypsum Board: Remove to a panel joint line on a stud or support line.

H. Plaster: Saw cut plaster on straight lines, leaving a minimum 2-inch width of firmly attached metal lath for installing new lath and plaster.

I. Remove existing improvements not specifically indicated or required but necessary to perform Work. Cut to clean lines, allowing for installation of Work.

3.06 PATCHING

A. Patch or repair materials to remain when damaged by the performance of the Work of this section. Finish material and appearance of patch and/or repair Work shall match existing.

3.07 CLEANING

A. Clean existing materials to remain with appropriate tools and equipment.

B. Protect existing improvements during cleaning operations.

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

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

E. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Owner, or store and protect for reuse where required. Continuously clean up and remove items as demolition Work progresses.

F. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 03 1000

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete as indicated.

2. Installation of items to be embedded in concrete, such as anchor bolts, inserts, embeds, and sleeves.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 2000: Concrete Reinforcing.

3. Section 03 3000: Cast-In-Place Concrete.

1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 318 – Building Code Requirements for Structural Concrete, Chapter 6, Formwork, Embedded Pipes, and Construction Joints.

2. ACI 347 – Guide to Formwork for Concrete.

B. American Plywood Association (APA):

1. Form No. V345 - Concrete Forming Design/Construction Guide.

C. National Institute of Standards and Technology (NIST):

1. NIST Voluntary Product Standard PS 1.

1.03 SUBMITTALS

A. Submit detailed structural calculations and drawings approved and signed by a California registered Civil Engineer where the height of the falsework or vertical shoring, as measured from the top of the sills to the soffit of the superstructure exceeds 14 feet, or where individual horizontal span lengths exceed 16 feet, or where provision for vehicular traffic through falsework or shoring occurs. For all other falsework and shoring submit layout signed by California registered Civil Engineer, manufacturer's authorized representative or a licensed contractor experienced in the

usage and erection of falsework and vertical shoring. A copy of the plans and calculation shall be available at the jobsite at all times.

B. Shop Drawings: Submit Shop Drawings indicating locations of forms, construction and expansion joints, embedded items, and accessories.

C. Product Data: Submit manufacturer's Product Data for form materials and accessories.

1.04 REGULATORY REQUIREMENTS

A. California Building Code (CBC), Chapter 19A.

B. California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 4, Construction Safety Orders, Article 6, Excavations, Sections 1713 and 1717.

1.05 DELIVERY, STORAGE AND HANDLING

A. Storage shall prevent damage and permit access to materials for inspection and identification.

PART 2 - PRODUCTS

2.01 GENERAL

A. Form materials may be reused during progress of the Work provided they are completely cleaned and reconditioned, recoated for each use, capable of producing formwork of required quality, and are structurally sound.

B. Form Lumber: WCLIB Construction Grade or Better, WWPA No. 1 or Better.

C. Plywood: NIST Voluntary Product Standard PS 1, Group 1, Exterior Grade B-B Plyform or better, minimum 5-ply and 3/4 inch thick for exposed locations and at least 5/8 inch thick for unexposed locations, grade marked, not mill oiled. Furnished plywood with medium or high density overlay is permitted.

D. Coated Form Plywood: For exposed painted concrete, plastic overlaid plywood of grade specified above, factory coated with a form coating and release agent Nox-crete", or equal.

E. Tube Forms: Sonoco "Seamless Sonotubes," Ceme-Tube, Quik-Tube, or equal, of the type leaving no marks in concrete, one-piece lengths for required heights.

F. Joist Forms: Code recognized steel or molded plastic types as required.

G. Special Forms: For exposed integrally-colored concrete, plywood as above with high density overlay, plywood with integral structural hardboard facing or fibrous glass reinforced plastic facing, providing specified finish.

H. For Exposed Concrete Finish:

1. Plywood: New, waterproof, synthetic resin bonded, exterior type Douglas fir or Southern pine plywood manufactured especially for concrete formwork and conforming to NIST Voluntary Product Standard PS 1, Grade B-B grade, Class I.

2. Glass-Fiber-Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.

3. Steel: Minimum 16 gage sheet, well matched, tight fitting, stiffened to support weight of concrete, without deflection detrimental to tolerances and appearances of finished concrete surfaces.

4. Plywood: "Finland Form,," "Combi Form" by North American Plywood Corporation, "Plyform" by Roy O. Martin, "ProForm" by Pacific Wood Laminates, or equal. The material shall be furnished with hard smooth birch face veneers with phenolic resin thermally fused onto panel sides. Edges shall be factory sealed.

I. Form Ties: Prefabricated rod, flat band, wire, internally threaded disconnecting type, not leaving metal within 1 1/2-inch of concrete surface.

J. Form Coating: Non-staining clear coating free from oil, silicone, wax, not grain-raising, "Formshield" by A.C. Horn, Inc., "Release" by Edoco/Dayton Superior, "Cast-Off" by Sonneborn/BASF Building Systems or equal. Where form liners are furnished, provide form coatings recommended by form liner manufacturer.

K. Form Liner: Rigid or resilient type by L.M. Scofield, Symons, Greenstreak, or equal.

L. Void Forms: Manufactured by SureVoid Products, Inc., Sonotube, Void Form International, or equal. Forms shall be "WallVoid" for temporary support of concrete walls and grade beams spanning between supports, and "SlabVoid" for creating gaps between concrete slabs or steps and underlying soils. Void forms shall be fabricated of corrugated paper with moisture resistant exterior, and shall be capable of withstanding working load of 1,500 psf. Provide accessories as required.

PART 3 - EXECUTION

3.01 GENERAL

A. Forms shall be constructed so as to shape final concrete structure conforming to shape, lines and dimensions of members required by Drawings and Specifications, and shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape. Forms and their supports shall be designed so that previously placed structures will not be damaged.

B. Use form coating at all surfaces in contact with concrete.

3.02 TOLERANCES

A. Permitted abrupt or gradual irregularities in formed surfaces as measured within a 5 feet length with a straightedge shall per ACI 347, Table 3.1:

Class of Surface			
A	B	C	D
1/8 inch	1/4 inch	1/2 inch	1 inch

Edit Note: Edit tolerances indicated below for project specifics.

1. Class A: Use for concrete surfaces prominently exposed to public view.

2. Class B: Use for coarse-textured concrete-formed surfaces intended to receive plaster, stucco or wainscoting.

3. Class C: Use as a general standard for permanently exposed surfaces where other finishes are not specified.

4. Class D: Use for surfaces where roughness is not objectionable and will be permanently concealed.

3.03 ERECTION

A. Plywood shall be installed with horizontal joints level, vertical joints plumb and with joints tight. Back joints by studs or solid blocking, and fill where necessary for smoothness. Reused plywood shall be thoroughly cleaned, damaged edges or surfaces repaired and both sides and edges oiled with colorless form oil. Nail plywood along edges, and to intermediate supports, with common wire nails spaced as necessary to maintain alignment and prevent warping.

B. Openings for Cleaning: Provide temporary openings at points in formwork to facilitate cleaning and inspection. At base of walls and wide piers, bottom form board on one face for entire length shall be omitted until form has been cleaned and inspected.

C. Chamfers: Provide 3/4 inch by 3/4 inch chamfer strips for all exposed concrete corners and edges unless otherwise indicated.

D. Reglets and Rebates: As specified in Section 03 3000: Cast-In-Place Concrete.

3.04 REMOVAL OF FORMS

A. Forms shall not be removed until concrete has sufficiently hydrated to maintain its integrity and not be damaged by form removal operations. Unless noted otherwise and/or permitted by the Architect, columns and wall forms shall not be removed in less than five days, floor slabs in less than seven days, beams and girders in less than 15 days, pan forms for joists may be removed after three days, but joist centering shall not be removed until after 15 days, and ramp, landing, steps and floor slabs shall not

be removed in less than seven days. Shoring shall not be removed until member has acquired sufficient strength to support its weight, load upon it, and added load of construction.

B. Compressive strength of in-place concrete shall be determined by testing field-cured specimens representative of concrete location or members, as specified in Section 03 3000: Cast-In-Place Concrete.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Concrete steel reinforcement.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4523: Testing and Inspection.
3. Section 03 1000: Concrete Forming.
4. Section 03 3000: Cast-In-Place Concrete.
5. Section 04 2100: Clay Unit Masonry.
6. Section 04 2200: Concrete Unit Masonry.

1.02 REGULATORY REQUIREMENTS

A. Fabrication and placement of reinforcing shall be in accordance with requirements of CBC, Chapter 19A.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM):

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
5. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
6. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

7. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

B. American Concrete Institute (ACI) Publication:

1. ACI SP-66 – ACI Detailing Manual.

2. ACI 318 – Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1908A.

C. American Welding Society (AWS):

1. AWS D1.4 – Structural Welding Code – Reinforcing Steel.

1.04 SUBMITTALS

A. Shop Drawings: Submit steel reinforcement Shop Drawings in accordance with ACI 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.

1.05 QUALITY ASSURANCE

A. 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. CBC, Chapter 19A, Concrete.

B. Source Quality Control: Refer to Division 01 Sections for general requirements and to 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.

C. Certification of Welders: Shop and Project site welding shall be performed by welding operators certified by AWS.

1.06 DELIVERY, STORAGE AND HANDLING

A. Avoid exposure to dirt, moisture or conditions harmful to reinforcing.

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.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide reinforcing of sizes, gages and lengths indicated, bent to indicated shapes.

2.02 MATERIALS

A. Steel Reinforcing Bars: ASTM A615, or ASTM A706 deformed grade 60 billet steel unless otherwise specified or indicated.

B. Bars or Rod Mats: ASTM A184.

C. Welded Wire Fabric for Reinforcement: ASTM A185.

D. Tie Wire: ASTM A82, fully annealed, copper-bearing steel wire, 16 gage minimum.

E. Chairs, Spacers, Supports, and Other Accessories: Standard manufacture conforming to ACI 315 fabricated from steel wire of required types and sizes. For reinforcement supported from grade, provide properly sized dense precast blocks of concrete.

2.03 FABRICATION OF REINFORCING BARS:

A. Comply with CRSI Manual of Standard Practice for Reinforced Concrete Construction for fabrication of reinforcing steel.

B. Bending and Forming: Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted. Provide only tested and permitted bar materials.

C. Welding: Provide only ASTM A706 steel where welding is indicated. Perform welding by the direct electric arc process in accordance with AWS D1.4 and specified low-hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is not permitted. Do not tack weld bars. Clean metal surfaces to be welded of loose scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts

of welds deemed defective, using chisel, and replace with proper welding. Prequalification of welds shall be in accordance with CBC requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Bars shall be bent cold. Bars partially embedded in concrete shall not be field bent except as indicated on reviewed Shop Drawings.

B. Before installation and just prior to placing concrete, clean reinforcing of loose scale, rust, oil, dirt and any coating that could reduce bond.

C. Accurately position, install, and secure reinforcing to prevent displacement during the placement of concrete.

D. Provide metal chairs to hold reinforcement the required distance above form bottoms. In beams and slab construction, provide chairs under top slab reinforcement as well as under bottom reinforcement. Space chairs so that reinforcement will not be displaced during installation. Provide metal spacers to secure proper spacing. Stirrups shall be accurately and securely wired to bars at both top and bottom. At slabs, footings, and beams in contact with earth, provide concrete blocks to support reinforcement at required distance above grade.

E. Install and secure reinforcement to maintain required clearance between parallel bars and between bars and forms. Lapped splices shall be installed wherever possible in a manner to provide required clearance between sets of bars. Stagger lapped splices. Dowels and bars extending through construction joints shall be secured in position against displacement before concrete is installed and subsequently cleaned of concrete encrustations while they are still soft.

F. Do not install reinforcing in supported slabs and beams until walls and columns have been installed to underside of slabs and beams or until construction joints have been thoroughly cleaned. Reinforcing shall be inspected before placement of concrete and cleaned as required.

G. Use deformed bars unless otherwise indicated, except for spiral 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 03 3300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cast-in-place normal weight and lightweight concrete, placement and finishing.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 32 1313: Site Concrete Work.
3. Section 03 1000: Concrete Forming and Accessories.
4. Section 03 2000: Concrete Reinforcing.
5. Section 07 2600: Vapor Barriers.

1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 – Specifications for Structural Concrete.
3. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
4. ACI 305R - Specification for Hot Weather Concreting.
5. ACI 306.1 – Standard Specification for Cold Weather Concreting.
6. ACI 318 - Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1908A.

B. American Society for Testing and Materials (ASTM) Standards:

1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.

3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

5. ASTM C88 - Standard Test Method for Soundness of Aggregates by use of Sodium Sulphate or Magnesium Sulphate.

6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

8. ASTM C150 - Standard Specification for Portland Cement.

9. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

10. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.

11. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

12. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

13. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).

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

15. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

16. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

17. ASTM C567 - Standard Test Method for Determining Density of Structural Lightweight Concrete.

18. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

19. ASTM C845 - Standard Specification for Expansive Hydraulic Cement

20. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.

21. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

22. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.

23. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures

24. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).

25. ASTM D1751 - Standard Test Method for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

26. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

27. ASTM E1155 - Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.

28. 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.

29. ASTM E1745 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating locations of cast-in-place concrete Work and accessory items such as vapor barriers. Include details and locations of reinforcing, embedded items, and interfacing with other Work.

B. Mix Design Data: Submit concrete mix designs as specified herein and in Article 2.02.

1. Submit name, address and telephone number of the concrete production facility which the contractor intends to engage to design the concrete mixes. Submit name and qualifications of the proposed concrete technologist.

2. Mix Design: Submit a concrete mix design for each strength and type of concrete indicated in the drawings or specified. Include water/cement ratio, source, size and amount of coarse aggregate and admixtures. Predict minimum compressive strength, maximum slump and air content percentage. Clearly indicate locations where each mix design will be used.

   a. Water/cement ration for concrete slabs on grade shall be 0.50 maximum.

3. Test Reports: Submit copies of test reports showing that the proposed mixes produce concrete with the strengths and properties specified. Include tests for cement, aggregates and admixtures. Provide gradation analysis.

C. Material Samples: Submit Samples illustrating concrete finishes and hardeners, minimum 12-inch by 12-inch.

D. Certificates: Submit certification that each of the following conforms to the standards indicated:

1. Portland cement: ASTM C150.

2. Normal weight concrete aggregates: ASTM C33.

3. Lightweight concrete aggregates: ASTM C330.

4. Aggregates: Submit evidence that the aggregate is not reactive in the presence of cement alkalis. In the absence of evidence, aggregate shall be tested per ASTM C289. If results of test are other than innocuous, aggregates shall be tested per ASTM C1567 as reported per ACI 318 as modified by CBC, Section 1903A.3.

5. Curing materials: ASTM C171.

E. Admixtures: Submit product data for proposed concrete admixtures.

1.04 QUALITY ASSURANCE

A. Continuous inspection shall be provided at the batch plant and for transit-mixed concrete to run check sieve analysis of aggregate, check moisture content of fine aggregate, check design of mix, check cement being used with test reports, check loading of mixer trucks, and certify to quantities of materials placed in each mixer truck.

B. Inspection shall be performed by a representative of a testing laboratory selected by the OWNER. OWNER will pay for inspection costs. Notify the laboratory 24 hours in advance of time concrete is to be mixed. Notify the laboratory of postponement or cancellation of mixing within at least 24 hours of scheduling time.

C. CONTRACTOR shall assist the testing laboratory in obtaining and handling samples at the project site and at the source of materials.

D. Continuous batch plant inspection requirement may be waived in accordance with CBC Section 1704A.2.5. Waiver shall be in writing, including DSA approval. When batch plant inspection is waived by DSA, the following requirements shall be met:

1. Approved inspector of the testing laboratory shall check the first batching at the start of work and furnish mix proportions to the licensed weightmaster.

2. Licensed weightmaster shall positively identify materials as to quantity and certify to each load by a ticket.

3. Tickets shall be transmitted to the Inspector by a truck driver with load identified thereon. The Inspector will not accept the load without a load ticket identifying the mix and will keep a daily record of placements, identifying each truck, its load and time of receipt and approximate location of deposit in the structure and will transmit a copy of the daily record to DSA.

4. At the end of the project, the weightmaster shall furnish an affidavit to DSA certifying that all concrete furnished conforms in every particular to proportions established by mix designs.

E. Special Inspections and Tests shall be in accordance with CBC Chapter 17A, Reinforcement and Anchor testing per CBC Section 1910A.1 and Specification Section 01 4523.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store cement and aggregate materials so as to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.

B. Packaged materials shall bear the manufacturers and brand name label, and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.

1.06 PROJECT CONDITIONS

A. Cold Weather Requirements: Batching, mixing, delivering and placing of concrete in cold weather shall comply with the applicable requirements of ACI 306.1.

B. Hot Weather Requirements: Batching, mixing, delivering and placing of concrete in hot weather shall comply with the applicable requirements of ACI 305R.

C. Concrete temperature of freshly mixed concrete shall be determined per ASTM C1064.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: ASTM C150. Portland Cement.

B. Aggregates: Conform to the following standards:

1. Normal weight concrete: ASTM C33.

2. Lightweight concrete: ASTM C330, with fine aggregates per ASTM C33.

3. Aggregate shall be tested for Potential Alkali Reactivity of Cement-Aggregate Combinations per ASTM C289.

4. Nominal maximum size of coarse aggregate shall be no larger than:

a. 1/5 the narrowest dimension between sides of forms, nor

b. 1/3 the depth of slabs, nor

c. 3/4 the clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, or ducts.

d. CONTRACTOR may request the ARCHITECT and DSA waiver of the above limitations reported per ACI 318 as modified per CBC Section 1903A.3, provided that the workability and methods of consolidation are such that the concrete can be placed without honeycombs or voids.

C. Water: Water for concrete mixes, curing and cleaning shall be potable and free from deleterious matter.

D. Admixtures: Shall be shown capable of maintaining essentially the same composition and performance throughout the work as the product used in establishing concrete proportions in accordance with ACI 318, Section 3.6.

1. Admixtures containing chlorides or sulfides are not permitted.

2. Air-entraining admixtures shall comply with ASTM C260. Air-entrained admixtures shall not be used for floor slabs to receive steel trowel finish.

3. Admixtures for water reduction and setting time modification shall conform to ASTM C494.

4. Admixtures for producing flowing concrete shall conform to ASTM C1017.

5. Fly ash, pozzolan and ground granulated blast-furnace slag: Modify ACI 318 Sections 3.6.6 and 3.6.7 as follows:

a. Fly ash or other pozzolan used as a partial substitution for ASTM C150 Portland cement shall meet the following requirements:

1) Shall conform to ASTM C618 for Class N or F materials (Class C is not permitted).

2) [ ] percent by weight of fly ash or other pozzolans shall substitute for ASTM C150 Portland cement provided the mix design is proportioned per ACI 318, Section 318 5.3,and the durability requirements of CBC Section 1904A are met.

b. Ground-granulated blast-furnace slag used as a partial substitution for ASTM C150 Portland cement shall meet the following requirements:

1) Shall conform to ASTM C989.

2) [ ] percent by weight of ground-granulated blast-furnace slag shall substitute for ASTM C150 Portland cement provided the mix design is proportioned per ACI 318, Section 5.3, and the durability requirements of Section CBC 1904A are met.

6. Admixtures containing ASTM C845 expansive cements shall be compatible with the cement and produce no deleterious effects.

7. Silica fumes used as an admixture shall conform to ASTM C1240.

E. Reinforcement Fibers: Chop strands of alkali-resistant polypropylene or nylon fibers added to the concrete mix for protection against shrinkage cracks.

F. Expansion Joint Fillers: Preformed strips, non-extruding and resilient bituminous type, of thickness indicated, conforming to ASTM D1751.

G. Curing Paper: Shall conform to ASTM C171 and consist of two sheets of kraft paper cemented together with a bituminous material in which are embedded cords or strands of fiber running in both directions. The paper shall be light in color, shall be free of visible defects, with uniform appearance.

H. Floor Hardener: Water soluble, inorganic, silicate-based curing, hardening, sealing and dustproofing compound. Aquaseal W20 by Monopole Inc., Kure-N-Harden by BASF, Chem Hard by L&M, Liqui-Hard by W. R. Meadows, or equal.

I. Underlayment: Two component latex underlayment for filling low spots in concrete for both interior and exterior applications, from featheredge to a maximum of 3/8 inch in thickness. Underlayment shall be non-shrink and suitable for repairing exposed concrete surfaces and for underlayment of carpet, resilient, tile and quarry floor coverings. La-O-Tex by TexRite, Underlay C, RS by Mer-Krete Systems, Underlayment 962 by C-Cure, or equal.

J. Vapor Barrier: Refer to Section 07 2600, Vapor Barriers.

K. Stair Treads and Nosings: Two part stair tread and nosing with ribbed abrasive bars. Fabricated from 6063-T5 or 6063-T6 extruded aluminum, mill finish. Anti-slip abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Color shall extend uniformly throughout filler.

1. American Safety Tread: TP-311R.

2. Balco Inc.: DST-330.

3. Nystrom: STTB-P3.375E.

4. Wooster Products Inc.: WP-RN3SG.

5. Equal.

L. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 7 days; of consistency suitable for application and a 30 minute working time.

2.02 CONCRETE MIX

A. Mix shall be signed and sealed by a Civil or Structural Engineer currently registered in the State of California.

B. Strength of Concrete: Strengths and types of concretes shall be as indicated in the Drawings. Unless otherwise indicated or specified, concrete shall be provided with minimum 28-day strength of 3000 psi (f'c).

C. The required strength and durability of concrete shall be determined by compliance with the proportioning, testing, mixing and placing provisions of CBC Sections 1905A.1 through 1905A.13. Concrete mix shall meet the durability requirements of ACI 318, Chapter 4.

D. Concrete proportioning shall be determined on the basis of field experience and/or trial mixtures shall in accordance with ACI 318, Section 5.3. Proportions of materials shall provide workability and consistency to permit concrete to be placed readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.

E. Ready-Mixed Concrete: Mix and deliver in accordance with requirements of ASTM C94.

PART 3 - EXECUTION

3.01 GENERAL

A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.

B. Time of Placing: Do not place concrete until reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, and other embedded materials are securely fastened in place. Contact the Inspector at least 24 hours before placing concrete; do not place concrete until inspected by the Project Inspector.

C. Pouring Record: A record shall be kept on the Project site of time and date of placing concrete in each portion of structure. Such record shall be maintained on the Project site until Substantial Completion and shall be available for examination by the ARCHITECT and DSA.

3.02 TOLERANCES

A. Concrete construction tolerances shall be as specified in ACI 117 and as modified herein.

B. Floor Flatness (F_F) and Floor Levelness (F_L) shall be as indicated below:

	Specified Overall Value		Minimum Local Value	
	F_F	F_L	F_F	F_L
Slabs on ground: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	15	10
Slab on ground: carpet.	25	20	17	15

Slab on ground: thinset tile and resilient flooring.	35	25	24	17
Suspended slabs: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	N/A	N/A
Suspended slabs: carpet.	25	20	N/A	N/A
Suspended slabs: thinset tile and resilient flooring.	35	20	N/A	N/A

C. Refer to ACI 302.1R, Tables 8.1 and 8.2 Slab on Ground and Suspended Flatness/Levelness Construction Guide, for recommended concrete placing and finishing methods.

D. Floor Flatness and Floor Levelness shall be tested in accordance to ASTM E1155. Floor measurements shall be made within 48 hours after slab installation, and shall precede removal of shores and forms.

3.03 PREPARATION

A. For installation of vapor barrier refer to Section 07 2600, Vapor Barriers.

B. Reglets and Rebates:

1. Form reglets and rebates in concrete to receive flashing, frames and other equipment as detailed and required. Coordinate dimensions and locations required with other related Work.

2. If concrete slabs on grade adjoin a wall or other perpendicular concrete surface, form a reglet in wall to receive and carry horizontal concrete Work. Reglet shall be full thickness of the slab and shall be 3/4 inch wide, unless otherwise indicated. Requirement does not apply to exterior walks, unless specifically indicated.

C. Screeds: Install screeds accurately and maintain at required grade or slab elevations after steel reinforcement has been installed, but before starting to place concrete. Install screeds adjacent to walls and in parallel rows not to exceed 8 feet on centers.

3.04 INSTALLATION

A. Conveying and Placing:

1. Concrete shall be placed only under direct observation of the Project Inspector. Do not place concrete outside of regular working hours, unless the Inspector has been notified at least 48 hours in advance.

2. Concrete shall be conveyed from mixer to location of final placement by methods that will prevent separation or loss of materials.

3. Concrete shall be placed as nearly as practicable to its final position to avoid segregation due to re-handling or flowing. No concrete that has partially hydrated

or has been contaminated by foreign materials shall be placed, nor shall re-tempered concrete or concrete which has been remixed after initial set be placed.

4. In placing concrete in columns, walls or thin sections, provide openings in forms, elephant trunks, tremies or other recognized devices, to prevent segregation and accumulation of partially hydrated concrete on forms or metal reinforcement above level of concrete being placed. Such devices shall be installed so that concrete will be dropped vertically. Unconfined vertical drop of concrete from end of such devices to final placement surface shall not exceed 6 feet.

5. Concrete shall be placed as a continuous operation until placing of panel or section is completed. Top surfaces of vertically formed lifts shall be level.

6. Concrete shall be thoroughly consolidated by suitable means during placement, and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.

7. Where conditions make consolidation difficult or where reinforcement is congested, batches of mortar containing same proportions of cement, sand, and water as provided in the concrete, shall first be deposited in the forms to a depth of at least one inch.

B. Cold Weather:

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. All ground with which concrete is to come in contact shall be free from frost. No frozen materials or materials containing ice shall be used.

2. The temperature of concrete at the time of placement shall not be below the minimum temperatures given in Table 3.1 of ACI 306.1.

3. Concrete shall be maintained at a temperature of at least 50° F. for not less than 72 hours after placing or until it has thoroughly hardened. Cover concrete and provide sufficient heat as required. When necessary, aggregates shall be heated before mixing. Special precautions shall be taken for protection of transit-mixed concrete.

C. Hot Weather:

1. Concrete to be placed during hot weather shall comply with the requirements of ACI 318, Section 5.13.

2. Maintain concrete temperatures indicated in Table 2.1.5 of ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square feet of exposed concrete per hour.

3. Cool concrete using methods indicated in ACI 305R Appendix B.

4. Place and cure concrete as specified in ACI 305R Chapter 4.

D. Compaction and Screeding:

1. Tamp freshly placed concrete with a heavy tamper until at least 3/8 inch of mortar is brought to surface. Concrete shall then be tamped with a light tamper and screeded with a heavy straightedge until depressions and irregularities are eliminated, and surface is true to finish grades or elevations. Remove excess water and debris.

2. Where slabs are to receive separate cement finish or mortar setting bed, continued tamping to raise mortar to surface is not performed. Laitance shall be removed by brushing with a stiff brush or by light sandblasting to expose clean top surface of coarse aggregate.

E. Floating and Troweling:

1. When concrete has hydrated sufficiently, it shall be floated to a compact and smooth surface. After floating, wait until concrete has reached proper consistency before troweling. Top surfaces shall receive at least 2 troweling operations with steel hand trowel. Prior to and during final troweling, apply a fine mist of water frequently with an atomizing type fog sprayer. Omit troweling for slabs to receive a separate cement finish.

2. For interior finish slabs, final troweling shall provide a hard, impervious, and non-slip surfaces, free from defects and blemishes. Finished surface shall be within tolerances indicated in Article 3.02. Avoid burnishing. Do not add cement or sand to absorb excess moisture.

   a. Floor of Walk-In Refrigerator: Finish as specified above, to a smooth finish.

   b. Floor of Gymnasium Locker Rooms: After floating, and while the surface is still plastic, provide a fine textured finish by drawing a fine fiber bristle broom uniformly over the surface in one direction only. Floors sloped for drainage should be brushed in the direction of flow.

3. Exterior Paving and Cement Walks: Finish as specified above, except surface shall be given a non-slip broom finish to match Sample reviewed by the ARCHITECT.

4. Vertical concrete surfaces shall be finished smooth and free from marks or other surface defects.

F. Curing:

1. Length of time, temperature and moisture conditions for curing concrete shall be in accordance with ACI 318, Section 5.11.

2. Forms containing concrete, top of concrete between forms, and exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for at least 7 consecutive days after placing.

3. If weather is hot or surface has dried out, spray surface of concrete slabs and paving with fine mist of water, starting not later than 2 hours after final troweling

and continuing until sunset. Surface of finish shall be kept continuously wet until curing medium has been installed.

4. Immediately after finishing, monolithic floor slabs shall be covered with curing paper. Paper shall be lapped 4 inches at joints and sealed with waterproof sealer. Edges shall be cemented to finish. Repair or replace paper damaged during construction operations.

G. Filling, Leveling and Patching:

1. Concrete slabs exhibiting high or low spots and indicated to receive resilient floor covering or soft floor covering, shall have surfaces repaired. High spots shall be honed, or ground with power-driven machines to required tolerances. Low spots shall be filled with latex underlayment, installed in strict accordance with manufacturer's written recommendations.

2. Holes resulting from form ties or sleeve nuts shall be solidly packed, through exterior walls, by pressure grouting with cement grout, as specified. Grouted holes on exposed surfaces shall be screeded flush and finished to match adjoining surfaces.

H. Cement Base: Cement base shall be of the height, thickness, and shape detailed. Base shall be reinforced with one inch mesh, 18 gage, zinc-coated wire fabric. Base finish mixture shall be one part Portland cement, 2 parts of fine aggregate and one part pea gravel. Colored cement base shall include a chemically inert mineral oxide pigment in the mix.

3.05 FINISHING

A. Soda and Acid Wash: Concrete surfaces to receive plaster, paint or other finish, and which have been formed by oil coated forms, shall be scrubbed with a solution of 1-1/2 pounds of caustic soda to one gallon of water. Surfaces where smooth wood or waste molds have been furnished shall be scrubbed with a solution of 20 percent muriatic acid. Wash with clean water after scrubbing.

B. Sacking: Exposed concrete curbs, walls, and other surfaces shall be sacked by an application of Portland cement grout, floated, and rubbed. Sacking shall not be performed until patching and filling of holes has been completed. Entire sacking operation for any continuous area shall be started and completed within the same day.

1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having consistency of thick paint. Wet surface of concrete sufficiently to prevent absorption of water from grout. Apply grout uniformly with a brush or spray gun, then immediately float surface with a cork or other suitable float, scouring wall vigorously.

2. While grout is still plastic, finish surface with a sponge-rubber float, removing excess grout. Allow surface to dry thoroughly, then rub vigorously with dry burlap to completely remove dried grout. No visible film or grout shall remain after rubbing with burlap.

C. Sandblasting: Exterior concrete surfaces to receive stucco dash coat finish, where plywood or other smooth forms have been furnished, shall be uniformly sand-blasted with sharp quartz sand under sufficient air pressure to remove dirt, form oil and other foreign materials, and roughen surface to provide a proper bond. Such surfaces shall be thoroughly washed with clean water after sandblasting.

D. Abrasive: Concrete stair treads, landings, ramps and steps on interior and exterior of buildings, and interior exposed concrete floors in shop buildings shall receive an abrasive finish.

E. Floor Hardener: Exposed interior concrete floors throughout shall be treated with floor hardener.

1. Protect adjacent surfaces. Clean surfaces to receive treatment in accordance with manufacturer's instructions, ensuring that all stains, oil, grease, form release agents, laitance, dust and dirt are removed prior to application.

2. Apply hardener in accordance with manufacturer's instructions as soon as concrete is firm enough to work on after final troweling.

F. Cement Grout and Dry-Pack Concrete: Cement grout shall be mixed at the Project site and shall be composed of one volume of Portland cement and 2-1/2 volumes of fine aggregate. Materials shall be mixed dry with sufficient water added to make mixture flow under its own weight. When grout is used as a dry pack concrete, add sufficient water to provide a stiff mixture, which can be molded into a sphere.

G. Broom Finish: Exterior stair treads and landings shall be provided with a non-slip broom finish in addition to abrasive finish specified.

H. Abrasive Stair Nosing: Nosing shall be installed according to manufacturers written recommendations.

3.06 EXPANSION AND CONSTRUCTION JOINTS

A. Construction Joints: Details and proposed location of construction joints shall be as indicated on the Drawings, located to least impair strength of structure, in accordance with the following:

1. Thoroughly clean contact surface by sand blasting entire surface not earlier than 5 days after initial placement.

2. A mix containing same proportion of sand and cement provided in concrete plus a maximum of 50 percent of coarse aggregate shall be placed to a depth of at least one inch on horizontal joints. Vertical joints shall be wetted and coated with a neat cement grout immediately before placing of new concrete.

3. Should contact surface become coated with earth, sawdust, or deleterious material of any kind after being cleaned, entire surface shall be re-cleaned before applying mix.

B. Expansion Joints: Provide expansion joints where indicated in walks and exterior slabs. Space approximately 20 feet apart, unless otherwise indicated. Joints shall extend

entirely through slab with joint filler in one piece for width of walk or slab. Joint filler shall be 3/8 inch thick, unless otherwise indicated.

C. Tooled Joints: Slabs, walks and paving shall be marked into areas as indicated with markings made with a V-grooving tool. Marks shall be round-edged, free from burrs or obstructions, with clean cut angles and shall be straight and true. Walks, if not indicated, shall be marked off into rectangles of not more than 12 square feet and shall have a center marking where more than 5 feet wide.

3.07 TESTING

A. Molded Cylinder Tests:

1. Inspector or testing lab personnel will prepare cylinders and perform slump tests. Samples for concrete strength shall be taken in accordance to ASTM C172. Each cylinder shall be dated, given a number, point in structure from which sample was obtained, mix design number, mix design strength and result of accompanying slump test noted.

2. Separate tests of molded concrete cylinders obtained at same place and time shall be made at age of three days, seven days, and 28 days. A strength test shall be the average of the compressive strength of two cylinders, obtained from the same sample of concrete and tested at 28 days or at test age designated for determination of f'c.

3. Test cylinders shall be prepared at the Project site and stored in testing laboratory in accordance with ASTM C31, and tested in accordance with ASTM C39.

B. Core Test: At request of the ARCHITECT, cores of hardened concrete shall be cut from portions of hydrated structures for testing, in accordance with CBC and ASTM C42.

1. Provide 4 inch diameter cores at representative places throughout the structure as designated by the ARCHITECT.

2. In general, provide sufficient cores to represent concrete placed with at least one core for each 4,000 square feet of building area, and at least 3 cores total for each Project.

3. Where cores have been removed, fill voids with drypack, and patch the finish to match the adjacent existing surfaces.

C. Concrete Consistency: Measure consistency according to ASTM C143. Test twice each day or partial day's run of the mixer.

D. Adjustment of Mix: If the strength of any grade of concrete for any portion of Work, as indicated by molded test cylinders, falls below minimum 28 days compressive strength specified or indicated, adjust mix design for remaining portion of construction so that resulting concrete meets minimum strength requirements.

E. Air Content Testing: Measure in accordance to ASTM C173 or ASTM C231, for each composite sample taken in accordance to ASTM C172.

F. Defective Concrete:

1. Should strength of any grade of concrete, for any portion of Work indicated by tests of molded cylinders and core tests, fall below minimum 28 days strength specified or indicated, concrete will be deemed defective Work and shall be replaced or adequately strengthened in a manner acceptable to the ARCHITECT and DSA.

2. Concrete Work that is not formed as indicated, is not true within 1/250 of span, not true to intended alignment, not plumb or level where so intended, not true to intended grades and levels, contains sawdust shavings, wood or embedded debris, or does not fully conform to Contract provisions, shall be deemed to be defective Work and shall be removed and replaced.

G. Concrete for Equipment Pads, Mechanical and Electrical Work: Unless otherwise indicated, strength shall have a minimum $f'c$ = 3,000 psi. Exposed concrete shall be provided with a hand trowel finish with radius corners and edges. Form and place concrete where necessary as described in Section 03 1000 Concrete Forming and Accessories, and reinforced as described in Section 03 2000 Concrete Reinforcing. Calcium chloride shall not be furnished in any concrete mix provided for the installation of underground electrical conduits. For concrete encasement of more than one conduit, furnish 3/4 inch maximum aggregate.

3.08 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.09 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Structural steel.
2. Architecturally exposed structural steel.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4523 - Testing and Inspection.
3. Section 03 3000 - Cast-In-Place Concrete.
4. Section 05 3000 - Metal Decking.
5. Section 05 5000 - Metal Fabrications.
6. Section 07 8116 - Cementitious Fireproofing.
7. Section 09 9000 - Paints and Coatings.

1.02 REFERENCES

A. CBC Chapter 22A.

B. CFC Chapter 35.

C. American Institute of Steel Construction (AISC):

1. AISC – Steel Construction Manual:
   a. AISC 360 Specifications for Structural Steel Buildings.
   b. AISC Code of Standard Practice for Steel Buildings and Bridges.
   c. RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts.
2. AISC 341 - Seismic Provisions for Structural Steel Buildings, including Supplements.
3. AISC 358 - Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications.

D. American Society for Testing and Materials (ASTM):

1. ASTM A36 – Standard Specification for Carbon Structural Steel.
2. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
4. ASTM A123 – Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
5. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength.
7. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 Ksi Minimum Tensile Strength.
8. ASTM A435 - Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates.
9. ASTM A490 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
10. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
11. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
12. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
13. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
14. ASTM A673 - Standard Specification for Sampling Procedure for Impact Testing of Structural Steel,
15. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
16. ASTM A992 – Standard Specification for Structural Steel Shapes.
17. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).
18. ASTM E23 - Standard Test Methods for Notched Bar Impact Testing of Metallic Materials.
19. ASTM E112 - Standard Test Methods for Determining Average Grain Size.

20. ASTM F436 – Standard Specification for Hardened Steel Washers.

21. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.

22. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-Ksi Yield Strength.

23. ASTM F1852 – Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tension Strength.

E. American Welding Society (AWS):

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

2. AWS D1.8 – Structural Welding Code – Seismic Supplement.

2. AWS A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination.

3. AWS B2.1 – Specifications for Welding Procedures and Performance Qualification.

F. SSPC – Steel Structures Painting Council:

1. SP-2 - Hand Tool Cleaning.

2. PA-1 - Paint Application Specification No. 1.

1.03 REGULATORY REQUIREMENTS

A. Structural steel shall conform to CBC requirements, except that steel manufactured by acid Bessemer process is not permitted for structural purposes.

B. Sheet and strip steel other than those listed in CBC, if provided for structural purpose, shall comply with DSA requirements.

1.04 SUBMITTALS

A. Shop Drawings:

1. Submit Shop Drawings, including complete details and schedules for fabrication and shop assembly of members, and details, schedules, procedures and diagrams showing the sequence of erection. Fully detail minor connections and fastenings not shown or specified in the Contract Documents to meet required conditions using similar detailing as shown in the Contract Documents. Include a fully detailed, well controlled sequence and technique plan for shop and field welding that minimizes locked in stresses and distortion; submit sequence and technique plan for review by the Architect.

a. Include details of cuts, connections, camber, and holes in accordance with Figure 4.5 of AWS D1.1 or AISC Chapter J, weld position plan and other pertinent data. Indicate welds by standard AWS symbols, and show size, length and type of each weld.

b. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed for Work specified in other sections.

c. Erection and Bracing Plan and Erection Procedure: Submit an erection and framing plan, including columns, beams, and girders, signed and sealed by a Structural or Civil Engineer registered in the State of California in accordance with Title 8 California Code of Regulations, Section 1710, Erection of Structures. Maintain a copy at the Project site as required by the California Division of Industrial Safety.

d. Submit a list of steel items to be galvanized.

e. Include identification and details of Architecturally Exposed Structural Steel (AESS) members, if applicable.

B. Product Data:

1. Submit copies of fabricator's specifications and installation instructions for the following products. Include laboratory test reports and other data required demonstrating compliance with these Specifications:

a. Structural steel, each type; including certified copies of mill reports covering chemical and physical properties.

b. Welding electrodes.

c. Welding gas.

d. Unfinished bolts and nuts.

e. Structural steel primer paint.

f. High-strength bolts, including nuts and washers.

C. Manufacturer's Mill Certificate:

1. Submit, certifying that products meet or exceed specified requirements.

D. Mill Test Reports:

1. Submit manufacturer's certificates, indicating structural yield and tensile strength, destructive and non-destructive test analysis.

G. Welding Procedure Specifications (WPS): Submit weld procedures for all welding on project to Owner's testing laboratory for approval. After approval by testing laboratory, submit to Architect for record. Weld procedures shall be qualified as described in AWS D1.5, AISC 341 and AISC 358, as applicable. Weld procedures shall indicate joints details and tolerances, preheat and interpass temperature, post-heat treatment, single or multiple stringer passes, peening of stringer passes for groove welds except for the first and the last pass, electrode type and size, welding current, polarity and amperes and root treatment. The welding variables for each stringer pass shall be recorded and averaged; from these averages the weld heat input shall be calculated. Submit the manufacturer's product data sheet for all welding material used.

H. Welder's Certificates: Field welders shall be Project certified in accordance with AWS D1.1. Shop welders shall be Project certified for FCAW in accordance with AWS D1.1.

I. Test Reports: Submit reports of tests conducted on shop and field welded and bolted connections. Include data on type of test conducted and test results.

1.05 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges, modified as follows:

a. Replace "Structural Design Drawings" with "Contract Documents' throughout the document.

b. Paragraph 3.2 is hereby modified in it's entirety as follows:

"Contract Documents including but not limited to architectural, mechanical, plumbing, electrical, civil and kitchen design drawings and specifications shall be used as supplement to the structural plans to define configurations and construction information."

c. Delete Paragraph 3.3.

d. In Paragraph 4.4, delete the following sentence:

"These drawings shall be returned to the Fabricator within 14 calendar days."

e. Delete Paragraph 4.4.1.(a) in its entirety.

f. Paragraph 4.4.2 is hereby modified in it's entirety as follows:

"No review action, implicit or explicit, shall be interpreted to authorize changes in the Contract Documents."

2. Perform welding in accordance with CFC Chapter 35, AWS Standards, AWS D1.1, and California Building Code Section 2004A.1 and approved Weld Procedure Specifications (WPS).

B. Shop fabrication shall be inspected in accordance with CBC.

C. Erect mock-up panel of fabricated structural steel meeting Architecturally Exposed Structural Steel (AESS) tolerances for exposed areas. Approval by Architect is required. Mock-up to remain for comparison but may not be left as part of the work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store structural steel above grade on platforms, skids or other supports.

B. Protect steel from corrosion.

C. Store welding electrodes in accordance with AWS D 12.1.

D. Store other materials in a weather-tight and dry place until installed into the Work.

PART 2 - PRODUCTS

2.01 GENERAL

A. Stock Materials: Provide exact materials, sections, shapes, thickness, sizes, weights, and details of construction indicated on Drawings. Changes because of material stock or shop practices will be considered if net area of shape or section is not reduced thereby, if material and structural properties are at least equivalent, and if overall dimensions are not exceeded.

B. Shapes, bars, plates, tubes and pipes shall be made of materials with at least 16 percent recycled content if produced from Basic Oxygen Furnace (BOF) or at least 67 percent recycled content if produced from Electric Arc Furnace (EAF).

2.02 MATERIALS

A. Structural Steel: All wide flange shapes shall conform to ASTM A992 grade 50. Other steel shall conform to ASTM A36.

B. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low carbon bolts and nuts.

C. High-Strength Threaded Fasteners: ASTM A325, ASTM A490 ASTM F959 or ASTM F1852 quenched and tempered, steel bolts, nuts and washers.

D. Primers: Lead-free metal primer:

1. SSPC-Paint 20, Zinc-Rich Primer.
2. SSPC-Paint 23, Latex Primer.
3. SSPC-Paint 25 Zinc Oxide Primer.

E. Steel Pipe: ASTM A53, Type E or S, Grade B.

F. Structural Tubing:

1. Hot-formed, ASTM A501.
2. Cold-formed, ASTM A500, Grade B.

G. Galvanizing: ASTM A123.

I. Shear stud connectors: ASTM A108, Grade 1015 forged steel, headed, uncoated, granular flux filled shear connector or anchor studs by Nelson Stud Welding Division, or equal.

J. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at seven days; of consistency suitable for application and a 30 minute working time.

2.03 FABRICATION

A. Cleaning and Straightening Materials: Materials being fabricated shall be thoroughly cleaned of scale and rust, and straightened before fabrication. Cleaning and straightening methods shall not damage material. After punching or fabrication of component parts of a member, twists or bends shall be removed before parts are assembled.

B. Cutting, Punching, Drilling and Tapping: Unless otherwise indicated or specified, structural steel fabricator shall perform the cutting, punching, drilling and tapping of Work so that Work of other trades will properly connect to steel Work.

C. Milling: Compression joints depending on contact bearing shall be furnished with bearing surfaces prepared to a common plane by milling.

D. Use of Burning Torch: Oxygen cutting of members shall be performed by machine. Gouges greater than 3/16 inch that remain from cutting shall be removed by grinding. Reentrant corners shall be shaped notch free to a radius of at least 1/2 inch. Gas cutting of holes for bolts or rivets is not permitted.

E. Galvanizing: After fabrication, items indicated or specified to be galvanized shall be galvanized in largest practical sizes. Fabrication includes operations of shearing, punching, bending, forming, assembling or welding. Galvanized items shall be free from projections, barbs, or icicles resulting from the galvanizing process.

F. Welding:

1. Type of steel furnished in welded structures shall provide chemical properties suitable for welding as determined by chemical analysis. Welds shall conform to the verification and inspection requirements of CBC Chapter 17A. Conform to AWS D1.1, and CBC Chapter 22A.

2. Materials and workmanship shall conform to the requirements specified herein and to CBC requirements, modified as follows:

   a. No welded splices shall be permitted except those indicated on Drawings unless specifically reviewed by the Architect.

   b. Drawings will designate joints in which it is important that welding sequence and technique be controlled to minimize shrinkage stresses and distortion.

3. Welding shall be performed in accordance with requirements of the AWS Structural Welding Code.

4. Architecturally Exposed Structural Steel: Verify that weld sizes, fabrication sequence, and equipment used for Architecturally Exposed Structural Steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds ½ inch and larger. Grind flush butt welds. Dress exposed welds.

5. Remove erection bolts on welded, Architecturally Exposed Structural Steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Shop Finish:

1. Notify the Project Inspector when Work is ready to receive shop prime coat. Work shall be inspected by the Project Inspector before installation of primer.

2. Structural steel and fittings shall receive a coat of primer, except:

a. Surfaces that will be galvanized.

b. Surfaces that will be fireproofed.

c. Surfaces that will be field welded.

d. Surfaces in contact with concrete.

e. Surfaces high strength bolted.

3. The primer specified shall be spray applied, filling joints and corners and covering surfaces with a smooth unbroken film. The minimum dry film thickness of the primer shall be 2.0 mils.

H. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

I Fabricate Architecturally Exposed Structural Steel with exposed surfaces smooth, square, and free of surfaces blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.

1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating and shop priming.

2. Comply with fabrication requirements, including tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for Architecturally Exposed Structural Steel.

J. Architecturally Exposed Structural Steel: use special care in unloading, handling and erecting the steel to avoid marking or distorting the steel members. Minimize damage to any shop paint when temporary braces or erection clips are used. Avoid unsightly surfaces upon removal. Grind smooth tack welds and holes filled with weld metal or body solder. Plan and execute all operations in such a manner that the close fit and neat appearance of the structure will not be impaired.

2.04 SHOP AND FIELD QUALITY CONTROL

A. A special inspector, approved by DSA to inspect the Work of this section, shall inspect high-strength bolted connections. The Owner will provide a DSA approved independent testing laboratory to perform tests and prepare test reports in accordance with CBC 1704A.3.3. The Project Inspector shall be responsible for monitoring the work of the special inspector and testing laboratories to ensure that the testing program is satisfactorily completed.

B. An AWS CWI certified special inspector, approved by DSA to inspect the Work of this section, shall inspect welded connections in accordance with CBC 1704A.3.1. The Owner will provide a DSA approved independent testing laboratory to perform tests and prepare test reports. The Project Inspector shall be responsible for monitoring the work of the special inspector and testing laboratories to ensure that the testing program is satisfactorily completed.

C. The independent testing laboratory shall conduct and interpret test and state in each report whether test specimens comply with requirements, and specifically state any deviations there from.

D. Provide access to all places where structural steel Work is being fabricated or produced so required inspection and testing can be performed.

E. The independent testing laboratory may inspect or test structural steel at plant before shipment; however, Architect reserves the right at any time before Contract Completion to deem materials not in compliance with the specified requirements as defective Work.

F. Correct defects in structural Work when inspections and laboratory test reports indicate noncompliance with specified requirements. Perform additional tests as may be required to reconfirm noncompliance of original Work, and as may be required to show demonstrate compliance of corrected Work.

G. Inspection of Structural Tube Steel/Hollow Structural Sections (HSS): Structural tube steel members (round, square, rectangular), disregarding steel origin, will be inspected during shop fabrication per DSA Bulletin 07-03. Inspector will perform a visual examination of the seam weld area for visible discontinuities. When defects are suspected, non-destructive testing will be considered.

H. Welding: Inspect and test during fabrication and erection of structural steel assemblies as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in the Work. Record Work required and performed to correct deficiencies.

2. Inspect welds. Welds shall be visually inspected before performing any non-destructive testing. Groove weld shall be inspected by ultrasonic or other approved non-destructive test methods. Testing shall be performed to AWS D1.1 Table 6.3 cyclically loaded non-tubular connections.

3. Ultrasonic testing shall be performed by a specially trained and qualified technician who shall operate the equipment, examine welds, and maintain a record of welds examined, defects found, and disposition of each defect. Repair and test defective welds.

4. Rate of Testing: Completed welds contained in joints and splices shall be tested 100 percent either by ultrasonic testing or by radiography.

5. Welds, when installed in column splices, shall be tested by either ultrasonic testing or radiography.

6. Base metal thicker than 1 ½-inch, when subjected to through-thickness weld shrinkage strains, shall be ultrasonically inspected by shear wave methods for discontinuities directly behind such welds. Tests shall be performed at least 48 hours after completed joint has cooled down to ambient air temperature.

7. Material discontinuities shall be reviewed based on the defect rating in accordance with the criteria of AWS D1.1 table 6.3 by the Architect and DSA.

8. Other method of non-destructive testing and inspection, for example, liquid dye penetrate testing, magnetic particle inspection or radiographic inspection may be performed on weld if required.

9. Lamellar Tearing: Lamellar-tearing resulting from welding is a crack (with zero tolerance) and shall be repaired in accordance with AWS D1.1.

10. Lamination: The rejection criteria shall be based on ASTM A435.

11. Where testing reveals lamination or conditions of lamellar tearing in base metal, the steel fabricator shall submit a proposed method of repair for review by the Architect. Test repaired areas as required.

12. Magnetic Particle Testing: Magnetic particle testing when required shall be provided in accordance with AWS D1.1 for procedure and technique. The standards of acceptance shall be in accordance with AWS D1.1 – Qualification.

I. Lamellar Tearing: Prior to welding plates 1 to 1 ½-inch thick and greater and rolled shapes within the distance from 6 inches above the top of the joint to 6 inches below the bottom of the joint shall be checked by ultrasonic testing for laminations in base metal which may interfere with the inspection of the completed joint. Should these defects occur, members will be reviewed by the Architect and DSA. Welding procedure specifications in sub-section 1.5G specify welding practices to minimize lamellar tearing.

J. Prior Testing of Base Material: Test material before fabrication.

K. Lines and levels of erected steel shall be certified by a State of California licensed surveyor as set forth in related Division 01 section.

L. Welded studs shall be tested and inspected by the special inspector in accordance with requirements of AWS D1.1 – Stud Welding.

M. Record Drawings: After steel has been erected, correct or revise Shop Drawings and erection diagrams to correspond with reviewed changes performed in the field.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify governing dimensions and conditions of the Work before commencing erection Work.

1. Report discrepancies between drawings and field dimensions to Architect before commencing work.

2. Beginning of installation means erector accepts existing conditions and surfaces underlying or adjacent to work of this section.

B. Provide temporary shoring and bracing, and other support during performance of the Work. Remove after steel is in place and connected, and after cast-in-place concrete has reached its design strength.

C. Coordinate prime coat repair and application with requirements of Section 09 9000.

3.02 ERECTION

A. Install structural steel accurately in locations, to elevations indicated, and according to AISC specifications and CBC requirements.

B. Clean surfaces of base plates and bearing plates.

1. Install base and bearing plates for structural members on wedges, shims, or setting nuts as required.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims; cut off flush with edge of base or bearing plate before packing with grout.

C. Maintain erection tolerances of structural steel within AISC Code of Standard Practice for Steel Buildings and Bridges.

1. Architecturally Exposed Structural Steel members and components, plumbed, leveled and aligned to a tolerance not to exceed one-half the amount permitted for structural steel. Contractor to provide adjustable connections between Architecturally Exposed Structural Steel and the structural steel frame or the masonry or concrete supports, in order to provide the erector with means for adjustment.

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact after assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

E. Do not permit thermal cutting during erection of structural steel.

F. Where indicated for field connections, provide standard bolts complying with ASTM A307.

G. Install high strength steel bolts at locations indicated. Assembly and installation shall be in accordance with CBC requirements.

1. Allowable hole sizes: 1/16 inch larger than bolt size.

2. Use friction type connection with standard hardened steel circular, square or rectangular washer under bolt nut.

3. Thoroughly clean area under bolt head, nut and washer. Remove all paint, lacquer, oil or other coatings except organic zinc-rich paints in accordance with SSPC, SP-2.

4. Tighten bolts by power torque wrench or hand wrench until twist-off.

H. Contractor shall be responsible for correcting detailing and fabrication errors and for correct fitting of all members and components.

I. Erect structural steel plumb and level and to proper tolerances as set forth in the AISC Manual. Provide temporary bracing, supports or connections required for complete safety of structure until final permanent connections are installed.

J. Install column bases within a tolerance of 1/8 inch of detailed centerlines, level at proper elevations. Support bases on double nuts and solidly fill spaces under bases with cement grout.

K. Provide anchor bolts with templates and diagrams. Contractor shall be responsible for proper location and installation of bolts. Correct deficiencies and errors.

L. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A780.

3.03 FITTING

A. Closely fit members, finished true to line and in precise position required to allow accurate erection and proper joining in the field.

B. Drilling to enlarge unfair holes will not be allowed. Allow only enough drifting during assembly to bring parts into position, but not enough to enlarge holes or distort the metal. Do not heat rolled sections, unless approved by Architect.

3.04 PUNCHING AND DRILLING

A. Punch material 1/16 inch larger than nominal diameter of bolt, wherever thickness of metal is equal to or less than the diameter of the bolt plus 1/8 inch.

B. Drill or sub-punch and ream where metal is equal to or more than the diameter of the bolt plus 1/8 inch. Make diameter for sub-punched and sub-drilled holes 1/16 inch larger than nominal diameter of bolt.

C. Precisely locate holes to ensure passage of bolt through assembled materials without drifting. Enlarge holes when necessary to receive bolts by reaming; flame cutting to enlarge holes is not acceptable. Structural Steel members with poorly matched holes will be rejected.

3.05 FINISHING

A. After erection, spots or surfaces where paint has been removed, damaged, or burned off, and field rivets, bolts, and other field connections shall be cleaned of dirt, oil, grease, and burned paint and furnished with a spot coat of the same primer installed during shop priming.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Install paint to exposed areas with the same material installed during shop painting. Install by brush or spray to provide a minimum dry film thickness of 1.5 mils.

3.06 FIELD QUALITY CONTROL

A. Owner will provide a special inspector and independent testing laboratory to perform field inspections and tests and to prepare test reports.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

3.07 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project Site.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.09 HANDLING

A. Both in shop and in the field, transport, handle and erect to prevent damage or overstressing of any component.

END OF SECTION

SECTION 05 4100

STRUCTURAL METAL STUD FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Load-bearing metal stud systems.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4523 - Testing and Inspection.

3. Section 05 1200 - Structural Steel Framing.

1.02 SUBMITTALS

A. Shop Drawings: Submit drawings showing framing, connection details, accessories and anchorage. Indicate location of assemblies, size and spacing of framing components.

B. Product Data: Submit manufacturer's catalog data for each item proposed for installation.

C. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.03 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. AISI - Specifications for Design of Cold Formed Steel Structural Members.

2. Welds shall be performed by AWS certified welders. Welding shall be performed in accordance with requirements of American Welding Society (AWS) Structural Welding Code-Steel D1.1 and D1.3. Structural welding Code-Sheet Steel.

3. Welding shall be inspected by a special inspector, approved by DSA to inspect Work of this section. The Project Inspector shall be responsible for monitoring work of special inspector to ensure that inspection program is satisfactorily completed.

4. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by Hot Dip Process.

5. ASTM A924 – Standard Specification for General Requirements for Steel Sheet Metallic-Coated by Hot-Dip Process.

6. ASTM A1003 – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

7. ASTM A1008 – Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability.

8. ASTM C954 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks) and Bracing or Bridging for Screw Application of Gypsum Panel Products and Plaster Bases.

9. 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.

10. ASTM C1007 – Standard Specification for Installation of Structural (Axial and Transverse) Steel Framing Members and Accessories.

11. ASTM E488 – Standard Test Methods of Strength Anchors in Concrete and Masonry.

12. ASTM E1190 – Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.

13. Manufacturer shall be a member of the Steel Stud Manufacturers Association (SSMA).

B. Tolerances: Install walls and partitions on straight lines, plumb, free of twists or other defects, and contacting a 10-foot straight edge for its entire length at any location within a 1/8 inch tolerance. Install horizontal framing level within a tolerance of 1/8 inch in 12 feet in any direction.

1.04 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered in their original unopened packages and stored protected from damage. Do not store material directly on grade. Provide adequate support to prevent bowing of material prior to installation.

B. Store welding electrodes in accordance with AWS D12.1.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide studs, tracks, joists, header, and accessories manufactured by one of following:

1. ClarkWestern Building Systems (ESR 1166P)

2. Dietrich Industries, Inc. (ESR-1166P)

3. Marino/WARE. (ESR-4062)

4 Cemco. (ESR-3016)

5. Equal.

B. Special Connection Accessories: Products manufactured by The Steel Network, Inc. (ESR-2049), or equal.

2.02 MATERIALS

A. Light Gage Metal Framing:

1. Metal framing shall be formed from corrosion resistant-steel conforming to requirements of ASTM A653, 50 ksi minimum.

2. Metal framing shall be zinc coated in conformance to requirements of ASTM A926, G60.

3. Metal framing shall be manufactured in conformance to ASTM C955.

4. Install metal framing per ASTM C1007, Standard Specification for Installation of Load-Bearing (Transverse and Axial) Steel Studs and Related Accessories.

B. Gages and properties of studs shall be as indicated on Drawings.

C. Mechanical anchors to concrete and masonry shall be metal cinch at least 3/8 inch in diameter threaded bolt head type. Anchor bolts to be installed in concrete shall be hook type ½ inch diameter or more. Unless otherwise indicated.

D. Mechanical anchors to metal framing shall be No. 10 self-tapping and self-drilling wafer-head screws.

E. Accessories: Special top tracks, angles, fasteners, and strips of gypsum wallboard, as required for fire rating assembly required at each condition.

F. Mineral Wool Safing Insulation: 4.0 pcf density. Thermafiber, Fibrex, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install plumb and true. Install necessary accessories for proper installation.

B. Anchor top and bottom runner track to ceiling or roof structure overhead and to floor structure below.

C. Install studs squarely in top and bottom runner track with firm abutment against track webs.

D. Align and plumb studs, and fasten to flanges of both top and bottom runner tracks.

E. Provide three studs minimum at corners of stud walls. Locate so as to provide surfaces for attachment of interior and exterior facing materials.

F. Members not indicated to be welded together shall be attached with manufacturer recommended screws with minimum one screw at each flange of stud to top and bottom track. Wire tying of framing members is not permitted.

G. Provide lateral bracing and bridging in accordance with manufacturer's written recommendations or as required by CBC.

H. Intersecting walls and partitions, whether load-bearing or not, shall be connected.

I. Splices in axially loaded studs are not permitted.

J. Splice or butt weld butt joints in runner tracks. No splices are permitted in tracks over lintels, diaphragm sheathing, or diagonal bracing.

K. Weld connections by fillet welds or plug welds in accordance with AWS recommended procedures and practices.

L. Touch-up field abrasions and welds with galvanizing touch-up material.

M. Studs that frame door openings shall be clipped to floor with 14 gage angle clips. Each clip to have two fasteners into studs and two fasteners into floor.

N. Provide additional joists or blocking adjacent to exterior and interior walls, openings and elsewhere as required to provide support for indicated ceiling construction.

O. Provide an additional joist under parallel partitions where partition length exceeds ½ joist span and around floor and roof openings which interrupt one or more spanning members.

3.02 CONNECTIONS TO METAL DECKING

A. Provide premolded neoprene filler strips matching flute profile for non-fire-rated walls and partitions covered on one or both sides up to metal decking.

B. Top runner track of fire-rated partitions shall be a minimum of 36 mils (20 gage), unless noted otherwise, and attached to metal deck with required fasteners at spacing required for fire rating, but in no case over 16 inches on center. Areas above runner shall be friction fit with a minimum depth of 2 ½ inches of 4 pounds per cubic foot density mineral wool insulation. A minimum of ½ inch of firestopping compound shall be installed to each side of mineral wool insulation for a one-hour system, and one inch of firestopping for a two-hour system. Install required special tracks, angles, fasteners and strips of gypsum wallboard to provide required fire resistance rating.

C. Fire-rated top tracks shall be installed in accordance with manufacturer's recommendations and fire rating approval requirements.

3.03 QUALITY CONTROL

A. Welding Inspection:

1. Inspection of field welding operations shall be performed by special inspector.

2. The special inspector shall inspect material, equipment, procedures, welds, and welder qualifications.

3.04 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.05 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 05 5000

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Metal fabrications:

1. Steel pipe.
2. Square and rectangular steel tubing.
3. Pipe columns.
4. Steel stairs.
5. Handrails and guardrails.
6. Steel thresholds.
7. Steel ladders.
8. Steel Gates.
9. Gratings, frames and covers.
10. Miscellaneous fabrications, as indicated on the Drawings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4523: Testing and Inspection.
3. Section 05 1200: Structural Steel Framing.
4. Section 08 7100: Door Hardware.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating provided materials, dimensions, anchoring detail, and details of termination or connection to adjacent construction. Indicate items that are purchased from a manufacturer and items that are shop fabricated. Indicate component parts requiring Project site fabrication or assembly.

B. Product Data: Submit Product Data for manufactured items. Submit Product Data for primers and finishes.

C. Material Samples: Submit Samples of primers and finishes on fabricated items.

D. Installation Instructions: Submit installation instructions for manufactured items.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Design, fabricate, and install miscellaneous metals in accordance with AISC - Design, Fabrication, and Erection of Structural Steel for Buildings.

2. AWS D-1.1 Code - Welding in Building Construction.

3. Inspection of Welding: Refer to Section 01 4523: Testing and Inspection.

4. Welding: Refer to Section 01 4523 Testing and Inspection.

B. Coordinate installation of accessory items required for metal fabrications.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store miscellaneous metal items above grade on platforms, skids, or other required supports.

B. Protect from corrosion or damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel Shapes: ASTM A36.

B. Steel Pipe:

1. Steel pipe for pipe columns and other structural purposes shall conform to ASTM A53, Type E or S, Grade B, as required.

2. Steel pipe other than pipe furnished for structural purposes shall conform to ASTM A53.

C. Square and Rectangular Steel Tubing:

1. Steel tubing for structural purposes shall be carbon steel conforming to ASTM A500.

2. Steel tubing other than tubing furnished for structural purposes shall be hot or cold rolled carbon steel electric welded tubing.

D. Cast Steel: ASTM A27, Grade 65-35.

E. Steel Bolts: ASTM A307, Grade A, with bolt head and nut dimensions conforming to ANSI B 18.2.1.

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. Chain: Chain shall be 4/0 double loop pattern coil chain.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications"Rapid set Cement".

2.02 FABRICATION

A. General:

1. For fabrication of Work exposed to view, provide only materials smooth and free of blemishes. Remove blemishes by grinding or by welding and grinding, before cleaning, treating, and installation of surface finishes including zinc coatings.

2. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated or specified.

B. Steel Pan Type Stairs:

1. Provide stringers, risers, sub-treads and platforms to profiles indicated. Form each tread pan and riser in one continuous piece to receive finished tread. Weld or bolt risers and treads to carrier angles. Weld or rivet carrier angles to structural steel stringers. Fasten countersunk bolts, or stud weld clips, through pans and platforms to facilitate fastening of welded wire fabric for concrete fill. Provide welded-on clips for support of soffits. Close ends of channel or box stringers.

2. At intermediate landings, provide metal bases formed of stringers. Miter and weld internal and external corners of metal bases.

3. Provide uprights and posts of rectangular or round tubing as indicated. Provide members a special shop straightening to eliminate distortion and to provide straight alignment. Correct bends, distortions, and damage. Fill dents and grind smooth.

4. Provide railings of profile indicated, fastened to stair stringers and wall substrates as indicated or required.

5. Countersink rivets, bolt heads and screws on finished surfaces, or cut flush with surfaces.

6. Fit and securely fasten components together, with exposed tight-fitting joints. Cut, drill, punch and tap as required for installation.

7. Furnish joints as strong and rigid as adjoining sections. Weld continuously along entire line of contact, except where spot welding is indicated.

C. Stair and Balcony Railings:

1. Railings: Handrails and standards shall be fabricated of Grade B standard weight steel pipe or indicated on Drawings. After fabrication, rails shall be galvanized. Standards shall be attached to stringers and face of balcony as detailed.

2. Panels:

   a. Mesh shall be 10 gage 1 ½-inch diamond mesh. The wires shall extend through the channel frame and shall be clinched.

   b. Frame members shall be 1 inch by 1/2 inch by 1/8 inch thick plate welded to top and end members. Corners shall be mortised and tenoned and continuously welded together. Panels shall be galvanized. Fasten panels to rails and standards as indicated.

3. Handrail Brackets: Type indicated.

D. Folding Steel Gates: Furnish and install folding steel gates, complete, where indicated. Gates shall be provided with hinged bottom track and shall allow for padlocking in both open and closed positions. Manufactured by Acorn Wire and Iron Works, American Woven Wire Corporation, King Wire Partitions, Inc., or equal.

1. Vertical bars shall consist of pairs of steel channels 3/4 inch by 3/8 inch by 1/8 inch minimum, approximately 6 inches on center with 5/8 inch by 3/16"inch steel lattice bars.

2. Gate leaves extending more than 8 feet shall be provided with over head tracks and hangers. Gates shall have casters unless over-head tracks are furnished and shall be hot dip galvanized or powder coat finish.

E. Ladder Extensions: Where vertical ladders are installed for access to roof hatches, provide the following:

1. Roof hatch ladders shall be provided with ladder extensions. Ladder extensions shall be Bilco Model 1, "LadderUP Safety Post," Maxam Metal Products, "Spring Balance Safety Post", or equal, on fixed ladders below roof hatches. Device shall be manufactured of high strength steel with telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by a stainless steel spring balancing mechanism. Finish shall hot dip galvanized. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.

F. Miscellaneous Framing and Supports:

1. Except as otherwise indicated, space anchors 2 feet on center, and provide minimum anchor units of 1 ¼-inch by ¼ inch by 8-inch steel straps.

2. Shelf angles for exterior construction shall be galvanized steel of sizes indicated.

G. Welding:

1. Weld connections unless otherwise indicated.

2. Weld corners and seams continuously and in accordance with requirements of AWS Code. Welds shall be inspected as required in Section 05 1200: Structural Steel Framing.

3. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

H. Galvanizing:

1. ASTM A123, ASTM A153, or ASTM A386, as applicable, hot dip with 2.0 ounces per square foot on actual surface and 1.8 ounces per square foot minimum on any specimen, and as specified herein.

2. Galvanizing Repair Material: DRYGALV as manufactured by the American Solder and Flux Company, Galvalloy, Galvion, or equal. Hot applied repair material, or anodic zinc- rich galvanizing repair paint conforming to Mil Spec DOD-P-21035.

3. Items to be galvanized shall be hot-dip galvanized in sections as large as possible.

I. Shop Finish:

1. Metal fabrications shall be provided with a coat of primer, except those indicated to be completed with exposed galvanized finish.

2. Primers:

a. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

b. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

c. Minimum dry film thickness of primer shall be 2.0 mils.

3. Preparation for Primer Painting: Miscellaneous ferrous metal, except items specified galvanized, shall be thoroughly cleaned and prepared for painting, including removal of shipping oils or protective coatings, mill scale, grease, dirt and rust. Prepare in accordance with SSPC recommendations. Deliver to Project site primed or galvanized as indicated, and ready to receive Project site applied finishes.

4. Galvanized Metal Work to receive Paint: Clean oil, grease and other foreign materials from surfaces. Apply vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Handrails and Guardrails:

1. Install standards into metal sleeves cast in concrete, and extending into it at least 9 inches. Wedge standards true, plumb, and fastened by packing with grout. Finish grout smooth and flush with adjacent surfaces.

2. Rails contacting a vertical surface shall be fitted with standard pipe rail flanges, secured to concrete or masonry surfaces with 3/8 inch 2-unit cinch anchor bolts and secured to wood frame surfaces with 3/8 inch lag screws, unless otherwise indicated.

3. Railings abutting pipe columns shall be provided with shaped end caps to fit columns welded to rails, and secured to columns with self-tapping machine screws.

B. Steel Thresholds: Fabricate channel or angle thresholds of rolled steel sections of size indicated, galvanized after fabrication. Anchor into concrete with countersunk 2-unit cinch anchor bolts, unless otherwise indicated.

C. Steel Ladders: Provide at locations indicated, fabricated as detailed. Ladders shall be anchored to concrete or masonry with 1/2 inch cinch anchor bolts. Ladders secured to a wood framed wall shall be anchored with 1/2 inch lag screws. Provide provisions for anchoring ladders before lath is applied to plastered walls.

D. Gratings, Frames and Covers:

1. Over areas indicated, provide steel gratings and grating frames as detailed. Frames shall have mitered and welded corners, and be fitted with anchors.

2. Provide steel checkered plate covers and steel frames for sumps, grease traps, and sand traps, and other covers for access where indicated. Frames shall be provided with mitered and welded corners and be fitted with anchors as detailed. Cover shall be perforated. Each section of access cover shall be furnished with steel pull rings and tool operated fastening device. Screws to fasten covers shall be brass.

3.02 ADJUSTING

A. Touch Up Damaged Surfaces:

1. Shop Painted Finishes: Comply with SSPC-PA-1 for touch-up; apply with brush to produce a minimum 2.0 mil dry film thickness.

2 Galvanized Surfaces: Clean field welds, connections and damaged areas. Repair galvanized finishes in accord with ASTM A780.

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 06 2000

FINISH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Finish carpentry.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 1000: Rough Carpentry.
3. Section 06 4000: Architectural Woodwork.
4. Section 08 1416: Flush Wood Doors.
5. Section 08 7100: Door Hardware.
6. Section 08 8000: Glazing.
7. Section 09 2900: Gypsum Board.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings of each item of finish carpentry and millwork, indicating materials, dimensions, construction, and anchorage details.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Douglas fir finish lumber shall be manufactured and graded in accordance with WCLIB - Standard Grading and Dressing Rule No. 17.
2. Redwood finish lumber shall be manufactured and graded in accordance with RIS - Standard Specifications for Grades of California Redwood Lumber.
3. Hardwood finish lumber shall be manufactured and graded in accordance with NHLA - Rules for the Measurement and Inspection of Hardwood and Cypress Lumber.

4. Softwood Plywood: Plywood shall comply with APA - Product Standard PS 1. Plywood shall be grade marked by APA.

5. Products and installation shall comply with the North American Architectural Woodwork Standards (NAAWS) for the Grade or Grades specified.

B. Finish lumber shall be kiln-dried according to recognized methods for the thickness and species. Lumber one inch thick or less shall be dried to an average moisture content of not more than 13 percent. Lumber 1-1/4 inches to 2 inches in thickness shall be dried to an average moisture content of not more than 15 percent.

1.04 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.

B. Interior millwork and finish carpentry shall not be installed unless interior building temperature and humidity levels are within the ranges recommended by the manufacturer and/or recognized standards.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Douglas Fir: Interior trim, solid lumber shelves, partitions, door frames and other concealed members of interior finish; NAAWS Economy Grade.

B. Hardwood: Birch, maple firsts and seconds.

1. Birch: NAAWS Custom Grade.

2. Maple: NAAWS Custom Grade.

C. Softwood Plywood: Except where otherwise specified, AWI Custom Grade, Douglas fir unless otherwise indicated.

D. Hardwood Plywood: NAAWS Premium Grade, species as indicated.

E. Redwood: Exterior millwork, except framing lumber, shall be clear heartwood redwood. Where installed in direct contact with earth or provided for exterior storage units, install Foundation Grade.

F. Perforated Hardboard Panels: Panels shall be 1/4 inch thick tempered hardboard, SIS with 1/4 inch diameter holes spaced one inch on center.

2.02 FABRICATION

A. The means of fastening various parts together shall be concealed in finished Work. Work which is curved shall be fabricated from solid stock, or if veneered, shall be bent to a uniform radius.

PART 3 - EXECUTION

3.01 GENERAL

A. Interior and exterior wood, millwork, blocking, and lumber shall be installed level, plumb, and true to line. Members shall be neatly and accurately scribed in place, maintaining full widths of end members, wherever possible. Trim shall be installed in full lengths, without piecing, except where use of single lengths is not required. Butt joints, if necessary, shall be beveled. Exterior angles shall be mitered, and interior angles of molding parts coped. Nails shall be set for putty. Grain and color of adjoining interior finish shall match adjacent finishes. Where Work specified in this section adjoins other Work, provide a neat tight joint.

B. Interior and exterior finish carpentry and other fixed wooden equipment having hammer marks or other visible damage will be deemed defective Work.

C. Staff or brick moulds of exterior wood doorframes shall be attached to frames after frames have been set and caulked. Moulds shall be mitered at corners and coped to sills, accurately secured in place with finish nails, and nails set.

3.02 INSTALLATION

A. Install Work of this section as specified in the North American Architectural Woodwork Standards.

B. Wood shoe base shall be fitted and temporarily tacked in place until floor covering is installed. Provide and install corner fillets, same contour and materials as shoe base, in corners where shoe base is installed.

C. Platform Front: Plywood at platform front and adjoining steps in Multi-Purpose Building shall be provided with face veneers of unselect birch. Trim and frames shall match face veneer of panels. Joints shall be V-shaped where indicated.

D. Door Frames: Frames shall be installed plumb and true, solidly blocked, reinforced for butts and hardware, and shall be fastened to structural frame with 16d set finish nails at not more than 24 inches on centers. Nails securing exterior door and window frames shall be cement coated. Doorframes shall be dadoed together at the head.

E. Sealing of Joints: Joints between exterior frames and adjoining surfaces shall be primed before sealing.

3.03 CLEAN UP

A. Remove debris, rubbish and waste material 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 06 4000

ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Architectural woodwork, casework, trim, hardware, countertops, and shelving as indicated on Drawings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 1000: Rough Carpentry.
3. Section 06 2000: Finish Carpentry.
4. Section 08 8000: Glazing.
5. Section 09 9000: Painting and Coating.
6. Section 10 1100: Visual Display Units.
7. Section 22 1000: Plumbing.

1.02 DEFINITIONS

A. "Sustainably managed" is defined as "forests that are being managed through a professionally administered forestry management plan in which timber growth equals or exceeds harvesting rates in both quantity and quality, protecting rivers and streams from degradation, minimizing damage to the forest when harvesting and promoting biodiversity".

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide wood products from certified sustainably harvested sources.

1.04 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings of casework indicating materials and hardware, details of construction, dimensions, methods of fastening and installation details. Shop Drawings shall bear a Woodwork Institute (WI) Certified Compliance Label indicating that Shop Drawings fully meet requirements of the North American Architectural Woodwork Standards (NAAWS) grade or grades specified. Shop Drawings shall indicate grounds,

backing, blocking, sleepers and other items required for installation of casework, which are to be provided and installed as part of the Work.

B. Certificates: Provide a WI Certified Compliance Certificate certifying that materials, fabrication and installation will comply with the specified requirements.

C. Material Samples: Submit 2-inch by 3-inch plastic laminate and solid surfaces color Samples of manufacturer's entire color range.

D. Submit manufacturer's product data for adhesives and finishes. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.

E. Forest Stewardship Council (FSC): Provide letter of certification signed by lumber supplier. Indicate compliance with FSC "Principles for Natural Forest Management" and identify certifying organization.

F. Closeout Submittals: Provide a WI Certified Compliance Certificate for Installation.

1.05 QUALITY ASSURANCE

A. Comply with the North American Architectural Woodwork Standards (NAAWS), latest edition, published jointly by the Architectural Woodwork Manufacturer's Association of Canada and the Woodwork Institute of California, grades as specified herein.

B. Each elevation of casework shall bear a WI Certified Compliance Label indicating that casework fully meets requirements of the AWS grade specified.

C. Each plastic laminate countertop and/or solid surface top shall bear a WI Certified Compliance Label indicating tops fully meet requirements of the AWS grade specified.

D. Mock-ups: When required by the Architect, submit a full-scale base cabinet, countertop, and wall-hung cabinet, illustrating joinery and plastic laminate finish. Base cabinet shall incorporate a drawer, an adjustable shelf, and a door. Wall-hung cabinet shall incorporate two doors, one adjustable shelf and finished end, including required hardware.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in humidity and temperature. Refer to the North American Architectural Woodwork Standards (NAAWS) for recommended care and storage.

B. In event of damage immediately furnish necessary repairs or replacements.

1.07 PROJECT CONDITIONS

A. Store indoors, in ventilated areas with constant but minimum temperature of 60 degrees F. and maximum relative humidity of 25 percent to 55 percent. Do not install casework until

building is enclosed and ambient conditions are within the temperature and humidity range to be expected during occupancy. Acclimatize materials to the installation temperature and humidity for at least 72 hours prior to installation. Maintain conditions until Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Plastic Laminate Faced Cabinets:

1. Plastic laminate: High pressure plastic laminate conforming to NEMA standard LD-3; Grade HGS 0.048 inches at horizontal surfaces, Grade VGS 0.028 inches at exposed vertical surfaces and edge bands, and HGP 0.039 inch minimum for post-formed countertops.

2. Particle Board Core Material: 45 lb. density, conforming to ANSI A208.1, Table 1, Grade 1-M-2.

3. Solid Lumber:

   a. Solid lumber for exposed members, drawers, trays and special details shall be Clear birch or maple.

   b. Unexposed solid lumber for concealed webs or structural members shall be of Douglas Fir., alder or birch.

4. Softwood Plywood: Rotary cut exterior type A-C grade softwood plywood complying with PS1.

5. Hardboard: Factory finished pressure sealed hardboard conforming to the requirements of PS 58. Oil tempered hardboard shall conform to CS 251.

6. Cabinet Liner: Semi-exposed surfaces shall be finished with 0.020 inch high-pressure laminate cabinet liner, conforming to NEMA Standard LD-3.

7. Edge Banding: One of the following.

   a. T-type extruded tenite-butyrate 1/16 inch minimum thickness, with serrated leg 3/8 inch in length. Use only when matching existing.

   b. 0.028 inch minimum thickness plastic laminate.

   c. PVC, 0.6 mm at cabinet sides, top, bottom divisions and shelves, 3 mm at doors, drawer fronts and false fronts.

8. Glass Doors: 1/4 inch laminated safety glass.

9. Adhesive: Type II water-resistant, rigid type glue of formula conforming to PS 51.

10. Sealer: Thompson Water Seal 101, Watco Oil, Zinsser, or equal.

11. The Owner will supply tote trays unless otherwise indicated.

12. Base: Cover toe spaces with typical wall base unless otherwise indicated.

B. Wood Casework:

1. Sheets:

a. Medium Density Fiberboard (MDF): ANSI A208.2.

b. Medium Density Overlay (MDO): APA PS-1.

c. Hardwood Plywood: ANSI/HPVA – HP–1.

2. Edge Banding: Same species of wood as adjacent to exposed surfaces.

C. Countertops:

1. Solid Surfaces: Filled cast polymeric resin panel, with homogeneous composition throughout its thickness.

a. Corian.

b. Formica.

c. Wilsonart.

d. Equal.

D. Hardware:

1. Drawer Slides for Custom Grade Cabinetry:

a. Pencil drawers: Full extension type: Accuride 2006, Blum, Hafele, or equal.

b. Drawers and box drawers, up to 24 inches wide: Accuride 3832E, Blum, Hafele, or equal.

c. Lateral file drawers, up to 30 inches wide: Accuride 4034 overtravel or 4033 equal travel, Blum, Hafele, or equal.

d. Lateral file drawers, more than 30 inches wide: Accuride 3640, Blum, Hafele, or equal.

2. Drawer Slides for Premium Grade Cabinetry:

a. Pencil drawers: Full extension type: Accuride 2632, Blum, Hafele, or equal.

b. Drawers and box drawers, up to 24 inches wide: Accuride 7432, Blum, Hafele, or equal.

c. Lateral file drawers, up to 30 inches wide: Accuride 4034 overetravel or 4033 equal travel, Blum, Hafele, or equal.

d. Lateral file drawers, more than 30 inches wide: Accuride 3641, Blum, Hafele, or equal.

3. Flipper Door Slides for Premium and Custom Grade Cabinetry:

a. For vertically mounted retracting cabinet doors up to 75 pounds and 72 inches tall: Accuride 1432, Blum, Hafele, or equal, with hinge carrier strip.

4. Door Mutes: Rubber, approximately 1/4 inch diameter, colors to match adjacent finish.

5. Plastic Grommets: Doug Mockett, Alliance Express, Rockler, or equal; color as selected by Architect.

6. Adjustable Shelves with Clips: Adjustable shelf supports (EDP type, unless otherwise noted) set in 5 mm holes spaced 32 mm on center:

a. Hafele America, Co., No. 282.04.711, Blum, Hettich, or equal.

b. Hafele America, Co., No. 282.24.13, Blum, Hettich, or equal.

7. Hinges: Five-knuckle overlay hinge with hospital tip - Rockford 376, or equal.

8. Cabinet Locks:

a. Door Locks: Pin tumbler type – CompX National No. C8173, Olympus 100DR x 12-1 strike, CCL Security Products, or equal.

b. Locks for Sliding Doors: National No. C8142 x thimble strike, Olympus 300 SD x thimble strike, CCL Security Products, or equal.

c. Drawer Locks: CompX National C8179brass strike, Olympus 200 DW x 12-1 strike, CCL Security Products, or equal.

d. Cabinet locks shall be flush with surface of door and protrude no greater than 3/16 inch.

9. Top-hung Hardware Assembly for Sliding Doors: Grant No. 6064, Hafele, Blum, or equal.

10. Track for Sliding Doors: K & V 455 x or 455.55, Hafele, Blum, or equal.

11. Pull Flush Ring at Drawers behind Doors: Safe No. 6116, Trimco 24, Quality, or equal.

12. Pulls: Quality No. 179 x 180, Trimco No. 553P, Hafele, or equal.

13. Catches: Magnetic type - Epco No. 592, Lawrence No. SC1364-AL, or equal.

14. Four-way Tension Catch: Glynn-Johnson GJ21A, Trimco, Quality, or equal.

15. Noiseless Catch:

16. Elbow Catch: Schlage SP2A3, or equal.

17. Bolts: Surface type, Quality B6, Trimco No. 4856-6, or equal.

18. Brackets and Shelf Strip for Glass Shelves: K & V No. 80 x 180, Garcy 604 x 686, or equal.

19. Shelf Standards and Brackets: K & V No. 255 x 256, line bored holes for pins as approved by AWI Standards Stanley No. 798 x 799, steel zinc plated, or equal.

20. Card Holders for Drawers: Corbin No. 1913-1/4H, Garcy No. 853, or equal.

21. Hanger Rods: 1-1/16 inches minimum diameter metal tubing, aluminum or stainless steel clad, KV660; heavy wall steel tubing KV770, Stanley, or equal.

22. Hanger Rod Flanges: KV757, or flanges KV734, KV735; Ronther Reiss R44-55; or equal.

23. Hardware Finish: With exception of finish hardware items which have finishes specified, hardware shall be furnished with dull chrome US 26D or dull stainless steel US 32D finish.

24. Keying:

    a. Key locks inside one room alike. Furnish three keys for each lock keyed separately, and 2 keys for each lock in keyed alike groups. Master keys shall be tagged and delivered to the Inspector. Locks and keys shall be stamped with coded set number / direct digit.

    b. Master keys shall be National GM2.

2.02 FABRICATION

A. Plastic Laminated Casework: Construction of plastic laminated casework shall conform to the material and construction requirements for North American Architectural Woodwork Standards Custom grade, flush overlay construction, except, modified as follows:

1. Exposed Exterior surfaces shall be High Pressure Decorative Laminate grade VGS.

a. Edge Band: PVC 1 mm. for cabinet body and 3 mm. at doors and drawer fronts.

2. Exposed Interior surfaces: Interior surfaces of open cabinets shall be laminated to match exteriors. Cabinets with glass doors shall use cabinet liner grade CLS.

3. Semi-exposed Surfaces: Shall be cabinet liner grade CLS and edges of panels shall be edge banded per 2.01 A.

4. Cabinet bases may be integral or separate. Bases shall be 3/4 inch thick plywood securely jointed at four corners to a supporting block 1 ½-inch thick.

5. Adjustable shelving shall be 3/4 inch thickness particleboard for spans up to 25 inches and one inch thickness for spans over 25 inches up to 34 inches. Adjustable shelving over 34 inches in span shall be one inch thick plywood core with 0.020 inch cabinet liner grade CLS both sides. Shelving hardware shall be adjustable to 1 1/4 inch centers. Faces of shelving shall be finished with 0.020 inch thickness cabinet liner grade CLS both sides.

6. Drawers:

   a. Drawers shall be of dovetail or dowel construction. Sides, backs and sub-fronts shall be made of 1/2 inch thick clear birch or maple solid stock, or 9 ply plywood without knots or interior voids. Drawer bottoms shall be in accordance with AWI requirements, glued and nailed.

   b. Drawers shall be fitted with ball bearing slides accurately installed for smooth drawer operation.

   c. Drawer fronts shall be of 3/4 inch thick plastic laminate construction, fully edge-banded with plastic laminate T-banding to be used when matching existing. T-banding joint shall occur at center of bottom edge of panel.

7. Doors:

   a. Doors shall be of flush overlay type. Doors shall be fully edge-banded. Doors of cabinets within any group of adjacent units shall be in alignment.

   b. Wrap around hinges shall be routed into edge of door.

8. Back Priming: Seal unfinished materials installed for backs, bases, self-edge backing, stripping and other concealed portions with a water-repellent sealer.

9. Banding:

   a. Edge banding shall be accurately fitted. Where edge band joins plastic surfaces, there shall be no open spaces, voids, or chipping of plastic laminate surface.

b. Exposed cabinet surfaces shall be flush, and any protruding edges of banding shall be machined or trimmed to provide a flat smooth corner at intersection of banding and adjoining surfaces. Plastic laminate edge banding shall be installed on tops, webs, bottoms, ends, and inside partitions. T banding may only be installed on drawer fronts and door edges and when required to match existing.

C. Countertops:

10. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

a. Manufacturers:

1. Avonite Surfaces.

2. E. I. du Pont de Nemours and Company.

3. Formica Corporation.

4. Wilsonart International.

5. Equal.

b. Type: Provide Standard Type.

c. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.

d. Colors and Patterns: As selected by Architect from manufacturer's full range.

e. Butt splash or seamless (coved) backsplash.

f. Provide drip groove.

2.03 FINISHING

A. Wood casework and wood components of laminated plastic casework shall be factory finished. Exposed surfaces shall be finished with one coat of lacquer sealer and 2 coats of finish lacquer. Unexposed materials such as backs, webs, back of tops, and the like, shall be sealed with one oil base prime coat. Semi-exposed wood surfaces such as drawers shall be finished with one coat of sanding sealer and one coat of clear gloss lacquer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install Work of this section as specified in the North American Architectural Woodwork

Standards (NAAWS), grade to match the grade of the work to be installed.

B. Cabinets: Install cabinets level, plumb, and secure to walls. Exposed screws shall have finish washers.

C. End Panels and Fillers: Furnish to match exposed surfaces and accurately scribe to walls and neatly and securely fit to cabinets.

D. Completion: Upon completion of installation, cabinets including drawers and shelves shall be cleaned. Doors and drawers shall operate easily and freely.

E. Scribe plastic laminated cabinets to walls. Installation of surface-applied moldings is not permitted.

F. Coordinate sink and penetration locations with 22 1000 Plumbing.

G. Install solid surface countertops per NAAWS custom grade.

3.02 CLEAN UP

A. Remove debris, rubbish and waste material 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 06 8316

FIBERGLASS REINFORCED PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fiberglass reinforced plastic panels and accessories.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 09 2900 - Gypsum Board.

1.02 PROJECT REQUIREMENTS

A. Fiberglass reinforced plastic panels and accessories for kitchen and food preparation areas as indicated on the Drawings.

1.03 SUBMITTALS

A. Shop Drawings: Indicate location and dimension of joints and fastener attachments

B. Samples: Submit 8 inch by 10 inch sample of each type, color, and accessories to be installed.

C. Certificate of Compliance: Submit certificate from manufacturer the installed wall surfacing meets Specification requirements.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Class A Interior Finish Material as defined by the National Fire Protection Association Life Safety Code 101.

2. Underwriters Laboratories, Inc. listed, in accordance with ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

3. USDA/FSIS Requirements.

4. FMRC (Factory Material Research Center) approved.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's cartons properly labeled and identified.

B. Store materials flat in a clean, dry storage area where temperature shall be maintained above 50 degrees F. Do not store rolls on end.

1.06 PROJECT CONDITIONS

A. Installation environment shall be stable and controlled.

B. Room temperature shall be controlled to 75 degrees F plus or minus 5 degrees, during and after installation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wall and/or ceiling panels: Crane Composites, Fire-X Glasbord FM with Surfaseal, , Marlite FRP Panel P-100 Class A, Panolam Industries International Inc., or equal.

1. Wall Panels: Class 1 (A) Interior Finish. Thickness to be .09 inch, embossed, color as selected by Architect.

2. Class A Flame Spread: Less than 25, with Smoke Developed less than 450, per ASTM E84.

3. Barcol Hardness scratch resistance: 39 as per ASTM D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

4. IZOD Impact per ASTM D256: 11.

B. Stainless steel trim. Provide inside corner and outside corners, panel division and edge trim.

C. Adhesive and Sealants: VOC compliant, as recommended by manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine backup surfaces to determine corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

B. Do not begin installation until backup surfaces are in satisfactory condition.

3.02 APPLICATION

A. Perform cutting with carbide tipped saw blades or drill bits, or cut with snips.

B. Install panels with manufacturer's recommended gap for panel field and corner joints.

C. Fastener holes in the panels shall be predrilled 1/8 inch oversize.

D. For trowel type and application of adhesive, follow adhesive manufacturer's recommendations.

E. Utilizing products acceptable to manufacturer, install the system in accordance with panel manufacturer's printed instructions.

3.03 CLEANING

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 07 1326

SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Sheet waterproofing in locations indicated including:

1. Sheet waterproofing on vertical walls below grade enclosing occupied spaces.
2. Sheet waterproofing in planters and retaining walls.
3. Drainage sheets and protection boards.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
4. Section 07 1400 - Fluid Applied Waterproofing.

1.02 SUBMITTALS

A. Certificates: Submit a certificate stating applicator is certified by the waterproofing material manufacturer and, upon completion, submit a certificate stating that waterproofing systems have been installed in conformance with reviewed submittals and manufacturer's recommendations.

B. Product Data: Submit manufacturer's Product Data including complete installation instructions.

C. Shop Drawings: Submit Shop Drawings indicating each condition of the Work. Indicate all adjoining Work, and indicate methods of adhesion and attachment, laps, and related conditions.

D. Samples: Submit Samples, not less than 12-inch square, of each type of composite sheet membrane, mounted on plywood. Submit 12-inch square Samples of each type of drainage and protection board.

E. Experience Record: Submit a list of at least five installations on which each of the materials and systems proposed for installation have been in satisfactory service for at least three years.

1.03 QUALITY ASSURANCE

A. References:

1. ASTM D6506 - Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing.

2. ASTM D6135 - Standard Practice for Application of Self-Adhering Modified Bituminous Waterproofing.

3. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

4. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

B. Qualifications of Manufacturer: Sheet membrane waterproofing system shall be manufactured by a firm with a minimum of 20 years experience in the production of self-adhesive sheet membrane waterproofing.

C. Qualifications of Installer: A firm which has at least three years experience in work of the type required by this section, and is recommended by manufacturer to install the specified products.

D. Pre-Installation Conference and Inspection: After review of submittals but before starting installation of the Work of this section, conduct a meeting at the Project site attended by the Project Inspector, Architect, OAR, Contractor waterproofing applicator and a technical representative of the waterproofing material manufacturer. The waterproofing applicator and material manufacturer's technical representative shall inspect the substrates to receive Work of this section and report defective conditions to Project Inspector, Architect, OAR and Contractor.

E. Manufacturer's Representative: Provide arrangements necessary to have a trained representative of the manufacturer visit the Project site on a weekly basis during membrane waterproofing Work to review installation procedures.

F. Materials shall comply with current State of California and local Air Quality Management District requirements for volatile organic compounds of not over 350 grams per liter.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened packages fully identified with manufacturer's name, trade name, type, class and grade. Each package shall be identified with material name, date of manufacturer and batch number.

B. Store materials at the Project site under cover and maintain in dry condition. Protect from damage from excessive temperature and construction operations. Do not double-stack pallets of membrane. Protect mastic and adhesive from moisture and excessive heat.

C. Store drainage composite or protection board flat and above grade. Provide cover on top and all sides of pallets and provide for adequate ventilation. Protect surface conditioner from freezing.

1.05 PROJECT CONDITIONS

A. Install suitable impervious type masking to preclude staining of surfaces to remain exposed wherever waterproofing abuts or laps on to other finish surfaces, and provide additional protection as necessary to supplement masking; cover entire area of building subject to damage or staining.

B. Protect adjacent Work during installation of Work of this Section.

C. Apply sheet waterproofing materials only in dry weather and when outside temperature is within the limits established by the manufacturer of the materials and products used.

D. Do not apply sheet waterproofing materials to damp or wet surfaces unless specifically approved in writing by manufacturer.

1.06 WARRANTY

A. Manufacturer shall provide a five year material warranty.

B. Installer shall provide a five year labor warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Sheet waterproofing shall be as manufactured by:

1. W.R. Grace & Co., W.R. Meadows, Inc.

2. Protecto Wrap Company.

3. Equal.

2.02 MATERIALS

A. Sheet waterproofing material shall be self-adhesive, cold-applied such as W.R. Grace Bituthene 4000, W.R. Meadows Mel-Rol, Protecto Wrap PW 100/60, or equal. The material shall be a self-adhesive, cold-applied composite sheet consisting of a thickness of 0.056 inches of rubberized asphalt and 0.004 inches of cross-laminated, high density polyethylene film specially formulated for use with water-based surface conditioner. Provide rubberized asphalt membrane covered with a release sheet, which is removed during installation. No special adhesive or heat shall be required to form laps.

B. Surface conditioner: Latex based surface conditioner as recommended by manufacturer

C. Adhesives fillets and sealers: Types as recommended by manufacturer for installation with specified membrane sheet.

D. Prefabricated Drainage Sheet:

1. For vertical surfaces: Hydroduct 220, Mel-Drain 5035B, Protecto Drain 2000-V, or equal, consisting of a dimpled high impact polystyrene core and a needle punched non-woven filter fabric adhered to one side of the core. A film shall be adhered to the other side of the core.

2. For horizontal surfaces: Hydroduct HSF, Mel-Drain 7555, Protecto Drain 2000-V, or equal, consisting of dimpled high impact polystyrene core and an extra heavy woven filter fabric bonded to the core.

E. Protection board for horizontal surfaces shall be 1/8 inch thick complying with ASTM D6506, semi-rigid sheets of fiberglass or mineral-reinforced asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

F. Protection board for vertical surfaces shall be 1 inch thick extruded polystyrene per Section 07 2100 Thermal Insulation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspect and verify condition of substrates and related Work, in the presence of the manufacturer's technical representative. Do not start installation of membranes until defects in substrates have been corrected. Concrete shall be smooth, dry, and free of voids. Masonry shall have a parge coat applied.

3.02 APPLICATION OF MEMBRANE ON VERTICAL WALLS BELOW GRADE ENCLOSING OCCUPIED SPACES AND IN PLANTERS

A. Surface Conditioning: Install surface conditioner and allow to dry to surfaces to be covered with membrane the same day.

B. Corner Treatment: Pretreat inside corners with liquid membrane compound, to form a fillet or use formed reinforcement fillet recommended by manufacturer. Smooth all surfaces of outside corners.

C. Horizontal Surfaces: Install nine inch wide strips of membrane material over construction joints, cracks, and grouted joints. Seal expansion joints as recommended by manufacturer. At drains and vertical projections, install two layers of membrane sheet extended out not less than 6 inches in all directions, and seal. At drains, extend the membrane into the clamping ring and seal. Over prepared surfaces install membrane in one layer and roll into place. Lap sheets 2-1/2 inches at edges and ends.

D. Vertical Surfaces: Install membrane vertically in heights to 8 feet. Lap seams 2 ½ inches. Roll membrane with hand roller. Extend membrane over top of foundation walls, planter walls and parapet walls, except where reglets are provided for termination.

3.03 PREFABRICATED DRAINAGE SHEET

A. Vertical Surfaces: Install rolls of vertical drainage sheet over the completed membrane, starting at the base of the wall. Peel the fabric back approximately 12 inches from the lower edge. Where drainage pipe occurs, install the drain core behind the pipe and extend the fabric over the outside of the pipe. Adhere the drainage sheet to the wall using strips of adhesive as recommended by manufacturer.

B. Horizontal Surfaces: Adhere the drainage sheet to the membrane with strips of adhesive. Butt adjacent panels together and overlap fabric onto the previous panel. At corners, cut the core and cover the core with filter fabric or tape.

3.04 COMPOSITE STRIP WATERPROOFING

A. Provide at sills, copings, eaves, ridges, and under other flashing as indicated. Do not fold over exposed edges. Prime concrete and masonry surfaces as recommended by manufacturer. Cut the membrane into 10 to 15-foot lengths and reverse roll. Separate membrane from release paper, press firmly into place, and roll to eliminate bubbles and assure full adhesion. Lap sides of sheets not less than 3.5 inches and ends not less than 6 inches.

3.05 HIGH TEMPERATURE RESISTANT UNDERLAYMENT

A. Seal joints in insulation as recommended by manufacturer. Prime insulation at rate of one gallon per 500 square feet if recommended by manufacturer. Over prepared surfaces install membrane in one layer and roll into place. Lap sheets 3 ½ inches at edges and 6 inches at ends. Roll firmly into place to obtain full adhesion of sheets to substrate.

3.06 APPLICATION OF MONOLITHIC MEMBRANE FOR ALL SUBSTRATES OTHER THAN CONCRETE

A. Membrane Application:

1. Install the rubberized asphalt membrane at a rate to provide a continuous, monolithic coat of 90 mil, into which is fully embedded a layer of spunbound polyester fabric reinforcing sheet, followed by another continuous monolithic coat of membrane at a minimum thickness of 125 mils. Total membrane thickness to be provided is 215 mils.

2. Overlap fabric reinforcing sheet 1 to 2 inches with membrane between sheets.

3.07 PROTECTION BOARD

A. Cover all surfaces, vertical and horizontal, with protection board, unless indicated otherwise. Install with adhesive recommended by manufacturer, and compatible with membrane materials.

3.08 TESTS OF MEMBRANES

A. Horizontal membranes shall be subjected to standing water test after completion, but before protection board is applied. Tests shall be conducted as soon as possible after

completion of membrane in each area. When membrane installation is completed, seal drain, sandbag perimeter, fill membrane with water to height of not less than 2 inches, pond test for not less than 24 hours, repair all leaks or defects disclosed, and test until results are satisfactory. Remove all sandbags, plugs and drain when testing is completed. Clean surfaces of membrane.

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 07 2100

THERMAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Thermal batt insulation for exterior walls and under roof decks.
2. Thermal batt insulation in furring at concrete or masonry walls.
3. Extruded polystyrene board at horizontal and vertical waterproofing.
4. Continuous insulation at exterior walls.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 3000 - Metal Decking.
3. Section 05 4100 - Structural Metal Stud Framing.
4. Section 07 1326 - Self-Adhering Sheet Waterproofing.
5. Section 07 2719 –Plastic Sheet Air Barriers.
6. Section 09 2216 - Non-Structural Metal Framing.
7. Section 09 2423 – Cement Plaster and Metal Lath.
8. Section 09 8100 – Acoustical Insulation.

1.02 SUBMITTALS

A. Product Data:

1. Material List: Provide a list of materials for installation under this section.
2. Provide manufacturer's printed Product Data for each type insulation and accessory.

B. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.

C. Certification: Provide certification that insulation materials conform to requirements of CBC Chapter 7, Section 720 and Chapter 26.

D. Recycled Content: Provide certification that insulation materials contain a minimum 30 percent recycled materials.

1.03 QUALITY ASSURANCE

A. Surface Burning Characteristics: Flame spread rating shall not exceed 25 and smoke density shall not exceed 50 when tested in accordance with ASTM E84.

B. Combustion Characteristics: Rated as non-combustible when tested in accordance with ASTM E136.

C. Comply with following as a minimum requirement:

1. ASTM C209 – Standard Test Methods for Cellulosic Fiber Insulating Board.

2. ASTM C553: Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

3. ASTM C578: Specification for Rigid, Cellular Polystyrene Thermal Insulation.

4. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.

5. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

6. ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.

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

8. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

D. CHP Low-Emitting Materials Table: Materials submitted for building insulation must be listed as low emitting on the CHPS website, www.CHPS.net, or must be tested by an independent laboratory to meet CHPS requirements. Components of an assembly must meet CHPS requirements individually or in an assembly.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site and store in a safe, dry place, with labels intact and legible at time of installation.

B. Protect building insulation materials from damage.

1.05 PROJECT CONDITIONS

A. Avoid exposure to humidity and moisture. Protect from exposure to sunlight.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Owens Corning.

B. Johns Manville.

C. CertainTeed Corporation.

D. The DOW Chemical Company.

E. DiversiFoam Products.

F. Equal.

2.02 MATERIALS

A. General:

1. Provide Unfaced, friction-fit batt insulation where both sides of installation are enclosed.

2. Provide batt insulation with integral vapor barrier when one side of installation will be unenclosed.

3. Provide batt insulation with integral vapor barrier where at least one side of installation will be exposed to high humidity, such as showers.

4. Recycled content shall be a minimum of 30 percent.

B. Mineral Fiber Batt Insulation:

1. Unfaced Mineral Fiber Batt Insulation: Provide friction-fit, unfaced mineral fiber batts. Insulation shall consist of mineral fibers, glass or slag, and thermosetting resins complying with ASTM C665, Type I.

2. Faced Mineral Fiber Batt Insulation: Provide mineral fiber batts with vapor barrier consisting of mineral fibers, glass or slag, and thermosetting resins complying with ASTM C665, Type III, Class A, with vapor-retardant membrane facing.

3. Fasteners for Attaching Insulation to Wood Framing:

   a. For faced batt insulation provide one of following types of staples: Stainless steel, monel, or copper-coated steel, size as required by manufacturer or applicable code.

   b. For unfaced batt insulation provide 18 gage, minimum, galvanized steel wire where required to maintain proper insulation placement.

4. Fasteners for Attaching Insulation to Underside of Metal Roof Decks:

   a. Spindle Anchors: Stic-Klip Mfg. Co., Type A or B as required, with Type S adhesive; Miracle Adhesives Corp. "Miracle StukUps" with Type HT994 adhesive; or Goodloe E. Moore Gemco or Tuff-Weld with G-P Improved or Tuff-Bond Quik-Set Type Adhesive as applicable; or equal. Provide adhesives of correct type for substrates and type of anchor.

   b. String Wires: Minimum 18 gage galvanized steel wire.

C. Extruded-Polystyrene (XPS) Board Insulation: ASTM C578, Type X, thickness as indicated on drawings; one inch minimum for waterproofing protection board.

1. Manufacturers:

   a. DiversiFoam Products, Certifoam.

   b. Dow Chemical Company, Thermax.

   c. Owens Corning, Foamular.

   d. Equal.

2. Physical Properties:

   a. Density, ASTM D1622: Not less than 1.35 pounds per cubic foot.

   b. Surface Burning Characteristics, ASTM E84: Flame spread less than 25, smoke developed no greater than 50.

   c. Compressive Strength, ASTM D1621: 25 psi minimum.

   d. Thermal Resistance, ASTM C1363: R 5 minimum per inch of thickness.

   e. Water Vapor Transmission, ASTM E96: Less than 0.03 perms.

   f. Water Absorption by Volume, ASTM C209: Maximum 0.10 percent.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine Work to verify suitability to receive insulation. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Fit batt insulation, of R-value indicated on Drawings, snugly between framing members.

2. Maintain total insulation integrity over entire area to be insulated, including areas between closely spaced members.

3. Extend full thickness insulation over entire area to be insulated. Furnish manufacturer's recommended clips to tightly fit batts at joints.

4. Cut and fit batt insulation tightly around pipes, conduits and penetrations.

5. Do not compress batt insulation in excess of 10 percent (R-19 may be installed in 2 by 6 stud walls).

6. Prevent batt insulation from sagging during and after installation by installing adequate wire.

7. Metal door and window frames in acoustically insulated walls shall be filled with insulation, unless otherwise indicated.

8. Where vapor barrier is provided, install with vapor barrier facing room.

a. Batts in Metal Framing: Provide friction-fit batts tightly fitted to stud webs and to metal furring.

b. Batts under Metal Roof Decks where underside of insulation will be exposed install foil-faced flanged-type insulation batts and staple flanges together at maximum 4-inch centers and seal joints at abutting vertical surfaces with a pressure-sensitive plastic tape. Where underside of insulation will be inaccessible, install secure with spindle anchors. Provide 18 gage galvanized string wires under batts wherever necessary to prevent sagging. Stretch wire taut.

c. Batts in Horizontal or Sloped Applications: Provide tightly stretched string wires along center of horizontal or sloping batts where support spacing exceed 16 inch on centers.

d. Batts in Ceiling Framing: Install batts between joists, so top of insulation is level with top of framing members. Do not install insulation over

recessed lighting fixtures, speakers, or other heat producing elements in ceilings. At junction boxes, access panels, and other items requiring access from above or below ceiling, cut insulation on each side to fit item and install loosely on top. Fit insulation snugly around ducts, conduits, pipes, and other items projecting through ceiling construction.

9. Install polystyrene board as required by Section 07 1326.

B. Continuous Insulation:

1. Continuous insulation shall be installed in accordance to manufacturer instructions. Fasten the insulation board to the exterior face of the steel stud wall framing using preassembled screw/stress plate fasteners, of type and length as recommended by the manufacturer. Fastener pacing shall be 12" on center at the board perimeter and 16" on center in the field of the board.

2. Bottom row of insulation panels shall be mounted on foundation casing "J" mold, refer to Section 09 2423, Cement Plaster and Metal Lath. Fasten insulation boards with corrosion resistant fasteners through sheathing into studs. Use 3/8 inch head roofing nails for wood studs, and self-drilling tapping screws for metal studs, or to "Z" channels, as applicable. Fastener penetration into studs shall be not less than 3/4 inch.

3. Stagger vertical joints at least one stud from adjacent courses.

3.03 PROTECTION

A. Protect Work of this section until Substantial Completion.

3.04 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 07 2600

VAPOR BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Testing of concrete slabs for moisture and acidity / alkalinity (pH).

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000: Cast-in-Place Concrete.
3. Division 09: Finishes; flooring sections.

1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

B. ASTM International (ASTM):

1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
2. ASTM D1709 - Standard Test Methods of Impact Resistance of Plastic Film by the Free-Falling Dart Method.
3. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
4. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
5. ASTM E1643 - Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for vapor barrier and accessories.

B. Samples:

1. 12 inch by 12 inch vapor barrier samples.

2. Pressure-Sensitive Tape: 12 inch long sample.

C. Test Reports: Conducted by nationally recognized independent testing agency indicating conformance with specified performance requirements.

1.04 QUALITY ASSURANCE

A. ASTM tests referenced in this Section shall be performed on a single production roll per ASTM E1745 Section 8.1. Submit third party documentation certifying this requirement.

B. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities and preparations for the installation of vapor barrier.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect in accordance with manufacturer's instructions and recommendations.

B. Deliver materials in manufacturer's packaging with labels intact.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Multi-layer plastic extrusion manufactured with high grade prime, virgin, polyolefin resins. Thickness shall be 15 mils minimum.

1. Stego Wrap by Stego Industries LLC.

2. Perminator by W.R. Meadows.

3. Ecoshield-E by Epro.

4. Equal.

B. Physical Properties:

1. Maintain permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).

2. Class Rating per ASTM E1745: Class A.

3. Puncture resistance per ASTM D 1709: 2200 g or higher.

4. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1

C. Accessories: Provide manufacturer recommended accessories for seams, penetrations and perimeter edges, including tapes, mastics, termination for a complete vapor barrier installation per ASTM E1643.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsoil and notify OWNER of deficiencies detrimental to proper vapor barrier installation; do not proceed until corrected.

3.02 INSTALLATION

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

1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.

2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise, where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself using manufacturer ASTM E1643 compliant accessory designed to adhere to concrete. Seam tape shall not be used for sealing the vapor barrier to the foundation wall, grade beam or slab.

3. Overlap joints 6 inches and seal with manufacturer's seam tape.

4. Seal vapor barrier penetrations per manufacturer's instructions.

5. Avoid the use of non-permanent stakes driven through the vapor barrier.

B. Prior to concrete placement inspect vapor barrier for damage. Clean damaged areas and with vapor barrier material cut a minimum 6 inches larger than damaged area on all sides. Seal to main vapor barrier with continuous seam tape.

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 07 2719

PLASTIC SHEET AIR BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Mechanically attached permeable flexible plastic sheet air barriers.

2. Flexible flashing of openings, penetrations, joints, and terminations of exterior walls and taping of seams.

B. Related Requirements:

1. Section 05 4100 – Structural Metal Stud Framing.

2. Section 07 6000 – Flashing and Sheet Metal.

3. Section 07 9200 – Joint Sealants.

4. Section 08 4113 - Aluminum Entrances and Storefronts.

5. Section 08 511 3- Aluminum Windows.

6. Section 08 5116 – Aluminum Windows with Louvers.

7. Section 08 5123 – Steel Windows.

8. Section 09 2423 – Cement Plaster and Metal Lath.

1.02 REFERENCES

A. ASTM International:

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

2. ASTM E1677 - Standard Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls.

3. ASTM E2178 – Standard Test Method for Air Permeance of Building Materials.

B. International Code Council (ICC):

1. ICC-ES Evaluation Reports.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each material and component proposed for installation.

B. Shop Drawings: Dimensioned plans and elevations indicating:

1. Complete information as to size and location of openings, sleeves, conduits, ducts, boxes, inserts, attachments, and structural interferences.

2. Layout of air barrier showing sheet lapping, cutting, flashing and taping, with references to enlarged details.

C. Installation Instructions: Submit detailed manufacturer's installation instructions.

D. Material Samples: Submit minimum 8-1/2-inch by 11-inch samples of air barrier, and 12 inch long flashing.

E. Test Reports: Submit Test Reports showing performance characteristics equaling or exceeding those specified.

F. Evaluation Reports: Submit ICC-ES Evaluation Report demonstrating conformance of plastic sheet air barrier to CBC 1404.2, for use as water-resistive barrier.

G. Qualification Statements:

1. Installer: Statement from plastic sheet air barrier manufacturer indicating installer is approved, certified, or has been trained for the installation of their products.

1.04 QUALITY ASSURANCE

A. Manufacturer:

1. Plastic sheet air barrier components and accessories shall be from a single source.

2. Manufacturer shall have a minimum of five years of continued experience in the manufacture of the specified products.

B. Installer:

1. Minimum five years in the installation of air/weather barriers.

2. Trained or certified by manufacturer for the installation of their products.

C. Mock-up: Refer to Section 09 2423, Cement Plaster and Metal Lath.

D. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities related to the installation of plastic sheet air barrier. In addition to the conference attendees listed on Section 01 3119, plastic sheet

air barrier installer and manufacturer technical representative shall attend pre-installation conference.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in undamaged and original packaging.

B. Store materials in a clean, dry, protected location and within temperature range required by plastic sheet air barrier manufacturer. Protect stored materials from direct sunlight.

C. Handle materials in accordance with Manufacturer's recommendations.

1.06 WARRANTY

A. Provide a ten year manufacturer's standard material warranty for replacement of plastic sheet air barriers that fail due to material defects.

B. Installation Warranty: Provide a two year installation warranty for the plastic sheet air barrier, including accessories, against loss of water-tight seal and loss of attachment.

C. Warranty shall start on the day of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturer and Products:

1. DuPont (E. I. du Pont de Nemours and Company): Tyvek CommercialWrap.

2. Polymer Group Inc., TyparMetroWrap.

3. Equal.

B. Properties:

1. Plastic sheet air barrier shall be Type I in accordance to ASTM E1677.

2. Air Permeance: shall not exceed 0.004 cfm/ft^2, under a pressure differential of 0.3 in w.g. (1.57 psf) (0.02 L/m^2 at 75 Pa), when tested in accordance with ASTM E2178.

3. Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance to ASTM E84.

2.02 MISCELLANEOUS MATERIALS

A. Flashing: Self-adhesive butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

1. DuPont (E. I. du Pont de Nemours and Company); FlexWrap and StraightFlash.

2. Polymer Group Inc.; Flashing Flex and Flashing AT.

3. Equal.

B. Fasteners: Manufacturer approved fasteners.

C. Tape: Three inch wide seam tape. Pressure-sensitive plastic tape recommended by air barrier manufacturer for sealing joints and penetrations in air barrier.

D. Sealants and Adhesive Primers: Compatible with plastic sheet air barrier and flashings system and approved by OWNER's Office of Environmental Health and Safety (OEHS).

1. Sealant: Dow Corning 732.

2. Spray Adhesive: Design Polymerics DP77.

3. Equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas and conditions under which plastic sheet air barrier will be installed.

B. Verify that substrate to receive air barrier has been completed and inspected before commencement of work.

C. For the installation of flashing and tape, surface shall be smooth, clean, dry and free from voids, loose substrate, protrusions, or any material that would hinder adhesion.

3.02 INSTALLATION

A. Install plastic sheet air barrier in accordance to manufacturer's installation guidelines, providing continuity throughout exterior walls. Install plastic sheet air barrier with drainage plane surface pattern in vertical position for proper drainage.

B. Install plastic sheet air barrier starting from the bottom of the building up to ensure proper overlapping of vertical and horizontal seams. Upper layer of plastic sheet air barrier shall overlap bottom layer by a minimum of six inches. Plastic sheet air barrier shall extend over the weep screed by two inches and be taped down.

C. Secure plastic sheet air barrier by fastening into studs at 12 to 18 inches on center vertically.

D. Unroll plastic sheet air barrier directly over windows and doors rough openings. Do not install fasteners within six inches of the sills and jambs of the openings and within nine inches of the header, plastic sheet air barrier shall be fastened at these locations during flashing installation.

E. Horizontal joints shall be overlapped a minimum of six inches with upper courses overlapping lower courses in water-shedding fashion. Vertical seams shall be overlapped a minimum of six inches. Overlap corners of building a minimum of 12 inches.

F. Tape vertical and horizontal seams using adhesive tape recommended by manufacturer. Seal tears and cuts with adhesive tape as recommended by manufacturer.

G. Place patch or strip of self-adhered flashing over plastic sheet air barrier where base plates, metal channels, z-girts, or other hardware will be installed.

3.03 FLASHING

A. Cut air barrier from door and window openings along jambs and sill. Cut a header flap at 45 degree angle to expose eight inches of plastic sheet air barrier to allow for head flashing installation. Install sill flashing per manufacturer instructions, overlapping up the jambs a minimum of six inches on each side.

B. Wrap flashing around interior jamb, wall face and exterior jamb, overlapping the vertical portion of the sill flashing by at least two inches.

C. Adhere flashing to the head following manufacturer's instructions. Flashing shall wrap jamb flashings by a minimum of two inches.

D. Flash piping, conduit, duct and similar penetrations through walls, and flashing ledgers and sills as recommended by manufacturer.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's technical representative shall inspect the work and submit a statement indicating that the installation has been done in conformance to manufacturer's installation instructions.

3.05 CLEANING

A. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

3.06 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 5113

COLD APPLIED BITUMINOUS ROOFING (PATCH AND REPAIR)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Cold Applied built-up roof membrane.
2. Base sheet.
3. Roofing insulation.
4. Aggregate ballast.

B. Related Sections include the following:

1. Division 01 – General Requirements.

2. Section 07 6000 - Flashing and Sheet Metal, for metal roof penetration flashings, flashings, and counterflashings.

3. Section 07 9200 - Joint Sealants.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definitions of terms related to roofing work not otherwise defined in this Section.

B. Cold Applied Built Up Roofing – An asbestos free formulation of asphalt, solvent, thixotrope, mineral stabilizer and reinforcing fibers used as an interply adhesive and surface coat.

1.4 PERFORMANCE REQUIREMENTS

A. General: Install a watertight, built-up roofing and base flashing roofing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

B. FM Listing: Provide built-up roofing, base flashings, and component materials that comply with requirements of FM 4450 and FM 4470 and FM 1-49 Loss Prevention Data Sheet as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.

1. Roofing system shall comply with the following:

a. Fire/Windstorm Classification: Class 1A-90.
b. FM 1-49 Loss Prevention Data Sheet - Perimeter Flashing
c. FM 1-28 Loss Prevention Data Sheet - Wind Loads to Roof Systems and Decks
d. FM 1-29 Loss Prevention Data Sheet - Above Deck Components
e. ASCE 7 – Section 6: Wind Forces on Buildings and other Structures

1.5 SUBMITTALS

A. Comply with requirements of Section 01 3300 Submittal Procedures.

B. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

C. Shop Drawings: Include plans, sections, details, and attachments to other work, for the following:

1. Base flashings, cants, and membrane terminations.
2. Tapered insulation, including slopes.
3. Crickets, saddles, and tapered edge strips, including slopes.

D. Samples for Verification: Of the following products:
1. 12-by-12-inch square of roofing insulation.
2. 3 lb of aggregate surfacing material.
3. 6 insulation fasteners of each type, length, and finish.

E. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system and is eligible to conduct the repairs or modifications in accordance with and to preserve the roofing manufacturer's warranty currently in place.

F. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform Work of this Section who has specialized in installing roofing similar to that required for this Project; who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product; and who is eligible to receive the standard roofing manufacturer's warranty.

B. Manufacturers Technical Services: Contractor shall provide the Roofing System Manufacturers Technical Services Inspections. The job site inspections are to be performed by the Manufacturers full time employees. Inspections shall be documented in writing. Provide a minimum of two (2) days of job site inspection.

C. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Meet with the same participants and review the same items listed for the pre-installation conference. In addition, review status of submittals and coordination of work related to roof construction. Notify participants at least 5 working days before conference.

D. Pre-installation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.

1. Meet with Owner; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members.
4. Review loading limitations of deck during and after roofing.
5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
6. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, warm, well-ventilated, weathertight location according to roofing system manufacturer's written instructions. Store rolls of felt and other sheet materials on end on pallets or other raised surfaces. Do not double-stack rolls.

1. Handle and store roofing materials and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.

B. Do not leave unused felts and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather and moisture and unless maintained at a temperature exceeding 50 deg F.

C. Deliver and store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.

D. Protect roofing insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturers written instructions for handling, storing, and protecting during installation.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

1.9 WARRANTY

A. General Warranty: The warranties 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.

1. Warranty Period: Continuance of Existing Tremco Warranty.

2. Additional Warranty Extension: Contractor to provide Manufacturers Warranty Extension to the existing Warranty. Warranty Extension shall be for an additional 10 years.

B. Contractors Warranty
1. Contractors Warranty shall cover all labor and materials required to install the specified assemblies. Warranty period shall be 2 years from Substantial Completion

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Materials are to be compatible with the existing materials and capable of inclusion into the long-term warranty currently in place. Subject to compliance with requirements, provide products by the following: The Existing Roofing systems are Tremco.

1. Built-up Asphalt Roofing:
   a. Tremco, Inc.

2. Polyisocyanurate Board Insulation: (Where required)
   a. Celotex Corp. (The).
   b. Firestone Building Products
   c. Rmax, Inc.
   d. NRG Barriers, Inc.

3. Wood-Fiber-Board Insulation:

a. Structo Deck by Tremco.

4. Walk Pads:
   a. Tremco.

5. Base sheet fasteners:
   a. Johns Manville - UltraLok Locking Impact Fastener
   b. OMG Roofing Products - CR Base Sheet Fastener
   c. OMG Roofing Products - OlyLok Locking Impact Nail

2.2 BASE-SHEET MATERIALS

A. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft.

B. Base Sheet: Unperforated, asphalt-impregnated and -coated, glass-fiber reinforced sheet, dusted with fine mineral surfacing on both sides, complying with ASTM D 4601, Type II.
   1. BURmastic Composite Ply HT by Tremco.

2.3 ROOF MEMBRANE PLIES

A. Ply Felt: Asphalt-coated, glass-fiber reinforced felt, complying with ASTM D 4601, Type II. 33 Pounds per square
   1. BURmastic Composite Ply HT by Tremco.
   2. BURmesh Webbing by Tremco.

2.4 ASPHALT MATERIALS

A. Asphalt Primer: TremPrime LV asphalt primer.

B. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, 1-part asbestos-free, cold-applied adhesive specially formulated for compatibility and use with built-up roofing membranes and flashings. Each container labeled with UL and FM logos indicating material was manufactured under the specified UL and FM quality assurance programs.
   1. BURmastic LV Adhesive by Tremco. For use in large roof replacement areas as indicated.
   2. Material is for use as inter-ply and surfacing adhesive.

2.5 AUXILIARY MEMBRANE MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with built-up roofing.

   1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

B. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application

1. ELS by Tremco

C. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions of FM 4470; designed for fastening base sheets and base flashings and for backnailing ply felts to substrate; tested by manufacturer for required pullout strength; and acceptable to roofing system manufacturer.
   1. Type and kind as required for the deck area in the area of work.

D. Aggregate Surfacing: Clean, dry, double washed, water-worn gravel, complying with ASTM D 1863. Color and size to match existing.

E. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer for intended use.

2.6 INSULATION MATERIALS

A. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents complying with ASTM C 1289, classified by facer type as follows:

   1. Facer Type: Type II, black, non-asphaltic fiber reinforced felt on both major surfaces.
   2. Facer Type: Type IV, cellulosic-fiber insulating board, complying with ASTM C 208, Type II, Grade 2, 1/2 inch thick on 1 major surface and a black, non-asphaltic fiber reinforced felt on the other.

B. Cellulosic-Fiber-Board Insulation: Fibrous-felted, rigid insulation boards of wood fiber or other cellulosic-fiber and water-resistant binders, asphalt impregnated, chemically treated for deterioration, complying with ASTM C 208, Type II, Grade 2.

2.7 INSULATION ACCESSORIES

A. General: Furnish roofing insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.

B. Insulation Adhesive: Solvent free, bituminous urethane adhesive
   1. Low Rise Insulation Adhesive by Tremco.

C. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions of FM 4470, designed for fastening roofing insulation to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

D. Tapered Edge Strips: Rigid, cellulosic-fiber insulation board, complying with ASTM C 208, Type 2.

E. Tapered Edge Strips: Rigid, glass-fiber insulation board, complying with ASTM C 726.

F. Substrate Joint Tape: 6 or 8 inches wide, coated, glass-fiber joint tape.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.

C. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at roof penetrations and terminations and match the thicknesses of insulation required.

1. Verify that wood nailer strips are located perpendicular to roof slope and spaced according to requirements of roofing system manufacturer.

D. Should concrete repairs be required, Do not proceed with installation until after the minimum concrete curing period recommended by roofing system manufacturer.

1. Test concrete substrate for excessive moisture by pouring 1 pint of roofing asphalt at equiviscous temperature on deck at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if test sample foams or can be easily and cleanly stripped after cooling.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean around area where new penetration or opening has occurred. Remove aggregate surfacing and all materials that will prevent proper adhesion of new materials.

B. Roofing Contractor shall cut existing membrane in manner to provide clean even edges. Take necessary precautions to prevent tearing and lifting of membrane to remain in place. Remove existing aggregate surfacing down to the existing membrane surface for 24" beyond the membrane cut edge.

C. General Contractor shall be responsible for maintaining openings in a weather tight condition. The existing Manufacturers Warranty shall be placed in suspension until all roofing work has been completed and accepted by the Manufacturer. Upon acceptable completion, the Warranty shall be re-instated as applicable.

D. Clean substrate of dust, debris, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions and standard procedures. Remove sharp projections.

E. Prevent materials from entering and clogging roof drains and conductors 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.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install built-up roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-Up Roofing."

1. Install roofing system according to applicable specification plates of NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Start installation of built-up roofing membrane in presence of roofing system manufacturer's technical personnel.

C. Cants: Install and secure preformed 45-degree wood cants at junctures of built-up roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.

D. Cooperate with inspecting and testing agencies engaged or required to perform services for installing built-up roofing membrane system.

E. Coordinate installing roofing system components so insulation and roofing plies are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.

1. Provide cutoffs at end of each day's work to cover exposed ply sheets and insulation with a course of coated felt with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

F. Cold process adhesive heating:
1. An in-line heat exchange unit may be used to facilitate application
   a. Maximum adhesive temperature: 100° F. Do not exceed the flash point of the adhesive.
2. Heat exchange unit: Filled with heat transfer oil approved by equipment manufacturer.
3. Follow operation procedures as recommended by equipment manufacturer.

G. Surfacing Adhesive

1. Aggregate Surfacing: Limit temperature of cold adhesive surface coat to the minimum required for proper embedment of aggregate and the maximum that will permit retention of required coating weight based on slope of surface.
2. Substrate-Joint Penetrations: Prevent roofing adhesive from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction. If it is applied directly to substrate, tape substrate joints.

3.4 INSULATION INSTALLATION (Where Occurs)

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system manufacturer's written instructions for installing roofing insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated and to Shop Drawings.

D. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

E. Install one or more layers of insulation under area of roofing to achieve required thickness. Provide an average of R19 thermal value. Where overall insulation thickness is 2 inches or greater, install required thickness in 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

F. Install insulation with long joints of insulation in continuous straight lines with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Attached Insulation: Over nailable decks, secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roofing insulation to deck type indicated. Over non-nailable decks, prime and install panels using maximum 4' x 4' panel size for first layer. Over LWC, mechanically install a base sheet with fasteners at 18" O.C. both ways and then adhere insulation using 4' x 4' maximum panel size for first layer. Install subsequent layers of insulation in a ribbon coverage of solvent free insulation adhesive at a rate of 1-½ gallons per 100 sq. ft. Immediately after placement, walk insulation boards into adhesive to achieve solid contact.

1. Fasten insulation according to requirements of FM's "Approval Guide" for specified Windstorm Resistance Classification and the insulation and roofing system manufacturers' written instructions.
2. Fasten insulation according to the insulation and roofing system manufacturers' written instructions.

H. Adhered Insulation:
1. At concrete decks: Prime surface of concrete deck with water based primer at a rate of 150 – 250 sq. ft. per gallon, unless a greater weight is required by roofing system manufacturer, and allow primer to dry.
2. At second or more layers of insulation, Set each layer of insulation in a ribbon coverage of solvent free insulation adhesive at a rate of 1-½ gallons per 100 sq. ft. Immediately after placement, walk insulation boards into adhesive to achieve solid contact.

3.5 BASE-SHEET INSTALLATION

A. Before installing insulation, install tie-off felt as indicated around perimeter of opening. Seal bottom of felt with roofing cement. Felt should extend up onto the existing membrane 6" minimum and out onto deck 6"

B. On top of insulation, install one lapped course of base sheet according to roofing system manufacturer's written instructions, extending sheet over and terminating beyond cut edge and tie-in felt. Attach base sheet as follows:
   1. Adhere to substrate in a uniform coating of cold adhesive.

3.6 ROOF MEMBRANE INSTALLATION

A. Install ply felts according to roofing system manufacturer's written instructions, starting at low point of roofing system. Cut roofing ply sheets in 18 – 20 ft. lengths and allow to relax 30 to 60 minutes. Stack lengths. Do not re-roll. Shingle side laps of ply felts uniformly to achieve required number of membrane plies throughout. Shingle in direction to shed water. Extend ply felts over and terminate beyond cants.
   1. Install 3 ply felts.
   2. Application: Adhere each ply felt in cold adhesive, applied within temperature range and at rate required by roofing system manufacturer, to form a uniform membrane without ply felts touching each other.
   3. Extend each felt 9" beyond the edge of the preceding felt.
   4. Seal final edge with 5 course application of mastic and webbing.

B. Surfacing Application:
   1. Prior to application of surface coat, contractor shall inspect roof with manufacturer's technical representative and repair any deficiencies.
   2. Over entire roof surface of new work, apply uniform and continuous surface coat of surfacing adhesive at a rate of 5 gallons per 100 sq. ft.

C. Aggregate Surfacing:
   1. Immediately broadcast minimum of 360 lbs /100 sq. ft. of new, clean roofing gravel. Cover surface coat material completely.
   2. Dress aggregate as needed to eliminate any bleed through of adhesives.

3.7 TIE-IN TO EXISTING MEMBRANE

A. Surfacing at existing membrane adjacent to new penetration, shall be removed to expose existing felts

B. Prime existing felts and allow to flash.

C. Install two 18-inch wide Composite Ply felt evenly across joint line of new and existing.

D. Install two ply strip-in using ply felts that extend past the edge of the previous felt a minimum of 6 inches

E. Surface coat and apply surfacing aggregate of same size and color as existing.

F. Coat new surfacing to match existing surface coating.

3.8 FIELD QUALITY CONTROL

A. Owner will engage, at their option, an independent testing and inspecting agency to perform field inspections and quality-assurance tests.

1. Testing agency will prepare reports stating whether inspected and tested Work complies with or deviates from requirements.

2. Testing agency personnel shall be versed and have minimum of 5 years experience in the type of roofing being inspected.

3. The Manufacturer and the Testing Agency shall agree in writing to acknowledge and accept the comments of the other agency.

B. Correct deficiencies in or remove and replace roof membrane that inspections and test reports indicate does not comply with specified requirements or are capable of being incorporated into the existing warranty.

1. Repair roof membrane that does not comply with specified requirements by re-adhering test specimens back in place and by applying additional plies, equal to the original number of plies specified, over test specimens according to roofing system manufacturer's written instructions.

C. Test Cuts: Before surface coating and surfacing built-up roofing membrane, test specimens will be removed to evaluate problems observed during quality-assurance inspections of roof membrane as follows:
1. Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with the criteria established in Appendix 3 of ARMA/NRCA'S "Quality Control Guidelines for the Application of Built-up Roofing."

D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect and Owner, General Contractor and Roof System Representative, 48 hours in advance of the date and time of inspection.

3.9 PROTECTING AND CLEANING

A. Protect built-up roofing membrane from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove built-up roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair base flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 6000

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sheet metal flashings in connection with roofing.
2. Reglet and counter flashing assemblies.
3. Miscellaneous metal flashing and counter flashing as required, except where provided under Divisions 22, Plumbing, 23, HVAC, or 26, Electrical.
4. Drip flashings.
5. Roof pipe flashings.
6. Roof expansion joint covers.
7. Other sheet metal items, not necessarily specified herein or in other sections, but required to prevent penetration of water into building.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 3000 – Metal Decking.
3. Section 07 9200 - Joint Sealants.
4. Section 08 3313 - Coiling Counter Doors.
5. Section 09 2423 - Cement Plaster and Metal Lath
6. Division 22 — Plumbing.
7. Division 23 - HVAC.
8. Division 26 - Electrical.

1.02 SUBMITTALS

A. Shop Drawings: Submit for fabricated sheet metal indicating shapes, details, methods of joining, anchoring and fastening, thicknesses and gages of metals, concealed reinforcement, expansion joint details, sections, and profiles.

B. Samples: Submit Samples for materials or assemblies as requested.

C. Product Data: Submit brochures of manufactured items.

1.03 QUALITY ASSURANCE

A. Drawings and requirements specified govern. Provide the Work of this section in conformance with the Architectural Sheet Metal Manual published by SMACNA for conditions not indicated or specified and for general fabrication of sheet metal items.

B. Materials shall conform to following standards:

1. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

2. ASTM A653 - Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

3. ASTM B370 - Copper Sheet and Strip for Building Construction.

C. Pre-installation Meetings: Refer to Division 07 roofing sections as appropriate. Attend the pre-installation and inspection meetings for roofing Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Do not install bent or otherwise damaged materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Galvanized Sheet Steel: ASTM A653, coating designation G90, hot-dip galvanized.

B. Copper Plate, Sheet and Strip: ASTM B370, cold-rolled, tempered. Copper sheet and strip shall be cold-rolled-temper.

C. Stainless Steel: Plate, sheet and strip shall conform to ASTM A167, Type 304 or Type 316, No. 4 finish on exposed surfaces and No. 2 finish on concealed surfaces unless otherwise specified or indicated. Furnish Type 304 for general applications and Type 316 where exposed to acidic or alkaline conditions.

D. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. As-Milled Finish: **[Mill] [One-side bright mill] [Standard one-side bright] [Standard two-side bright].**

E. Fastenings:

1. Galvanized Steel: Nails, rivets, and other fastenings furnished in connection with galvanized sheet steel Work shall be sealed with rust resistive coating. Rivets shall be tinned. Nails and other fastenings shall be zinc-coated.

2. Copper: Nails, rivets, and other fastenings furnished in connection with copper sheet metal Work, shall be manufactured from hard-temper copper or hard brass.

3. Stainless Steel: Nails, rivets and other fastenings furnished in connection with stainless steel Work, shall be 300 series alloy to match alloy of stainless steel being fastened.

F. Soldering Flux: Raw muriatic acid for galvanized steel; rosin for tin, lead and tinned copper; non-corrosive soldering salts for uncoated copper and acid-type flux formulated for soldering stainless steel.

G. Solder: ASTM B32, Grade 5A, composed of 95-5 tin-antimony. Name of product manufacturer and grade designation shall be labeled, stamped or cast onto each coil or bar.

2.02 FABRICATION

A. General:

1. Accurately form sheet metal Work to dimensions and shapes indicated and required. Cope finish molded and brake metal shapes with true, straight, sharp lines and angles and, where intersecting each other, to a precise fit. Unless otherwise specified, all galvanized sheet steel shall be 22 gage. Exposed edges of sheet metal shall have a ½ inch minimum hemmed edge.

2. Soldering of sheet steel or copper shall be performed with well-heated copper soldering iron or soldering torch, joints full flowing, neat and consistent. Fill joint completely with solder. Clean materials at joints before soldering, and tin coppers before soldering. Exposed soldering on finished surfaces shall be scraped smooth. Lock seam work shall be fabricated flat and true to line and soldered along its entire length. Acid-fluxed Work shall be neutralized after fabrication.

3. Form and install sheet metal Work to provide proper allowances for expansion and contraction, without causing undue stresses in any part of completed Work. Installation shall be water and weathertight.

B. Reglet Type Counterflashing: Where roof comes in contact with vertical surfaces, provide counterflashing. Set top of counter flashing 8 inches above roof deck unless otherwise indicated, and extend down at least 5 inches or to top of cant strip. Counterflashing and reglet shall be 22 gage galvanized sheet steel. Lap counter flashing and reglet 3 inches minimum at splices and miter at angles, or supply special metal corner fittings. Reglet and method of securing flashing shall be so constructed that flashing is firmly locked in place, but may be readily removed for replacement.

C. Roof Expansion Joint Covers: Fabricate of 22 gage galvanized sheet steel, as detailed. One side of joint shall be zee shaped, with 3-inch standing leg extended over the joint and turned down. The other side shall be box shaped, fabricated to extend over the joint, over the standing leg, and turn down to form a water barrier. Prefabricated bellows type joint covers are not permitted.

D. Miscellaneous Flashing: Unless otherwise indicated, miscellaneous flashing shall be fabricated of galvanized steel. Exterior doors and windows, unless covered by overhangs shall be provided with 22 gage galvanized steel drip flashing as detailed. At wood construction, nail flashing to framing before paper backed lath is installed.

E. Roof Pipe Flashings: Provide PVC flashings or prefabricated welded or seamless flashings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Concrete and masonry materials in contact with sheet metal shall be painted with alkali resistant coating, such as heavy-bodied bituminous paint. Wood in contact with sheet metal shall be painted with two coats of aluminum paint or one coat of heavy-bodied bituminous paint.

3.02 INSTALLATION

A. General: Coordinate with installation of underlayment indicated in the Drawings and specified in Section 09 2423.

B. Reglets: Install reglets at constant height above cant or as indicated. Provide minimum 3-inch lap at end splices of reglets. Seal laps watertight.

C. Counterflashing:

1. Install at constant horizontal elevation across roof slope and slope at constant height above cant or as indicated.

2. Provide minimum 3-inch lap at all end splices of counterflashing.

3.03 TESTING

A. Perform field water testing to demonstrate installation is watertight. Continue testing with a continuous hose stream applied at base of installation for at least 30 minutes. If leaking is observed, discontinue test and repair installation, then test until satisfactory results are obtained.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.05 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 07 8116

CEMENTITIOUS FIREPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cementitious spray-applied fireproofing installed on structural steel and underside of metal decking, for fire rated protection.

B. Related Requirements:

1. Division 01 – General Requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
3. Section 05 1200 - Structural Steel Framing.
4. Section 05 3000 - Metal Decking.

1.02 REFERENCES

A. Comply with the following as a minimum requirement:

1. ASTM E84 - Standard Test Methods for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E136 - Standard Test Methods for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
4. ASTM E605 - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Materials (SFRM) Applied to Structural Members.
5. ASTM E736 - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
6. ASTM E759 - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members.
7. ASTM E760 - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members.
8. ASTM E761 - Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members.

9. ASTM E859 - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members.

10. ASTM E937 - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.

11. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

12. UL Fire Resistance Directory.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings to indicate members and components to receive fireproofing.

1. Show plan indicating location of structural members to receive fireproofing.

2. Indicate various ratings shown on plans and fireproofing thicknesses required to achieve intended ratings.

3. Show details indicating repair of damaged fireproofing where other work disrupts installed fireproofing.

B. Product Data:

1. Submit manufacturer's specifications for materials with copies of code and UL approvals.

2. Submit manufacturer's recommended application instructions.

C. Material Samples: Submit 12-inch by 12-inch sprayed Sample. Prepare Samples accurately; apply required thickness and density of fireproofing material.

D. Test Reports: Submit reports of tests performed by an authorized independent testing laboratory, indicating conformance with performance criteria specified below.

1.04 QUALITY ASSURANCE

A. CBC Chapters 7 and 17A.

B. Qualifications of Installer: Minimum five years experience in successfully installing specified fireproofing materials and certified in writing by the manufacturer to install specified products.

1.05 DELIVERY, STORAGE AND HANDLING

A. Material shall be delivered in original unopened packages, fully identified as to manufacturer, branch or other identifying data, and bearing proper Underwriters Laboratories, Inc. labels for fire-resistance classification.

B. Material shall be stored above grade, under cover and in a dry location until ready for installation. Bags exposed to water before installation shall be considered unsuitable for

use and discarded. Stock of material is to be rotated and installed before its expiration date.

1.06 PROJECT CONDITIONS

A. A minimum temperature of 40 degrees F for air and substrate must be maintained for 24 hours before, during, and for 24 hours after installation of the sprayed fireproofing.

B. Provide ventilation to allow proper drying of fireproofing during and after its installation. In poorly ventilated areas lacking natural ventilation, provide forced air circulation as required.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. GCP Applied Technologies, or equal.

2.02 MATERIALS

A. Sprayed fireproofing: Monokote Type MK-6/HY, cementitious products by GCP. The material shall be factory-blended, cementitious fireproofing.

1. Performance Criteria:

a. Dry Density: Field density shall be measured in accordance with ASTM E605. Minimum average density shall be that listed in UL Fire Resistance Directory, ICC Evaluation Report, or as required by authorities having jurisdiction.

b. Deflection: Material shall not crack or de-laminate from surface to which it is installed when tested in accordance with ASTM E759.

c. Bond Impact: Material subject to impact tests in accordance with ASTM E760 shall not crack or de-laminate from the surface to which it is installed.

d. Bond Strength: Fireproofing, when tested in accordance with ASTM E736, shall have minimum bond strength of 200 psf.

e. Air Erosion: Maximum allowable weight loss of fireproofing material shall be 0.000 gm per square foot when tested in accordance with ASTM E859.

f. Compressive Strength: Fireproofing shall not deform more than 10 percent when subjected to compressive forces of 8.3 psi when tested in accordance with ASTM E761.

g. Abrasion Resistance: No more than 6 inches shall be abraded or removed from fireproofed substrate when tested in accordance with established test methods.

h. Impact Penetration: Fireproofing material shall not show a loss of more than 6 cm3 abraded when subjected to impact penetration tests in accordance with established test methods.

i. Surface Burning Characteristics: Material shall exhibit following surface burning characteristics when tested in accordance with ASTM E84; flame spread-0 and smoke development-0.

j. Fireproofing material shall not contribute to corrosion of steel members when tested in accordance to ASTM E937.

2. Sprayed fireproofing material shall have been tested and reported by Underwriters' Laboratories, Inc. in accordance with procedure of ASTM E119.

3. Sprayed fireproofing material and application shall meet requirements of OSHA regulation 29 CFR Section 1926.1101, which regulates use of asbestos in construction, and shall be free of mineral wool.

4. Fireproofing product shall be tested in accordance with ASTM G21, and shall show resistance to mold growth when inoculated with aspergillus niger, and mixed spore cultures (Tappi T487-M54 and ASTM G21). Mold inhibitor shall be provided by the manufacturer.

B. Mixing water shall be clean, fresh and suitable for domestic consumption and free from such amounts of mineral or organic substances that would affect installation of fireproofing material.

C. Bonding Agent: As recommended by fire proofing manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Comply with provisions of CBC 704.13.

B. Surfaces to receive sprayed fireproofing shall be free of oil, grease, paints/primers, loose dirt or other foreign substances which may impair proper adhesion of fireproofing to substrate. Where necessary, clean surfaces to receive fireproofing by a method recommended by fireproofing material manufacturer.

C. Installation of sprayed fireproofing shall not begin until surfaces to receive fireproofing have been inspected, to determine if surfaces are acceptable to receive fireproofing material.

3.02 PREPARATION

A. Before installation of fireproofing, clips, hangers, support sleeves, and other attachments required to penetrate fireproofing shall be installed.

B. Ducts, piping, equipment or other suspended material or equipment, which would interfere with installation of fireproofing material, shall not be installed until fireproofing Work is complete.

C. Bonding agent shall be installed to soffit of precast concrete planks. Coverage shall be 1,000 square feet per gallon. If diluted with water on a one-to-one ratio, coverage shall be 500 square feet per gallon.

3.03 APPLICATION

A. Provide equipment and application methods that conform to manufacturer's application instructions as reviewed.

B. Thickness of fireproofing shall conform to CBC Chapter 7 and Table 720.1(1), for types and locations of members to be protected. Special Inspection required per CBC 1705A.14

3.04 FIELD QUALITY CONTROL

A. The Owner will select and pay an independent testing laboratory to sample and verify thickness and density of fireproofing in accordance with provisions of ASTM E605.

B. The results of tests will be made available to all parties at the completion of installation.

3.05 PATCHING AND REPAIRING

A. Patch and repair fireproofing material after work of other trades to maintain fire-resistive ratings.

3.06 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.07 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 8413

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
2. Mineral fiber insulation, fire safing, and safing edge of floor slabs and curtain walls.
3. Damming material, clips, and closures.
4. Gaps between the top of walls and ceilings or roof assemblies.
5. Expansion joints in walls and floors.
6. Openings around structural members which penetrate floors or walls.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-in-Place Concrete.
3. Section 07 2100 - Thermal Insulation.
4. Section 07 9200 - Joint Sealants.
5. Section 09 2219 - Top Track Fire-Rated System.
6. Section 09 2900 - Gypsum Board.
7. Division 22 - Plumbing.
8. Division 23 - HVAC.
9. Division 26 - Electrical.
10. Division 27 - Communications.

1.02 REFERENCES

A. ASTM Standards:

1. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

4. ASTM E1399 – Standard Test Method for Cyclic Movement and Measuring Minimum and Maximum Joint Widths on Architectural Joint Systems.

5. ASTM E1966 – Standard Test Methods for Fire-Resistive Joint Systems.

6. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops

7. ASTM E2307 – Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus.

8. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

B. Underwriters Laboratories, Inc.

1. UL Fire Resistance Directory.

2. UL 263 – Standard for Fire Tests of Building Construction and Materials.

3. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.

4. UL 1479 – Fire Tests of Through Penetration Firestops.

5. UL 2079 – Test for Fire Resistance of Building Joint Systems.

C. Testing Services:

1. Intertek ES SAT.

2. Southwest Research Institute.

3. Underwriters Laboratories.

D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

E. CBC, Sections 714 and 1705A.17.1 Fire Tests of Through-Penetration Fire Stops.

F. CPC, Section 1404.3.

G. CMC, Section 316.5.

H. CEC, Section 300.21.

I. Firestop Contractors International Association (FICA) Manual of Practice.

1.03 SYSTEM DESCRIPTION

A. Provide fire stops and smoke seals to prevent the passage of fire, smoke, toxic gasses or water from one floor or area to another. Seal openings in floors, fire rated walls and permanent partitions penetrated by pipes, ducts, conduits and other items as shown, specified, and as required for the type of construction.

B. Mineral fiber insulation installed as fire safing at non-rated penetrations not containing pipes, ducts, conduits, and other items in floor slabs, wall partitions, construction-joint conditions between slabs and adjacent construction and where indicated or required.

C. Provide damming material, clips, and closures as required for support and containment of dams, and other insulation materials required for tested and rated fire stop systems.

1.04 QUALITY ASSURANCE

A. Performance Criteria:

1. Provide materials and Work to conform to source quality control criteria specified herein and CBC requirements in fire resistant wall and floor assemblies to prevent the passage of fire, smoke, and toxic gases.

2. Installed fire stops shall be of sufficient thickness, width, and density to provide a fire resistance rating at least equal to the floor, wall, or partition construction into which it is installed.

B. Comply with CBC 714 requirements for fire rated construction.

C. Qualifications of Manufacturer: Products furnished for fire stopping and smoke seals shall be manufactured by a firm which has been continuously and regularly employed in the manufacture of these materials for a period of at least 5 years; and which can provide evidence of these materials being satisfactorily installed on at least 5 projects of similar size and type within such period.

D. Qualifications of Installer: The Work of this section shall be installed by a firm which has been in the business of installing similar materials for at least 5 consecutive years; and can provide evidence of satisfactory completion of 5 projects of similar size and scope. Installer shall have applicators trained and certified by manufacturer for performing this Work. Comply with requirements of FICA Manual of Practice.

E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

F. Firestopping tests shall be performed by a qualified testing and inspection agency. A qualified testing and inspection agency shall be UL, Intertek or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction. Firestopping products shall bear the classification marking of a qualified testing and inspection agency.

G. Qualifications of Inspector: Inspector Premier Level Certification

1.05 SUBMITTALS

A. Product Data:

1. Submit manufacturer's Product Data for each type of fire stop and smoke seal material proposed for installation. Indicate product characteristics, typical installations, performance, and limitation criteria and test data.

2. Submit manufacturer's printed installation instructions for each type of product, system, and construction required for the Work. Indicate fire resistance rating of each installation.

3. Submit fire test reports from independent testing agency indicating the following:

a. Fire test report of fire stop material installed to substrate and penetration materials similar to the Work of this section. Test to indicate both Fire Resistance (F) and Temperature (T) Ratings.

b. Test reports of products to be installed shall indicate conformance to ASTM E814 or UL 1479 for penetrations, ASTM E1966 or UL 2079 for joints, and ASTM E2307 for perimeter fire barrier (edge-of-slab) systems.

B. Field Samples: No less than 10 days before commencing the Work of this section, provide field installed Samples of fire stop materials and systems.

1. Apply one Sample of fire stop material for each different penetration and related fire rating required for the Work.

2. Sample areas shall comply with thickness, fire resistance ratings, and finished appearance.

C. Manufacturer's Qualifications: Submit evidence of conformance with qualification requirements specified above.

D. Installer's Qualifications: Submit evidence of conformance with qualification requirements specified above.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the Project site in manufacturer's original, unopened containers bearing correct UL labeling.

B. Fire stop material shall be stored above grade in an area protected from detrimental weather and moisture conditions and in compliance with manufacturer's requirements, including temperature restrictions.

C. Fire stop and seal materials shall be installed before expiration of shelf life.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Unless otherwise noted, products of this section shall be as manufactured by:

1. 3M Fire Protection Products.

2. Hilti, Inc.

3. Nelson Firestop Products.

4. Specified Technologies, Inc. (STI).

5. Tremco, Inc.

6. Equal.

B. Provide materials and systems of specified manufacturers to suit penetration and substrate as determined by various conditions of installation.

C. Provide firestopping composed of components that are compatible with the substrates forming openings and the items penetrating the firestop, under conditions of service and application, as demonstrated by the fire stopping manufacturer based on testing and field experience.

2.02 MATERIALS

A. Cast-in Firestop Devices: Pre-installed firestop devices penetrating cast-in-place concrete decks and concrete over metal decks, for use with combustible and non-combustible pipe, (closed and open systems) insulated pipe, conduits and cable bundles. Provide metal deck adapters and top seal plugs.

1. 3M: Fire Barrier Cast-in-Place Devices.

2. Hilti: CP 680 Cast-in-Place FS Device

3. Tremco: CIPP Plastic, CIPP Metal.

4. Specified Technologies, Inc. (STI): Cast-In Firestop Devices.

5.

5. Equal.

B. Firestop Collar: Made of galvanized steel housing and Intumescent inserts for firestopping combustible pipes through walls and floors. For use with concrete, masonry, wood floor and gypsum wall assemblies. Provide two collars on walls, one on each side, and one collar on underside of floors.

1. 3M: Plastic Pipe Device PPD.

2. Hilti: CP 643N and CP 644.

3. Tremco: TREMstop D.

4. Nelson Firestop Products: PCS Pipe Choke System.

5. Specified Technologies, Inc. (STI): Intumescent Firestop Collars, type LCC, SSC or RTC.

6. Equal.

C. Fire Pillows and Blocks: Intumescent flexible pillows consisting of a mineral fiber core sealed with a water-resistant intumescent membrane, heat-sealed in a durable fire-retardant poly bag; or intumescent block based on a two component foam, for use in walls and floors and concrete, masonry and gypsum wall assemblies. For large openings containing multiple penetrations: wall openings up to 48 inches by 48 inches and floors up to 36 inches by 36 inches.

1. 3M: Fire Barrier Self-Locking Pillow.
2. Hilti: FS 657.
3. Tremco: TREMstop PS1, TREMstop PS2.
4. Nelson Firestop Products: Fire Brick, Pillows.
5. Specified Technologies, Inc. (STI): SSB Firestop Pillows.
6. Equal.

D. Firestop Mortar: Fire-resistant mortar suitable for firestopping large horizontal or vertical, concrete or masonry openings penetrated by single or multiple non-combustible pipes or cable trays.

1. 3M: Fire Barrier Mortar.
2. Hilti: CP 637.
3. Tremco: TREMstop Mortar.
4. Nelson Firestop Products: CMP Firestop Mortar.
5. Specified Technologies, Inc. (STI): SSM Firestop Mortar.
5. Equal.

E. Firestop Putty Stick: Intumescent, non-hardening, firestop putty for single or bundled cables and non-combustible pipe penetrations. For use in horizontal or vertical, concrete, masonry or gypsum wall assemblies.

1. 3M: MP + Stix.
2. Hilti: CP 618 and CP 619T.
3. Tremco: TREMstop MP Putty Stick.
4. Nelson Firestop Products: FSP AA445, AA439.
5. Specified Technologies, Inc. (STI): SSP Firestop Putty.
6. Equal.

F. Firestop Putty Pad: Moldable firestop putty for protection of electrical outlet boxes.

1. 3M: MPP+.

2. Hilti: CP 617.

3. Tremco: TREMstop MP Putty Pad.

4. Nelson Firestop Products: FSP AA452, AA439.

5. Specified Technologies, Inc. (STI): SSP Putty Pads or Electrical Box Insert.

6. Equal.

G. Firestop Sealant: Smoke, gas and water resistant. For use in horizontal or vertical, concrete, masonry or gypsum wall assemblies.

1. Single component intumescent sealant for protection of combustible and non-combustible pipe, conduit and cable penetrations.

a) 3M: CP-25WB+, IC-15WB+, 3000WT.

b) Hilti: FS ONE.

c) Tremco: TREMstop IA+ or FyreCaulk.

d) Nelson Firestop Products: ES1399.

e) Specified Technologies, Inc, (STI): LCI or SSS Intumescent Firestop Sealant.

f) Equal.

2. Silicone based system that provides maximum movement in fire-rated joint applications and pipe penetrations.

a) 3M: 2000+, 2000 NS.

b) Hilti: CP 601S.

c) Tremco: TREMstop Fyre-sil.

d) Nelson Firestop Products: CLK AA529, AA542, AA492.

e) Specified Technologies, Inc. (STI): SIL Silicone Firestop SealantSIL300 or SIL300SL (self-leveling).

f) Equal.

3. Acrylic based system that provides movement capability in fire rated joints and seals through penetration applications.

a) 3M: FD 150+.

b) Hilti: CP 606.

c) Tremco: TREMstop Acrylic GG.

d) Nelson Firestop Products: FSC3.

e) Specified Technologies, Inc. (STI): ES Elastomeric Firestop Sealant.

f) Equal.

4. Self-leveling silicone-based firestop sealant for use with through penetrations and construction joints in horizontal floor/ceiling assemblies.

a) 3M: 1000 SL.

b) Hilti: CP 604.

c) Tremco: TREMstop Fyre-sil S.L.

d) Nelson Firestop Products: CLK AA539, AA552.

e) Specified Technologies, Inc. (STI): SIL Silicone Firestop, type SIL300SL.

f) Equal.

H. Firestop Wrap Strip: Wrap strip of intumescent, flexible firestop for use with plastic and insulated pipe penetrations. For use in horizontal or vertical, concrete, masonry or gypsum wall assemblies.

1. 3M: Ultra GS, FS-195.

2. Hilti: CP 648-S, CP 648-E.

3. Tremco: TREMstop SuperStrip or TREMstop WS.

4. Nelson Firestop Products: MCT, MPS.

5. Specified Technologies, Inc. (STI): SSW Intumescent Wrap Strips, type BLU, BLU2, RED or RED2.

6. Equal.

I. Spray: Sprayable or brush applied fire-rated mastic for construction joints where maximum movement is required. For use in horizontal or vertical, concrete, masonry or gypsum wall assemblies, at top of wall joints, curtain wall/slab edge and expansion joints.

1. 3M: FD 200.

2. Hilti: CP 672.

3. Tremco: TREMstop Acrylic SP spray.

4. Nelson Firestop Products: FSC3.

5. Specified Technologies, Inc. (STI): AS200 Elastomeric Spray with or without SpeedFlex® Joint Strip, or Fast Tack® Firestop Spray.

6. Equal.

J. Drywall Track Gaskets: Intumescent cover for drywall ceiling track providing fire, smoke and acoustical ratings for head-of-wall joints between gypsum walls and concrete floor slabs.

1. Hilti: CFS-TTS Top Track Seal.

2. Specified Technologies, Inc. (STI): TTG Track Top Gasket.

3. Equal.

K. Fire Rated Cable Pathways: Gangable device modules capable of being retrofitted around existing cables and comprised of steel raceway with built-in intumescent material allowing 0 to 100 percent cable fill and requiring no additional action in the form of plugs, twisting closure, putty, pillow, or sealant to achieve fire and leakage ratings.

1. 3M: Fire Barrier Pass-Through Device.

2. Hilti: CP 653 Firestop Speed Sleeve.

3. Specified Technologies, Inc. (STI): EZ-Path Fire Rated Pathway.

4. Equal.

L. Fire Rated Grommet or Disc: For single or dual cable penetrations through the same small opening.

1. Hilti: CFS-D Firestop Cable Disc.

2. Specified Technologies, Inc. (STI): EZ-Path Firestop Grommets

3. Equal.

M. Metal Deck Strips and Plugs: Precut preformed mineral wool plugs and strips to fit flutes of metal deck profile and gap between top of wall and metal deck.

1. 3M: PM4.

2. Hilti: CP 777 Speed Plugs; CP 767 Speed Strips.

3. Tremco.

4. Nelson Firestop Products.

5. Equal.

N. Fire Safing, Mineral Fiber or Ceramic Wool Non-Combustible Insulation:

1. Mineral Fiber: Density 4 pounds per cubic foot, USG Thermafiber, Johns Manville Industrial Insulation Group (IIG), Roxul AFB, or equal.

2. Ceramic Wool: Density 6 pounds per cubic foot, Johns Manville "Ceramic Fiber Insulation", Unifrax "Fiberfrax" ceramic fiber, or equal. Provide material in tested thickness for required hour rating.

a. Flame Spread: Less than or equal to 25.

b. Smoke developed: Less than or equal to 50.

3. For mineral fiber, provide 20 gage minimum size metal retainer clips and plates for fire safing support in vertical applications and in compliance with tested system design.

O. Supplemental Material: Provide supplementary materials required for complete, fire rated, installation.

2.03 SOURCE QUALITY CONTROL

A. Fire stop and smoke seal material shall be tested by an independent testing agency for conformance to Flame (F) and Temperature (T) requirements of ASTM E814/UL 1479, ASTM E1966/UL 2079, or ATSM E2307.

B. Conform to UL Fire Hazard Classification Requirements. Material shall be classified as a fill, void, or cavity material and system for UL through Penetration Firestop System.

C. Material shall be tested and shall display Flame Spread Index of 25 or less, and Smoke Developed Index of 450 or less when tested in accordance with ASTM E84.

PART 3 - EXECUTION

3.01 APPLICATION REQUIREMENTS

A. Provide single component fire stop sealant or putty:

1. Within penetrations subject to movement including conduit, cable bundles, buss duct, and noncombustible pipe.

2. As a sealant or caulking for smoke barrier construction, fire, and smoke dampers, mechanical/electrical framed elements in masonry and gypsum board partition systems, and other conditions.

B. Provide mineral fiber insulation for fire safing at joints and openings through floor slabs, walls, and partitions not indicated to be grouted, gaskets, sealed or otherwise made sound or air tight in this or other sections. Fire safing shall be packed and wedged solidly from both sides of walls and partitions, and from both top and bottom sides of slabs with noncombustible mineral fiber insulation.

3.02 PREPARATION

A. Examine the areas and conditions where fire stops and smoke seals are to be installed for conditions detrimental to the proper completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected for rated fire protection.

B. Surface to receive fire stops or smoke seals shall be free of dirt, dust, grease, form release agents, or other matter that would impair the bond of the fire stop material to the substrate or penetrating items. Substrate shall be frost free and when required, dry.

C. Voids and cracks in substrate shall be filled and unnecessary projections removed before installation of fire stops.

D. Assure that all pipes, conduit, cable, and other items, which penetrate fire rated construction, have been permanently installed before installation of fire stops. Schedule and sequence the Work to assure that partitions and other construction, which would conceal penetrations, are not installed before the installation of fire stops and smoke seals.

E. Comply with manufacturer's recommendations for temperature and humidity conditions before, during, and after installation of fire stops and smoke seals.

3.03 INSTALLATION

A. General: Provide installation in accordance with manufacturer's installation procedures, as required. Install fire stops in accordance with fire test reports, UL Fire Resistance Directory, Intertek Testing Services Directory or SpecDirect, and reviewed Sample installations.

B. Dam Construction:

1. Install dams when required to properly contain fire stopping materials within openings and as required to achieve fire resistance rating as tested and rated.

2. Provide in conformance with installation requirements for type of floor, wall, and partition construction, and as recommended by fire stop manufacturer.

3. Combustible damming material shall be removed after appropriate curing. Noncombustible damming material may be left as a permanent component of the fire stop system.

4. Placement of dams shall not interfere with function, or adversely affect the appearance, of adjacent construction.

C. Installation of Single Component Fire Stop Sealant:

1. Provide noncombustible insulation as required to achieve fire resistance rating.

2. Install with manual or powered sealant gun. For up to four hour rating, install to the thickness required by the Listed System Designs as directed for wall and floor applications.

3. Surface of gun grade fire stop sealant shall be tooled in accordance with manufacturer's recommendations.

4. Remove excess materials from adjacent surfaces within 10 minutes, with either water or other material compatible with sealant and recommended by sealant manufacturer, leaving the Work in a neat, clean condition.

D. Installation of Cementitious Fire Stop Mortar:

1. Mixing: Add dry powder to water and mix with mechanical mixer or hand mixing tools. Ratio and duration of mix shall be as instructed by fire stop mortar manufacturer. Average wet density of mortar shall be 70 pounds per cubic foot (plus or minus 5).

2. Wet surfaces before installation of fire stop mortar. Mortar may be hand installed or pumped into the opening.

3. When installing around layered and grouped cables, vibrate or move the cables slightly to prevent voids from forming between the cables.

4. Exposed surfaces shall be finished with conventional plastering tools before curing.

5. Allow at least 48 hours for initial cure before form removal. For full cure allow 28 days.

3.04 FIELD QUALITY CONTROL

A. Special inspection is required in accordance with CBC 1705A.17.1.

B. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

C. Repair damaged areas and restore integrity of assembly.

D. Keep areas of work accessible until inspection by authorities having jurisdiction.

E. OWNER will engage a qualified independent inspection agency to inspect through-penetration firestop systems in accordance with ASTM E2174, or joint systems in accordance with ASTM E2393. Manufacturer representatives shall not perform inspections of installed firestopping systems.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

A. Clean surfaces adjacent to sealed openings and joints and remove excess of firestopping materials.

B. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 07 9200

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Joint sealants.
2. Preparation for application of sealants.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 2000 - Finish Carpentry.
3. Section 07 6000 - Flashing and Sheet Metal.
4. Section 07 8413 - Penetration Firestopping.
5. Division 08 - Openings.
6. Division 09 - Finishes.
7. Section 10 2813 - Toilet Accessories.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating sealant joint locations, with full-size sealant joint details.

B. Product Data: Submit manufacturer's literature for each sealant material.

C. Material Samples: Submit Samples indicating color range available for each sealant material intended for installation in exposed locations.

D. Certifications: Submit manufacturer's certification materials comply with requirements specified.

E. Site Samples: At locations required, provide a Sample of sealant for each typical installation, approximately 24 inches long, including joint preparation, backing, sealant and tooling. Allow backing to extend 6 inches beyond end of sealant for inspection of substrate.

F. Test Reports: Submit manufacturer's adhesion compatibility test reports according to ASTM C794 for each substrate.

1.03 QUALITY ASSURANCE

A. Qualifications of Installer: The Work of this section shall be installed by a firm which has been in the business of installing similar materials for at least five consecutive years; and can show evidence of satisfactory completion of five projects of similar size and scope. Installer shall have applicators trained and approved by manufacturer for performing this Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store in accordance with manufacturer's recommendations. Provide a uniform ambient temperature between 60 and 80 degrees F.

1.05 WARRANTY

A. Manufacturer: five year material warranty.

B. Installer: two year installation/application warranty.

PART 2 - PRODUCTS

2.01 GENERAL

A. Furnish sealants meeting following in-service requirements:

1. Normal curing schedules are permitted.

2. Non-staining, color fastness (resistance to color change), and durability when subjected to intense actinic (ultraviolet) radiation are required.

B. Furnish the products of only one manufacturer unless otherwise required, sealant colors as selected to match the adjoining surfaces.

2.02 MANUFACTURERS

A. Sealants must be approved by LAUSD's Office of Environmental Health and Safety (OEHS). Check OEHS website for approved products. Not all products by a manufacturer are approved by OEHS.

2.03 MATERIALS

A. Sealants:

1. Sealant 1: Acrylic latex, one-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C834, Type S, Grade NS, formulated to be paintable.

a. Tremco Inc., Acrylic Latex Caulk.

b. Pecora Corporation, AC-20.

c. Equal.

2. Sealant 2: Butyl sealant, one-part, non-sag, solvent-release-curing sealant complying with ASTM C1311, gun grade and formulated with a minimum of 75 percent solids.

   a. Tremco Inc., Tremco Butyl Sealant.

   b. Pecora Corp., BC-158.

   c. Equal.

3. Sealant 3: Silicone sealant, one-part non-acid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.

   a. Dow Corning Corp., Dow Corning 790, 791, 795.

   b. General Electric Co., Silpruf.

   c. Tremco, Inc., Spectrem 1.

   d. Pecora Corp., 864.

   e. Equal.

4. Sealant 4: One-part mildew-resistant silicone sealant, complying with ASTM C920, Type S, Grade NS, Class 25.

   a. Dow Corning Corp., Dow Corning 786.

   b. General Electric Co., Sanitary 1700.

   c. Tremco, Inc., Proglaze White.

   d. Equal.

5. Sealant 5: One-part non-sag urethane sealant, complying with ASTM C920, Type S, Grade NS, Class 25.

   a. Sika Corporation, Sikaflex -221e.

   b. Equal.

6. Sealant 6: Multi-part pouring urethane sealant, complying with ASTM C920, Type M, Grade P, Class 25.

   a. Sika Corporation, Sikaflex 2C NS/SL.

   b. Equal.

7. Sealant 7: Acoustical sealant, non-drying, non-hardening permanently flexible conforming to ASTM D217.

   a. Pecora Corp., BA-98 Acoustical Sealant.

b. Equal.

B. See 07 8413 - Penetration Firestopping for rated sealants.

C. .Joint Backing: ASTM D1056; round, closed cell Polyethylene Foam Rod; oversized 30 to 50 percent larger than joint width, reticulated polyolefin foam.

D. Primer: Non-Staining Type. Provide primer as required and shall be product of manufacturer of installed sealant.

E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer.

F. Sealants shall have normal curing schedules, shall be nonstaining, color fast and shall resist deterioration due to ultraviolet radiation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that joint openings are ready to receive Work and field tolerances are within the guidelines recommended by sealant manufacturer.

3.02 SURFACE PREPARATION

A. Joints and spaces to be sealed shall be completely cleaned of all dirt, dust, mortar, oil, and other foreign materials which might adversely affect sealing Work. Where necessary, degrease with a solvent or commercial degreasing agent. Surfaces shall be thoroughly dry before application of sealants.

B. If recommended by manufacturer, remove paint and other protective coatings from surfaces to be sealed before priming and installation of sealants.

C. Preparation of surfaces to receive sealant shall conform to the sealant manufacturer's specifications. Provide air pressure or other methods to achieve required results. Provide masking tape to keep sealants off surfaces that will be exposed in finished Work.

D. Etch concrete or masonry surfaces to remove excess alkalinity, unless sealant 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, rinse thoroughly with water and allow to dry before sealant installation.

E. Perform preparation in accordance with ASTM C804 for solvent release sealants, and ASTM C962 for elastomeric sealants.

F. Protect elements surrounding Work of this section from damage or disfiguration.

3.03 SEALANT APPLICATION SCHEDULE

	Location	Type	Color
A.	Exterior and Interior joints in horizontal surfaces of concrete;	Sealant 6	To match adjacent material

	between metal and concrete masonry and mortar.		
B.	Exterior door, entrance and window frames. Exterior and interior vertical joints in concrete and masonry metal flashing.	Sealant 3 or 5	To match adjacent material
C.	Joints within glazed curtain wall system. Skylight framing system. Aluminum entrance system glass and glazing.	Sealant 3	Translucent or Black
D.	Interior joints in ceramic tile and at plumbing fixtures.	Sealant 4	Translucent or White
E.	Under thresholds.	Sealant 2	Black
F.	All interior joints not otherwise scheduled	Sealant 1	To Match Adjacent Surfaces
G.	Heads and sills, perimeters of frames and other openings in insulated partitions	Sealant 7	Match Adjacent Surfaces

3.04 APPLICATION

A. Provide sealant around all openings in exterior walls, and any other locations indicated or required for structure weatherproofing and/or waterproofing.

B. Sealants shall be installed by experienced mechanics using specified materials and proper tools. Preparatory Work (cleaning, etc.) and installation of sealant shall be as specified and in accordance with manufacturer's printed instructions and recommendations.

C. Concrete, masonry, and other porous surfaces, and any other surfaces if recommended by manufacturer, shall be primed before installing sealants. Primer shall be installed with a brush that will reach all parts of joints to be filled with sealant.

D. Sealants shall be stored and installed at temperatures as recommended by manufacturer. Sealants shall not be installed when they become too jelled to be discharged in a continuous flow from gun. Modification of sealants by addition of liquids, solvents, or powders is not permitted.

E. Sealants shall be installed with guns furnished with proper size nozzles. Sufficient pressure shall be furnished to fill all voids and joints solid. In sealing around openings,

include entire perimeter of each opening, unless indicated or specified otherwise. Where gun installation is impracticable, suitable hand tools shall be provided.

F. Sealed joints shall be neatly pointed on flush surfaces with beading tool, and internal corners with a special 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 installed.

G. Comply with sealant manufacturer's printed instructions except where more stringent requirements are indicated on Drawings or specified.

H. Partially fill joints with joint backing material, furnishing only compatible materials, until joint depth does not exceed 1/2 inch joint width. Minimum joint width for metal to metal joints shall be 1/4 inch. Joint depth, shall be not less than 1/4 inch and not greater than 1/2 inch.

I. Install sealant under sufficient pressure to completely fill voids. Finish exposed joints smooth, flush with surfaces or recessed as indicated. Install non-tracking sealant to concrete expansion joints subject to foot or vehicular traffic.

J. Where joint depth prevents installation of standard bond breaker backing rod, furnish non-adhering tape covering to prevent bonding of sealant to back of joint. Under no circumstances shall sealant depth exceed 1/2 inch maximum, unless specifically indicated on Drawings.

K. Prime porous surfaces after cleaning. Pack joints deeper than 3/4 inch with joint backing to within 3/4 inch of surface. Completely fill joints and spaces with gun applied compound, forming a neat, smooth bead.

3.05 MISCELLANEOUS WORK

A. Sealing shall be provided wherever required to prevent light leakage as well as moisture leakage. Refer to Drawings for condition and related parts of Work.

B. Install sealants to depths as indicated or, if not indicated, as recommended by sealant manufacturer but within following general limitations:

1. For joints in concrete walks, slab and paving subject to traffic, fill joints to a depth equal to 75 percent of joint width, but not more than 3/4 inch deep or less than 3/8 inch deep, depending on joint width.

2. For building joints, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

3.06 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.07 CURING

A. Sealants shall cure in accordance with manufacturer's printed recommendations. Do not disturb seal until completely cured.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 95 13

EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section

1.02 SUMMARY

A. Section Includes: Wall and Ceiling locations for Interior use.

B. Related Sections:

C.

1. Section 07 62 00 – Sheet Metal Flashing and Trim.
2. Section 09 29 00 – Gypsum Board.

1.03 REFERENCES

A. Reference Standards.

ASTM C509 – Elastomeric Cellular Preformed Gasket and Sealing Material

ASTM C864 – Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

ASTM C1107 – Packaged Dry, Hydraulic Cement Grout (Nonshrink)

ASTM D2000 – Rubber Products in Automotive Applications

ASTM D2628 – Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements

ASTM D3542 – Preformed Polychloroprene Elastomeric Joint Seals for Bridges

ASTM D4070 – Adhesive Lubricant for Installation of Preformed Elastomeric Bridge Compression Seals in Concrete Structures

ASTM E119 – Fire Tests of Building Construction and Materials

ASTM E814 – Fire Tests of Penetration Firestop Systems

ASTM E1399 – Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems

AA DAF-45 – Designation from Start to Finish

AAMA 2603-02 – Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions

and Panels

NAAMM / NOMMA 500-06 – Metal Finishes Manual

1.04 DESIGN REQUIREMENTS

A. Assemblies shall be designed to accommodate vertical and horizontal shearing movement and rotational movement caused by seismic activity as well as horizontal movement caused by thermal expansion and contraction. Components of joint cover assemblies shall be designed for indicated or required dynamic structural movement without material degradation or fatigue when tested in accordance with ASTM E1399.

B. The seismic gap shown on the drawings shall not be defeated by any part of the assembly.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications, installation instructions, details of construction, dimensions, profiles and finishes.

B. Samples: Submit 8 inch long sections of exposed cover assemblies showing material quality and finishes.

C. Samples: Submit 8 inch long sections for each type of expansion control system indicated.

D. Product Schedule: Prepared by or under supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion control system.
2. Expansion control system location cross-referenced to Drawings.
3. Nominal joint width.
4. Movement capability.
5. Classification as thermal or seismic.
6. Materials, colors, and finished.
7. Product options.
8. Fire-resistance ratings.

E. Submittal procedures and quantities are specified in Section 01 33 00.

1.06 REGULATORY REQUIREMENTS

A. Comply with 2016 California Building Code (CBC) and California Fire Code (CFC).

1.07 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain expansion joint cover assemblies from one source from a single manufacturer.

B. Regulatory Requirements: Joint cover assemblies used in fire rated floor and wall assemblies shall bear the label of Underwriters' Laboratories or other testing agency

acceptable to the State Fire Marshal, indicating that the joint cover assemblies have been tested in accordance with ASTM E119 and have hourly rating(s) equal to those of the floor, wall, or ceiling assembly in which they occur.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary protective cover on anodized aluminum finished surfaces.

B. Store cover assembly sections out of contact with the ground and under a weathertight covering. Do not cover assemblies with polyethylene film or similar coverings that will create a humidity chamber. Store in a clean dry location.

C. Protect factory coated surfaces during shipping and handling to prevent scratching, gouging or other damage to the finish.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.

B. Compression Seals: ASTM E 1612; preformed elastomeric extrusions having an internal baffle system and designed to function under compression.

C. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.

D. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.

E. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.

F. Moisture Barrier: Flexible elastomeric material, PVC, minimum 30 mils thick EPDM, minimum 45 mils thick and/or Santoprene.

G. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

H. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.02 EXPANSION JOINT SYSTEM

A. Wall and Ceiling Joint Assemblies: Provide units for wall, ceiling, and corner applications as indicated. Acceptable product manufacturers include the following:
   1. Basis of Design: MM Systems Corporation VSW 200 and VSWL 200 series, Pendergrass Georgia, M: 951.834.3373, O: 951.505.5813,

james.foy@mm-usa.com, www.mm-usa.com.

2. Construction Specialties, Inc.

2.03 ELASTOMERIC / NEOPRENE COMPRESSION SEALS

A. Provide for interior walls and ceilings and where indicated, elastomeric shall accommodate vertical and horizontal shearing movement, rotational movement, and horizontal movement caused by thermal expansion and contraction.

B. Exposed primary seal shall be color selected by Architect from manufacturers standard colors.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install joint assemblies in compliance with the Drawings and the manufacturer's printed instructions.

B. Heat weld or bond splices.

C. Provide single length joint assemblies only.

D. Miter and heat weld all corners.

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Hollow metal doors and frames or hollow metal doors as indicated.
2. Hollow metal window frames or hollow metal door and window frames.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 07 9200 - Joint Sealants.
3. Section 08 1416 - Flush Wood Doors.
4. Section 08 7100 - Door Hardware.
5. Section 08 8000 - Glazing.
6. Section 09 9000 - Painting and Coating.
7. Section 28 1600 - Intrusion Detection Systems.

1.02 DESIGN REQUIREMENTS

A. Door-and-frame assemblies or frames shall include reinforcing and provisions for hardware as shown and specified. Drawings indicate profile and general details of steel frame fabrication and installation.

1.03 SUBMITTALS

A. Shop Drawings: Submit composite Shop Drawings indicating detailed relationships of installation including Work of adjacent construction, finish hardware, security, fire and life safety devices, glazing, sealing, and requirements for field installation. Include elevations of each hollow metal door type, details of each frame type, location schedule of doors and frames indicating same reference for details and openings as indicated on Drawings, conditions of openings of various wall sections and materials, typical and special details of construction, methods of assembling sections, location and installation requirements for hardware, material size, shape, and thickness, and joints and connections.

B. Product Data: Submit manufacturer's Product Data indicating composition and construction for each fabricated item including louvers, coatings, finishes, and other components demonstrating compliance with referenced standards.

C. Certification: Submit certification of compliance with referenced standards and specified criteria, including but not limited to fire ratings in accordance with UL 10C, Physical Endurance in accordance with ANSI A250.4 and Prime Paint performance in accordance with ANSI A250.10..

D. Samples:

1. Hollow Metal Frame: Corner section of typical exterior and interior frame, of sufficient composite size to illustrate corner joint construction, hinge reinforcement, closer re-enforcement, floor anchor, dust cover, and jamb anchors, and showing galvanizing and prime coat finishes.

2. Hollow Metal Door: Section of typical interior door of sufficient composite size to illustrate edge, top, bottom, and core construction, hinge reinforcement and face stiffening, closer reinforcement and kick plate reinforcement, and corner of vision opening construction with glazing beads.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum documented experience of more than five years in work of this section.

B. Installer Qualifications: Minimum documented experience of more than five years in work of this section

C. Coordinate with hardware supplier for fabrication of doors and frames to receive hardware items.

D. Coordinate with intrusion alarm supplier for fabrication of doors and frames to receive intrusion detection devices.

E. References: Work shall comply with physical and performance requirements of following standards, including standards referenced in them, except for more stringent provisions specified herein or required by regulatory agencies:

1. ANSI/SDI A250.8, SDI 100 Recommended Specifications for Standard Steel Doors and Fames.

2. ANSI/NFPA 252, Fire Tests of Door Assemblies.

3. ANSI/UL 10B, Fire Tests of Door Assemblies.

4. ANSI/UL 10C, Positive-Pressure Fire Tests of Door Assemblies.

5. ANSI/NFPA 80, Fire Doors and Fire Windows

6. HMMA, Guide Specifications for Commercial Hollow Metal Doors & Frames (Standard of National Association of Architectural Metal Manufacturers).

7. ANSI/SDI A250.4, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings.

8. ANSI A250.10, Test Procedure and Acceptance Criteria for Prime Painted Steel Doors and Frames.

9. ANSI A250.6, Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.

F. Standards of Fabrication and Installation:

1. Finished Work shall be of uniform profile, accurately fabricated, rigid and strong, square and true, neat in appearance, smooth and free from dents, waves, warps, buckles, open joints, tool marks and/or other defects.

2. Steel sheet shall be clean with smooth surfaces free of scale, pitting or other defects.

3. Construction joints shall be flush, tight and welded their full length, ground flush and smooth on exposed surfaces.

4. Frame and door reinforcing and hardware provisions shall be performed in fabrication shop. Provide cuts, welds, and other fabrications before galvanizing or shop priming.

5. Lines and molded members shall be straight and true with angles as sharp as practical for thickness involved, surfaces flat, and fastenings concealed.

1.05 DELIVERY, STORAGE AND HANDLING

A. Frames: Before shipment, install temporary spreaders at bottom of bucks and do not remove until frames are installed.

B. Doors: Provide protection as required to protect doors during shipping and storage. Damaged doors will be rejected.

C. Inspect hollow metal Work upon delivery for damage. Remove and replace damaged items with new Work as required.

D. Store doors and frames in an upright position at Project Site under cover and protected from weather-related elements. Store units on minimum 4-inch high wood blocking with ½ inch air spaces between stacked doors to provide circulation. Do not store

doors and frames under plastic or canvas shelters that can create a humidity chamber. If shipping packaging becomes wet, immediately remove packaging.

1.06 WARRANTY

A. Manufacturer shall provide a five year material warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Doors and frames shall be products of a single manufacturer.

B. The following are acceptable manufacturers, as are others that can demonstrate their products are equivalent in quality, performance and compliance with these specifications.

1. Security Metal Products Corp.

2. Curries Manufacturing, Inc.

3. Steelcraft.

4. Amweld Metal Doors and Frames.

5. Stiles Custom Metal, Inc.

6. Door Components Inc.

7. CECO Door.

8. Equal.

C. Materials, fabrication and installation must comply with requirements of standards referenced in Section 1.04, Quality Assurance.

2.02 MATERIALS

A. Steel:

1. Exterior Doors and Frames: Galvanized Carbon Sheet Steel, Commercial Quality, A60 zinc coating (0.30 ounces per square foot per side), ASTM A653.

2. Interior Doors and Frames: Cold-Rolled Steel Sheets, Commercial Quality Carbon Steel, ASTM A1008.

3. Steel shall be free of scale, pitting, coil breaks or other surface blemishes, and free of buckles, waves or other defects.

4. Steel thicknesses expressed in steel gages (MSG) is for reference only. Actual steel thicknesses must meet minimum requirements of ASTM standards and as described in ANSI/SDI A250.8.

B. Supports and Anchors: Fabricate from a minimum 16 gauge galvanized sheet steel unless noted otherwise.

C. Fasteners: Provide as shown on Drawings and to suit conditions of secure installations. Furnish 304 Grade stainless steel types at exterior doors.

D. Door Louvers (prohibited at protected openings):

1. Louver free air flow shall be 50% free area.

2. Louvers for exterior doors shall be galvanized and furnished with not less than 12 gage frame and security grille welded to 18 gage steel blades, fully galvanized, with removable galvanized or bronze insect screen on inside. Install louver with tamperproof-head through-bolts. Anemostat PLSL, Air Louvers Inc. Model 1500-A, L & L Louvers, or equal.

3. Louvers shall be comply with SDI 111C and be furnished with factory primer.

E. Vision panels: Manufacturer's standard, U.L. approved, finished flush with door face, with no visible fasteners on either door face.

F. Shop Paint:

1. Conform to Steel Structures Painting Council (SSPC) for steel components.

2. Pretreatment/priming coatings shall be compatible with Project site finish painting system in accordance with Section 09 9000.

3. At frames to be grouted, surfaces that are inaccessible after installation shall be coated with bituminous or asphaltic base paint.

2.03 FABRICATION GENERAL

A. General: Fabricate hollow metal units to be rigid, neat in appearance, and free from defects including warp or buckle.

1. Accurately form metal to required sizes and profiles. Fit and assemble units in manufacturer's plant. Where practical, factory or shop fit and assemble units for shipment.

2. Weld joints continuously; grind, dress, and make smooth, flush, and invisible. Filler to conceal manufacturing defects or damage is not permitted.

3. Corner Joints: Finish corner joints by mitering, or coping and butting, or a combination of both. Trim and backbend shall be continuous around corner.

4. Continuously weld joints for full depth and width of frame, trim, and backbends.

5. Clearances for Fire-Rated Doors: As required by NFPA 80.

2.04 FRAMES

A. General: Provide fully welded steel frames with integral stops and trim for doors, transoms, sidelights, borrowed lights, and other openings, and with details indicated for type and profile. Use concealed fastenings, unless otherwise indicated.

B. Metal Thickness of Frames (minimum):

1.	Interior hollow metal frames up to 4-foot wide	16 gage
2.	Interior hollow metal frames wider than 4-foot	14 gage
3.	Exterior hollow metal frames	14 gage
4.	Borrowed lights up to 4-foot wide	16 gage

C. Supports and Anchors: Fabricate from at least 16-gage, galvanized steel sheet. Frame anchors shall comply with fire rated label requirements of opening.

1. Floor Anchors:

a. Minimum thickness: 12 gage galvanized steel sheet or bent steel plate, securely fastened inside each jamb, with two holes in anchor at each jamb for 3/8 inch floor anchorage fasteners. For preframed wood stud walls provide and additional wood stud anchor located as close to the bottom of the jamb as is practical.

b. Where required at sloping and uneven floor conditions, or to coordinate adjustments for trim alignments, provide adjustable floor anchors, providing at least 2-inch height adjustments.

2. Jamb Anchors:

a. Locate anchors near top and bottom and at intermediate points not to exceed 24 inches on center. Provide two anchors per head for openings up to 48 inches wide; over 48 inches wide provide anchors at 24 inches on center maximum.

b. Anchors in masonry construction: Provide manufacturers standard jamb anchors. Steel wire complying with ASTM A510, 0.177 inch in diameter, may be furnished.

c. Anchors in Stud Partitions: Provide steel anchors, 16 gage minimum sheet steel, of design to suit partition construction, securely welded inside each jamb.

d. Through-Frame Anchors: At frames indicated to be anchored with bolts through frame, provide countersunk holes for bolts with 16 gauge minimum sheet steel stiffeners full thickness of frame, and securely welded inside each frame at each hole.

D. Inserts, Bolts, and Fasteners: Provide manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A153 Class C or D as required.

E. Head Reinforcing: Refer to Detail #2 of this section. Reinforcing shall not act as lintel or load-carrying member and shall comply with fire rating requirements. Provide at frames regardless of whether a closer is called for.

F. Hardware Reinforcement and Accessories:

1. Butt Hinge: 7 gage minimum.

2. Continuous hinge: 14 gage continuous strip reinforcing.

3. Head assemblies: Reinforced internally with, full length, 10 gage angles on each side of frame and bar at bottom of stop for closer reinforcement in frames as shown in Detail #2 of this section.

4. Reinforcing for other items of finish hardware shall be accomplished according to ANSI A250.6.

5. Plaster Guards: Provide 26 gage galvanized steel plaster guards or dust cover boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

G. Mullion and Transom bars: Furnished and fabricated as specified for frames.

H. Glazed Openings: Applied stops with mitered or butted corners, of minimum 18 gage galvanized steel, one-piece lengths, secured within 3" of ends and at 12" centers with oval head countersunk tamper resistant screws. Corner joints shall be furnished with contact edges closed tight, with trim faces mitered and continuously welded. Frames for multiple openings shall be provided with mullion and/or rail members, fabricated of closed tubular shapes with no visible seams or joints. Joints between faces of

abutting members shall be securely welded and finished smooth. Provide condensate weeps 4 inches on centers, maximum.

I. Door Silencers: Except for exterior doors, drill and punch frames for three silencers at lock jamb of single swing doors or in double doors with astragal and one silencer per leaf in heads of doubled door frames.

J. Where frames are installed in walls sitting on a concrete curb, provide a closure plate or extend backbends to provide closure where frame abuts concrete curb.

2.05 DOORS

A. General: Custom-made, flush-panel "seamless type" with one-piece face panels; continuous weld, seamless edge construction with no visible seams or joints on faces or on vertical edges.

1. Provide type and size of doors shown with louvers and openings for glazing where indicated.

2. Door thickness: 1 ¾ inches.

3. Face Sheet Minimum Gage: 16 gage.

4. Stiffeners: Stiffen door face sheets with continuous vertical-formed steel (rib) sections or back to back hat sections, minimum 20 gage, full thickness of interior space between door faces, spaced 6" on center maximum, and spot welded to both faces 4" on center maximum.

5. Acoustical Insulation: Provide sound deadening and insulating material through entire core of door (full height, width, and thickness of door). Provide STC ratings where indicated on Drawings, scheduled, or for partition ratings indicated on Drawings.

   a. Doors shall have a minimum STC of 28 as tested under ASTM E90 and ASTM E413, unless noted otherwise..

6. Thermal Insulation: Exterior doors shall be insulated to R values scheduled or indicated on drawings.

7. Labeled Doors: Where fire-rated openings and conditions are indicated.

   a. Labeled doors shall be provided with fire-resistance rating indicated and shall be constructed as tested and approved by Underwriters' Laboratories (UL) for installation in labeled frame and door assemblies.

   b. Gaskets: Gaskets are supplied under Section 08 7100 - Door Hardware. Gaskets and installation shall conform to requirements of

CBC 716.5.3.1 and NFPA 105, "Installation of Smoke and Draft Control Door Assemblies."

c. Fabricate labeled doors with same finished appearance as specified for non-labeled hollow metal doors; with welded door edges, filled and ground smooth; with label affixed to door.

d. Where fire labels are required and continuous hinge is specified, install label on top of door within 6" of hinge side of door.

8. Door Edges: Join door face sheets at vertical edges of door with continuous weld full height of door. Grind, fill, and dress welds smooth to provide invisible seam with smooth, flush surface.

a. Close ends of doors with continuous recessed channels, 16 gage steel minimum, spot welded to both face sheets. Close top and bottom edges of doors with a internal steel channel, screw attached into top and bottom of door. Channel shall be galvanized at exterior doors. No screws are allowed on visible faces of door. Provide openings in bottom closure of exterior doors to permit escape of entrapped moisture.

b. Profile of Door Edges:

1) Single-acting swing doors: Bevel both vertical edges 1/8" in 2".

2) Pairs of single-acting swing doors: Bevel hinge edge 1/8" in 2". Provide surface mounted astragals for labeled or unlabeled doors unless otherwise shown on Drawings or required.

3) Double-acting swing doors: Round both vertical edges on 2" minimum radius.

9. Door Louvers: Install according to manufacturers recommendations.

10. Glass Stops:

a. Furnish fixed stops integral with and welded at security side of door.

b. Finish: Factory primer.

11. Transom: Fabricate to requirements specified for flush doors.

K. Hardware Reinforcement and Accessories:

1. Provide sheet steel or plate reinforcement for finish hardware items wherever necessary. Mortise, drill and tap to template requirements for mortise type hardware.

2. Butt reinforcing: 7 gage minimum, of length 4" longer than length of butt. Minimum 3 spot welds at top and bottom.

3. Door closer reinforcement: 14 gage minimum steel channel, 6" high on each side of door.,. Reinforcement to extend full width of door in accordance with Detail #1 of this section.

4. Other Hardware Requirements: Cut, reinforce, drill, and tap doors and frames for other hardware, including energy management switches or contacts and security devices, in accordance with furnished hardware templates for accessory items. Thickness and size of reinforcement shall be as required by ANSI A250.6.

2.06 SHOP PRIMING

A. Exposed and concealed metal surfaces of hollow metal doors, frames and other hollow metal Work of this Section shall be bonderized and then shop primed.

B. Exposed surfaces of doors, frames and accessories shall be filled, sanded smooth and cleaned before painting.

C. Exposed surfaces shall be shop primed after assembly.

PART 3 - EXECUTION

3.01 FRAME INSTALLATION

A. Install steel frames accurately in location, perfect alignment, plumb, straight and true. Brace frames to prevent displacement.

B. Anchor frames in concrete and concrete unit masonry with galvanized anchor bolts; 3/8 inch diameter, counter-sunk at 24 inches on center at head and jamb unless noted otherwise.

C. Anchor frames in steel and wood frame partitions with manufacturer recommended anchors.

D. Install frame at fire rated openings in accordance with NFPA Standard No. 80.

E. Furnish filler for anchor attachment screws, and sand smooth.

3.02 DOOR INSTALLATION

A. Install steel doors in accordance with manufacturer's instructions and as indicated on Drawings and in Finish Hardware Specifications. Coordinate with Work of other trades.

B. Ensure that door and jamb clearances comply with requirements of ANSI/NFPA 80. When wood doors are being installed in metal frames constructed pursuant to this section, allowable door and jamb clearances shall be as specified in Specification Section 08 1416.

C. Adjust operable parts for correct function.

D. Remove hardware, except primer-coated items, tag, box and install after finish painting has been completed.

3.03 PRIME COAT TOUCH-UP

A. Immediately after installation, remove rust, repair damaged surfaces to new condition, sand smooth, and install touch-up primer.

3.04 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

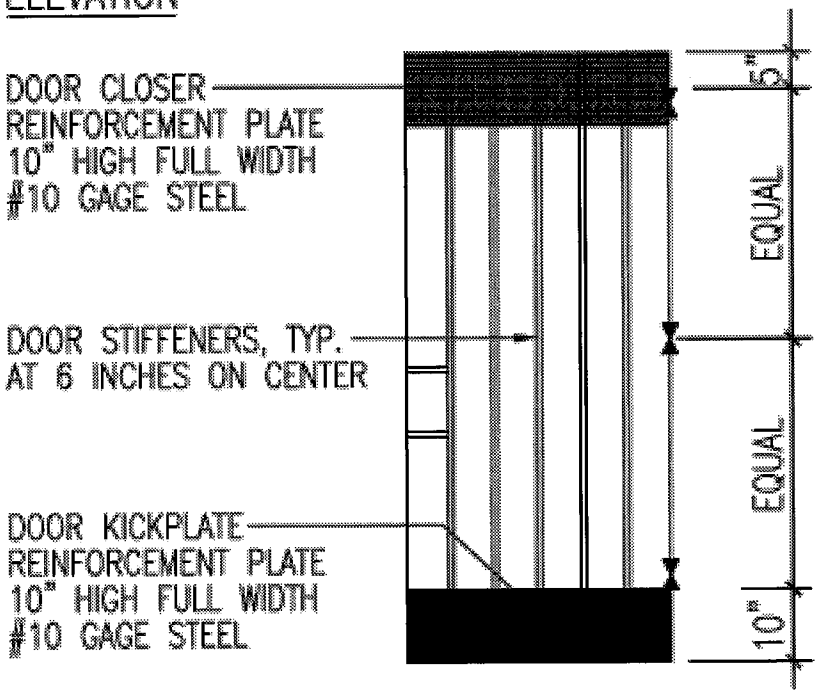
3.05 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

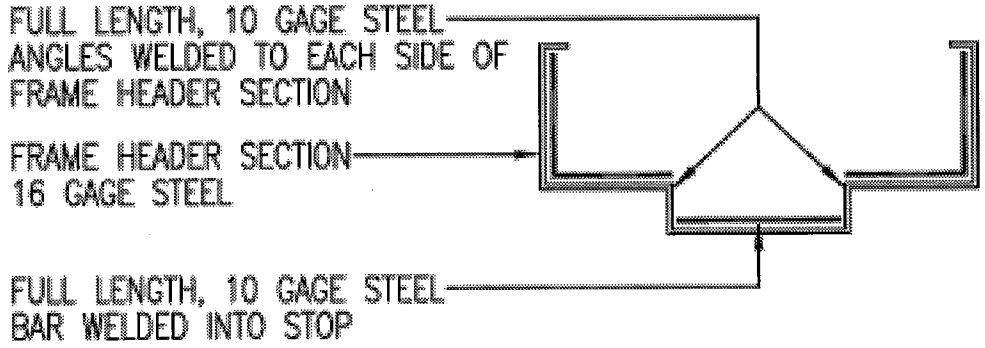
DETAIL # 1 - DOOR REINFORCEMENT

ELEVATION



DETAIL # 1 - DOOR HARDWARE REINFORCEMENT

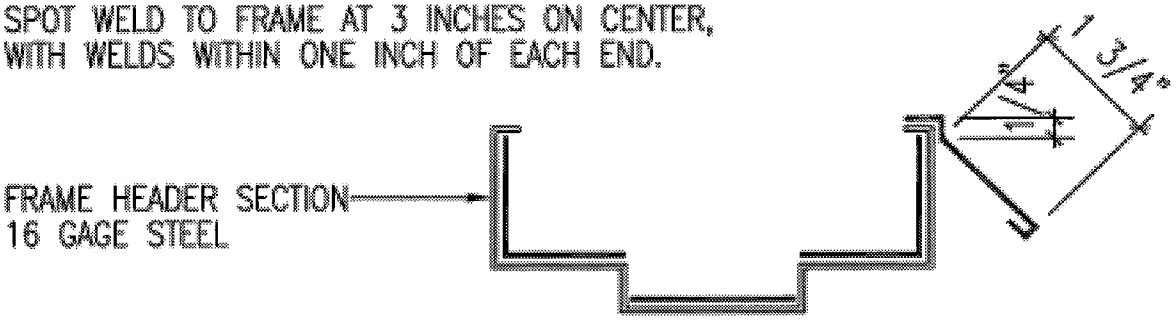
DOOR CLOSER REINFORCEMENT FOR ALL STEEL DOOR FRAMES



DETAIL # 3 – CONCRETE WALL CONDITION

DETAIL FOR EXTERIOR DOOR WHERE RAIN DRIP IS REQUIRED.
EXTERIOR SIDE WITH 22 GAGE GLAVANIZED SHEET METAL OR PAINT LOCK RAIN DRIP WELDED IN PLACE.

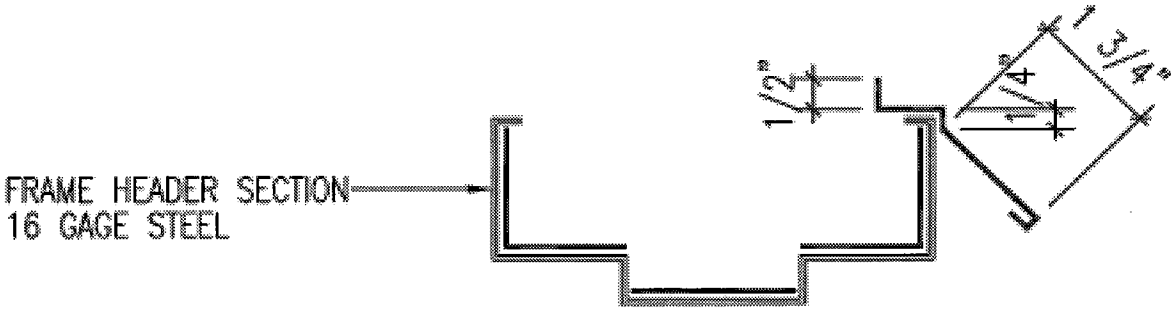
SPOT WELD TO FRAME AT 3 INCHES ON CENTER, WITH WELDS WITHIN ONE INCH OF EACH END.



DETAIL # 3A – PLASTER WALL CONDITION

DETAIL FOR EXTERIOR DOOR WHERE RAIN DRIP IS REQUIRED.
EXTERIOR SIDE WITH 22 GAGE GLAVANIZED SHEET METAL OR PAINT LOCK RAIN DRIP WELDED IN PLACE.

SPOT WELD TO FRAME AT 3 INCHES ON CENTER, WITH WELDS WITHIN ONE INCH OF EACH END.



SECTION 08 1116

INTERIOR ALUMINUM DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pre-finished aluminum door frames for interior use.
2. Pre-finished aluminum window frames for interior use.
3. Pre-finished aluminum framing system for interior use.
4. Pre-finished aluminum doors for interior use.

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in interior aluminum doors.
2. Division 08 Sections "Flush Wood Doors" for wood doors used in interior aluminum frames.
3. Division 08 Sections "Door Hardware" for door hardware used on interior aluminum doors and frames.
4. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on interior aluminum frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. AAMA 603.8 - Performance Requirements and Test Procedures for Pigmented Organic on Extruded Aluminum.
2. AAMA 607.1 - Guide Specification and Inspection Methods for Clear Anodized Finishes for Architectural Aluminum.
3. AAMA 608.1 - Guide Specification and Inspections Methods for Electrolytically Deposited Color Anodic Finished for Architectural Aluminum.
4. AAMA 609 & 610-02 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum.
5. ASTM B221 - Standard Specification for Aluminum and Aluminum-alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
6. NAAMM - "Metal Finishes Manual for Architectural and Metal Products".
7. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
8. NFPA 252 - Standard Method of Fire Tests of Door Assemblies.
9. ANSI A117.1 - Accessible and Usable Buildings and Facilities
10. ICC/IBC - International Building Code.

1.02 SUBMITTALS

A. Submit under provisions of Section 01 3300.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

C. Templates: Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the interior aluminum door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

D. Shop Drawings: Include the following:

1. Frame details for each frame type, including dimensioned profiles.
2. Locations of reinforcement and preparations for hardware.
3. Details of each different wall opening condition. Include requirements for steel framing at partitions for fit and securing of frames, partition widths and tolerances, direction of framing members, clips and attachments.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.
6. Details of moldings, removable stops, and glazing.
7. Elevations of each door design.
8. Details of doors, including vertical and horizontal edge details.
9. Details of preparations for power, signal, and control systems.

E. Samples for verification: Provide, at the request of architect, prepared Samples as indicated below:

1. Framing Member: 12 inches long
2. Corner Fabrication: 12-by-12-inch-long, full size window corner, including full-size sections of extrusions with factor-applied finish.
3. Aluminum chips in full range of manufacturer's standard finishes for architect's color selection.

F. Interior Aluminum Door and Frame Schedule: Use same designations indicated on Drawings. Coordinate with Door Hardware schedule and glazing.

G. Informational Submittals:

H. LEED Documentation: Submit manufacturer's environmental documentation and applicable sustainability program credits for MR-4 and that are specified herein.

I. Certificates of Compliance: Submit any product test report or information necessary to indicate compliance with this specification section.

1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain aluminum frames and doors through one source from a single qualified manufacturer.

B. Manufacturer Qualifications: A firm experienced in the manufacturing of interior aluminum framing systems and doors with a minimum five (5) years successful in-service performance providing product similar to those indicated, including pre-engineering and pre-fabricating all components of aluminum framing systems and doors.

C. Installer Qualifications: An experienced installer with a minimum five (5) years experience who has completed aluminum framing systems and door installations similar in material, design, and extent to those indicated and whose work has resulted in construction with a record of successful in-service performance.

D. Aesthetic Effects: 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. Fire Rated Assemblies: In locations where fire-rated openings are scheduled or required by regulatory agencies, provide fire-rated aluminum frames that have been tested and certified for specified exposure by an agency acceptable to governing authorities.

F. Provide labels permanently fastened on each frame that is within size limits established by NFPA and the testing authority. Provide labels for openings as scheduled on the drawings.

G. Pre-Installation Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing interior aluminum frames and doors and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver interior aluminum frames and doors individually protective wrapped within cartons and marked for the corresponding scheduled opening. Do not bulk pack frames.

B. Inspect frames upon delivery for damage.

C. Repair minor damage to pre-finished products as recommended by Manufacturer.

D. Replace frames that cannot be satisfactorily repaired.

E. Store Interior aluminum frames and doors at Project site under cover and as near as possible to final installation location. Do not use covering material that will cause discoloration of aluminum finish.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of interior aluminum frame openings by field measurements before fabrication and indicate measurements on Shop Drawings submittals.

B. Do not begin installation of aluminum frames and doors until area of work has been completely enclosed and interior is protected from the elements.

C. Maintain temperature and humidity in areas of installation within reasonable limits, as close as possible to final occupancy standards. If necessary, provide artificial heating, cooling, and ventilation to maintain required environmental conditions.

1.06 WARRANTY

A. Provide manufacturer's written warranty against defects in materials and workmanship upon final completion and acceptance of Work in this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Western Integrated Materials, Inc.
   3310 E. 59TH St., Long Beach, CA 90805
   Telephone: 562-634-2823
   Fax: 562-634-8449
   Web Site: www.western-integrated.com

2. Equal

B. Acceptable Products:

1. Western Integrated Materials, Inc. - Interior Aluminum Frames
2. Western Integrated Materials, Inc. - Interior Aluminum Swinging Doors

2.02 MATERIALS

A. Extruded Aluminum: Controlled ASTM B221 alloy billets of 6063-T5, to assure compliance with tight dimensional tolerances and maintain color uniformity.

B. Recycled Content of Aluminum Products: Post consumer recycled content plus pre consumer recycled content not less than 50 percent.

2.03 EXTRUDED INTERIOR ALUMINUM FRAMES

A. Provide interior aluminum framing components complying with dimensions, profiles, and relationships to adjoining work of components as indicated on Drawings. Provide frames that are fitted for partition types and throat openings meeting the throat opening and required clearances per frame manufacturer's recommendations. Reinforce for specified hinges, strikes, closers, and other hardware as required.

B. Western Integrated Materials Series 300, and 700 Frames: Provide frames with the following characteristics:

1. Rectilinear design.
2. 1-1/2" face profiles.
3. Trim:
   a. (304) 1-1/2" with 5/16" return (flush trim)
4. Series 300 Throat (drywall partition) sizes : 3-3/8", 3-3/4", 3-7/8", 4-5/8", 4-3/4", 4-7/8", 5", 5-1/4", 5-1/2", 6", 7-1/4" as required by wall type.
5. Series 700 (90 Minute Positive Pressure Fire Rated) Throat (drywall partition) sizes:From 3-3/4" to 8-3/8"as required by wall type.

C. Fire Rated Frames: Fabricate frames in accordance with NFPA80, listed and labeled by a qualified testing agency.

1. 300 Series Door Frames only may be rated up to 20 Minute Positive Pressure.
2. 700 Series Door Frames only are rated at 90 Minute Neutral or Positive Pressure.

2.04 INTERIOR ALUMINUM DOORS

A. General: Provide 1-3/4 inch doors of type and design indicated, not less than 1.10 inch thick material.

B. Aluminum Stile & Rail Type Swinging Doors: Door Stiles and rails to have tubular design with the following characteristics:

1. Stiles:
   a. Wide Stile (5")
2. Rails:

a. 5" Rail
3. Snap-in stops with factory applied glazing gaskets for 1/4", 3/8", or 1/2" thick glass.
4. Hardware as specified in Division 08 Section, "Door Hardware".

C. Interior Aluminum Door Glazing:

1. Glass and Glazing System: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum-framed glass doors unit.
2. Fixed panels shall be constructed to allow for field glazing. Panel glazing shall be accomplished using a "marine" style reusable, wraparound black flexible PVC or EPDM material per commercial standard CS23060 without the need for separated glazing beads or putty style bedding compounds. The glazing channel shall be provided with the unit for 1/4" and 3/8" glass.

2.05 ACCESSORIES

A. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.

B. Door Silencers: Manufacturer's standard continuous mohair, wool pile, or vinyl seals.

C. Glazing Gaskets: Manufacturer's standard extruded or molded plastic, to accommodate glazing thickness indicated.

D. Glazing: Comply with requirements in Division 08 Section, "Glazing."

E. Hardware: As specified in Division 08 Section, "Door Hardware".

2.06 FRAME FABRICATION

A. Factory pre-engineer and pre-cut interior aluminum frame components to the greatest extent practical. Linear glazing components fabricated in the field are not allowed. If necessary, allow for 2 inches excess vertical length for scribing to suit floor conditions. Face trim to be pre-cut to match jamb lengths. Machine jambs and prepare for hardware, with concealed plates, drilled and tapped as required, fastened in frame with concealed screws. Provide concealed corner reinforcements and alignment clips for precise joints at butt or mitered connections.

B. Hardware Preparation: Factory interior aluminum frames to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates as specified in Division 08 section, "Door Hardware".

C. Reinforce frames to receive surface mounted door hardware. Machine jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required and fastened within frame with concealed screws.

D. Locate hardware as indicated.

E. Coordinate locations of conduit, wiring boxes, and power transfers for electrical connections with Division 26 Sections.

F. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.

G. Fabricate all components to allow secure installation without exposed fasteners.

2.07 INTERIOR ALUMINUM DOOR CONSTRUCTION

A. Factory pre-engineer aluminum doors and components to the greatest extent practical.

B. Hardware Preparations: Factory interior aluminum doors to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tap ping according to the Door Hardware Schedule and templates as specified in Division 08 Section, "Door Hardware:.

C. Reinforce doors to receive surface mounted door hardware. Machine and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required and fastened within door with concealed screws.

D. Locate hardware as indicated.

E. Coordinate locations of conduit and power transfers for electrical connections with Division 26 Sections.

F. Clearances for Non-Fire-Rated Door Frames: Not more than 1/8" at jambs and heads, not more than 1/4" between pairs of doors. Not more than 3/4" at bottom.

G. Fabricate kits for glazing with removable stops to allow glazing replacement without dismantling.

2.08 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for apply and designated finishes. Exposed surfaces to be free of scratches and other serious blemishes.

B. Factory finish extruded frame components so that any part exposed to view upon completion of installation will be uniform in finish and color.

C. Acrylic Finish: Comply with AAMA 603.5; baked to assure hardness.

1. Color: As selected from manufacturer's standard colors.
2. Color: As indicated in schedules on the drawings.
3. Custom color to match Architect's sample.

D. Clear anodic coating: Comply with AAMA 607.1 Commercial, AAM12C22A21 clear anodized coating, 0.1 mill minimum thickness.

E. Color anodic coating: Comply with AAMA 608.1 Class II, AAM12C22A34 color coating electrolytically deposited, 0.4 mill minimum thickness.

1. Color: Bronze anodized
2. Color: Black anodized

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify wall thickness does not exceed standard tolerance of +- 1/16".

C. General Contractor to verify the accuracy of dimensions given to frame and door manufacturer for pre-cut openings.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install and set interior aluminum frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. At fire-protection-rated openings, install frames according to NFPA 80.

C. Install frame components in the longest possible lengths with no component less than 48 inches.

D. Use concealed installation clips to produce tightly fitted and aligned splices and connections. Secure clips to extruded main-frame components and not to snap-in or trim members. Do not use screws or other fasteners exposed to view when installation is complete.

3.03 ADJUSTING AND CLEANING

A. Final adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition.

B. Clean exposed frames promptly after installation, using cleaning methods recommended by frame manufacturer and according to AAMA 609 & 610.

C. Touch up marred areas so that touch-up is not visible from a distance of 48 inches. Remove and replace frames that cannot be satisfactorily adjusted.

3.04 PROTECTION

A. Provide protection required to assure that frames and doors will be without damage or deterioration upon substantial completion of the project.

END OF SECTION

SECTION 08 1117

FIRE-RATED ALUMINUM FULL VISION DOORS AND FRAMES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fire-rated aluminum full vision Aluflam door system including pre-finished door, frame, glazing, and hardware.

1.02 RELATED SECTIONS

A. Section 08 8710 - Door Hardware.
B. Section 09 2216 - Non-Structural Metal Framing.
C. Section 09 2900 – Gypsum Board.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
   2. ASTM E2074 Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.

B. National Fire Protection Association (NFPA):
   1. NFPA 80: Standard for Fire Doors and Fire Windows.
   2. NFPA 251: Standard Methods of Tests of Fire Endurance of Building Construction and Materials.
   3. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.

C. Underwriters Laboratories, Inc. (UL):
   1. UL 10C: Positive Pressure Fire Tests of Door Assemblies.

D. Standard Council of Canada:
   1. ULC Standard CAN4-S104: Fire Tests of Door Assemblies.

E. American National Standards Institute (ANSI):
   1. ANSI Z97.1 Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

F. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201 Categories I and II: Safety Standard for Glazing Materials.

1.04 SYSTEM DESCRIPTION

A. Performance Requirements:

   1. Fire Rating: 45 minutes.

2. Certification: Doors and frames shall be tested in accordance with ASTM E 2074, NFPA 252, UBC 7-2, UL 10C, CAN4-S104.
3. Testing Laboratory: Fire tests shall be conducted by an approved independent testing laboratory, similar to Underwriter's Laboratories, Inc.

1.05 SUBMITTALS

A. Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedure Section.
   1. Shop Drawings: Submit shop drawings showing layouts, profiles and product components.
   2. Samples: Submit samples for finishes, colors and textures.
   3. Technical Information: Submit latest edition of manufacturer's product data providing product description, technical data and installation instructions.

1.06 QUALITY ASSURANCE

A. Listings and Labels:
   Fire rated framing and glazing shall be under current follow-up services by an approved independent agency and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

1.07 DELIVERY, STORAGE AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Deliver materials to specified destination in manufacturer's packaging undamaged, complete with installation instructions.

C. Storage and Protection: Store off ground, under cover, protected from weather, direct sunlight, construction activities and at temperature conditions recommended by manufacturer, +10°F to +110°F.

D. Handling: Protect materials and finish during handling and installation to prevent damage.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

PART 2 - PRODUCTS

2.01 FIRE-RATED ALUMINUM FULL VISION DOORS AND FRAMES

A. Manufacturer: Aluflam North America
   1. Contact: 16604 Edwards Road, Cerritos, CA 90703: Telephone 562.926.9520 Fax 562.404.1394. E-mail info@aluflam-usa.com Website www.aluflam-usa.com, or local representative (www.aluflam-usa.com/contact/representatives.php).

2.02 MATERIALS – ALUMINUM FRAMING

A. Frame construction: Integral structure and glazing stops from extruded and thermally broken aluminum profiles. Filled internally with cement composite material.

B. Dimensions:
   1. Door framing face dimension: 2-½ inch
   2. Depth of door framing: 3-7/16 inch (3-5/8 for 90 Min Door)
   3. Door stile face dimension: 3-9/16 inch (3-3/4 for (90 Min Door)
   4. Door cross rail (if applicable): 3-9/16 inch (N/A for 90 Min Door)

C. Assembly: Frame corners assembled by means of crimped and bonded miter joints.

D. Sealing: Framing system shall insulate against effects of fire, smoke, and heat transfer from either side. Perimeter of the framing system to the rough opening shall be firmly packed with mineral wool insulation.

2.03 MATERIALS – FIRE RESISTANT GLAZING

A. Assemblies shall be glazed with 45 minute rated ¾ inch thick SGG Contraflam 45 fire resistant glazing material as manufactured by Vetrotech Saint-Gobain (www.vetrotechusa.com).
   1. Individual lites shall be permanently identified with a listing mark.
   2. Glazing material installed in "Hazardous Locations" (subject to human impact) shall be certified to meet the applicable requirements for fire rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used In Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
   3. Visible daylight transmission shall be a minimum of 81%. Glazing material shall be optically clear, colorless and free from unusual distortion.

2.04 MATERIALS – GLAZING AND ASSEMBLY ACCESSORIES

A. Fasteners: All fasteners, setting pads, and glazing clips, shall be stainless or zinc-plated steel.

B. Glazing Accessories: The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant intumescent glazing tape. Ceramic setting blocks shall be placed between the metal setting pads and the glazing material. Setting pads and blocks provided by manufacturer.

2.05 FABRICATION

A. Door frames and door leaves shall be furnished pre-assembled. Door assemblies shall be field glazed.

B. Door assemblies shall be factory prepared for field mounting of hardware.

C. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall guarantee dimensions within required tolerance (+ - 1/8"). Obtain approved shop drawings prior to fabrication.

2.06 FINISHES

A. Framing shall be chemically cleaned and pretreated, then finished on all exposed areas with: Anodized – Clear.

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Slight variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.07 DOOR HARDWARE

A. Hardware groups as specified in Section 08 7100 – Door Hardware.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine area to receive doors. Openings shall be plumb, square and within allowable tolerances. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Door installation shall be by a specialty contractor with appropriate experience qualifications; and in strict accordance with the approved shop drawings.

3.03 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Glass and frame should be cleaned using soft clean cloth, chamois leathers, sponges or soft paper. Use clean warm water with a mild detergent. Do not use detergent that contains either alkaline, acids or fluoride! Abrasive cleaning methods can damage surfaces! Clean prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 08 1416

FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wood doors.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 2000 - Finish Carpentry.
3. Section 08 1113 - Hollow Metal Doors and Frames
4. Section 08 7100 - Door Hardware.
5. Section 08 8000 - Glazing.
6. Section 09 9000 - Painting and Coating.

1.02 DESIGN REQUIREMENTS

A. Drawings indicate sizes, locations and general details of wood door construction and installation.

B. Regulatory Requirements:

1. Fire rated doors shall be listed by a nationally recognized testing and certification agency in accordance with local building codes and acceptable to the authorities having jurisdiction. The listed doors shall meet or exceed the requirements of UL10B, NFPA 252 and NFPA 80. All door requiring fire-rating shall carry either a UL or ITS (Intertek Testing Services-Warnock Hersey) label.
2. ASTM E2074 – Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure on Side-Hinged and Pivoted Swinging Door Assemblies.

1.03 SUBMITTALS

A. Shop Drawings: Submit schedules, plans, elevations and details indicating door construction details, opening identification symbols, sizes, door type and grade, fire classification, swing, light and louver cutout size and locations, and undercuts.

B. Product Data: Submit manufacturers technical data for each specified door type, including details of wood species, design and construction, factory finishing specifications and installation instructions.

C. Construction Samples: Submit samples of not less than 6-inch by 6-inch for each type of door to be furnished, showing face, edge and core construction.

D. Color/finish Samples: Submit samples of not less than 4-inch by 6-inch on representative door finish and samples of 3-inch by 8-inch for the exposed edges. Each sample shall bear a label identifying the job name, Architect, Contractor and the Woodwork Insitute finish system number.

E. Certificates:

1. Submit Certificate that solid core doors comply with all requirements of ANSI/WDMA I.S. 1-A.

2. Submit certification that fire rated doors comply with CBC Section 715 or UL 10B.

1.04 QUALITY ASSURANCE

A. Wood doors construction, manufacture, and fabrication shall conform to ANSI/WDMA I.S. 1-A, custom grade, extra heavy duty grade including the latest revisions, and special requirements specified.

B. Doors shall be fabricated, hardware factory fitted and machined, and factory finished, unless noted otherwise.

C. Wood Door Finishes shall comply with the North American Architectural Woodwork Standards (NAAWS) latest edition.

D. Doors shall be products of one manufacturer.

E. Door modifications are not permitted, unless reviewed by the OAR.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturers original, unopened, undamaged containers with identification labels intact.

B. Deliver doors to the Project site only after building has been provided with design temperature and humidity.

C. Store and handle in accordance with ANSI/WDMA I.S.1-A. Store doors protected from exposure to harmful conditions and at temperature and humidity conditions recommended by the manufacturer.

1.06 PROJECT CONDITIONS

A. Do not install doors until building is enclosed and ambient conditions are within the temperature and humidity range to be expected during occupancy.

1.07 WARRANTY

A. Manufacturer shall provide a two year material warranty for exterior doors.

B. Manufacturer shall provide a life time material warranty for interior doors.

C. Installer shall provide a two year fabrication and installation warranty for all doors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide products manufactured by one of the following:

1. Algoma Hardwood Inc.
2. Brentwood Manufacturing.
3. Eggers Industries.
4. Mohawk Flush Door, Inc
5. VT Industries, Inc.
6. Western Oregon Door.
7. Equal.

2.02 DOOR CONSTRUCTION

A. Exterior Flush Doors:

1. Exterior doors shall be furnished as follows:
   a. Transparent Finished (Stained): NAAWS Custom grade, extra heavy duty grade, solid wood core, 5 ply, veneer faces, fully bonded to core.
   b. Opaque Finished (Painted): NAAWS Custom grade extra heavy duty grade, solid wood core, 5 ply, medium density overlay faces, bonded to core.
2. Staved Lumber Core shall be low density, thoroughly kiln-dried wood blocks not more than 2 ½-inches wide, with joints staggered, and random lengths.
3. Edge strips: Shall be kiln-dried birch or maple
   a. Transparent Finished Doors: Same species as face veneer or similar in overall color, grain, character and contrast as the face veneer.
   b. Opaque Finished Doors: Close grain hardwood.
4. Full stile edge strip shall be not less that 2 inches wide. Stiles shall be fully bonded to the core. The outer face stiles shall be full length ¾ inch birch or maple. The inner back stile shall be 1 ¼-inch, 2 ply of similar species which may have four finger joints well staggered or be full lengths.

5. Top rail shall be a minimum of 2 inches with a maximum of three plies. Bottom rail shall be a minimum of 5 inches with a maximum of 6 plies. The outer rail faces shall be full length 7/8 inch of same species as edge strips. The inner rails shall be full length of similar species. Rails shall be fully bonded to core.

6. Crossbanding: Doors shall be furnished with full width crossbanding of properly dried hardwood, 1/16 inch thick, with a density of 52 pounds or higher per cubic foot.

7. Face Veneer for Transparent Finished Doors: NAAWS Custom grade, veneer shall be Grade"A". Minimum thickness shall be 0.0277 inches before sanding and 0.020 inches after sanding of specified face veneer.

   a. Veneer Species: Maple

   b. Veneer Cut: Plain

   c. Veneer Match: Book

   d. Pairs: Matched

8. Opaque Finished Doors: Custom grade medium density overlay hardboard.

9. Adhesive and Bonding: Bonding between veneer plies of wood face panels, and between door faces, frame and core unit shall be fabricated with type I waterproof cross-linking emulsion PVA adhesive.

10. Openings: Openings for lights, louvers and grilles, shall be fabricated by manufacturer, or in a certified door service mill in accordance with manufacturer's details, and in compliance with approved testing agency.

11. Louvers:

    a. Louvers for exterior doors shall be furnished with at least 12 gage frame and security grill welded to 18 gage steel blades, fully galvanized, with removable galvanized or bronze insect screen on inside. Install louver with tamperproof-head through-bolts: Anemostat PLSL, Air Louvers Inc. Model 1500-A, L & L Louvers, or equal.

    b. Louvers shall be furnished with factory primer.

12. Vision Panels: Vision panels in exterior doors shall be framed with Security Grille Glass Stop: Anemostat Sl-IS, Air Louvers Inc. VLF-SG, L & L Louvers, or equal. Install vision panels with tamperproof-head through bolts. Security Grille shall be supplied with manufacturer's standard baked-on enamel finish.

13. Security Grilles: Refer to Section 08 5656.

B. Interior Flush Doors:

1. Interior doors shall be furnished as follows:

a. Transparent Finished (Stained): NAAWS Custom grade. Solid wood core, 5 ply, veneer faced, fully bonded to core.

b. Opaque Finished (Painted): Custom grade. Solid wood core, 5 ply, MDO hardboard face, fully bonded to core.

2. Edge strips: Kiln-dried birch, maple or other material as indicated.

a. Transparent Finished Doors: Same species as face veneer or similar in overall color, grain, character and contrast as the face veneer.

b. Opaque Finished Doors: Close grain hardwood.

3. Full stile edge strip shall be not less that 1 ½ inches wide, two ply stile. Stiles shall be fully bonded to the core. The outer face stile shall be full length ¾ inch birch or maple. The inner back stile shall be ¾ inch of similar species which may have two finger joints fully bonded to core.

4. Top and bottom edge rails shall be full length and may be of glued up stock of similar species as edge strip, white fir or douglas fir, minimum density 24.33 pounds or higher per cubic foot. Top rail shall be minimum of 2 inches. Bottom rail shall be minimum of 5 inches fully bonded to core.

5. Crossbanding: Doors shall be furnished with full width crossbanding of properly dried hardwood or engineered fiber composite material, 1/16 inch thick, with a density of 52 pounds or higher per cubic foot.

6. Face Veneer for Transparent Finished Doors: Custom grade, veneer shall be Grade"A". Minimum thickness shall be 0.0277 inches before sanding and 0.020 inches after sanding of specified face veneer.

a. Veneer Species: Maple

b. Veneer Cut: Plain

c. Veneer Match: Book

d. Pairs: Matched

7. Opaque Finished Doors: Custom grade medium density overlay hardboard.

8. Adhesive and Bonding: Bonding between veneer plies of wood face panel, and between door faces, frame and core unit shall be fabricated with type I or II waterproof adhesives for interior doors.

9. Openings: Openings for lights, louvers and grilles shall be performed by the manufacturer, or in a certified door service mill in accordance with manufacturer's details, and in compliance with testing agency requirements.

10. Louvers (prohibited at protected openings):

a. Louvers for interior doors shall be furnished with at least 12 gage cold rolled steel frames and security grill welded to 18 gage blades:

Anemostat PLSL, Air Louvers Inc. Model 1500-A, L & L Louvers, or equal.

b. Install louvers with tamperproof-head through bolts.

11. Vision Panels: Vision panels in fire labeled doors shall be limited to 100 square inches and be framed with FGS-75 Fire Glass Stop by Anemostat, Air Louvers Inc. Model VLF, or equal and shall be State Fire Marshall listed. Frame shall be supplied with manufacturer's standard baked-on enamel finish. Install with tamperproof-head through bolts. Conform with CBC 716.5.3.2 716.5.5.1, 716.5.6, 716.5.8.1 provisions.

C. Fire Rated Doors:

1. Fire doors must meet the requirements of recognized fire door tests and bear certifying labels of an approved independent testing agency.

2. With exception to the requirements that would adversely affect the fire rating, rated doors shall meet the specifications listed in this section.

3. Door shall be constructed that when installed as an assembly and tested it will pass ASTM E2074 "Standard Test Method for Fire Test of Door Assemblies Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies," and can be rated as required.

4. Reinforcement Blocking: Provide hardware reinforcement blocking of size as required to secure specified hardware. Reinforcement blocking shall be in compliance with the manufacturer's labeling requirements and shall not be of mineral material.

2.03 FINISHING:

A. FACTORY FINISHING:

1. Factory finishing shall be NAAWSI Custom Grade and include all necessary preparation, materials and labor to provide an [Opaque] [Clear Transparent] [Stained Transparent] finish.

2. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

3. Finish: NAAWS [System 5, conversion varnish] [System 9, UV curable, acrylated epoxy, polyester, or urethane] [System 10, UV curable, water based] [or] [System 11, catalyzed polyurethane].

4. Staining: [Match Architect's sample] [As selected by Architect from manufacturer's full range] [None required].

5. Effect: [Open-grain finish] [Filled finish] [Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores].

6. Sheen: [Satin] [Semigloss].

B. JOB SITE FINISHING:

1. Doors indicated to be job site finished shall be factory back primed.

    a. Doors Scheduled for Opaque Paint finish: Prime with one coat of wood primer indicated on Section 09 9000 - Painting and Coating.

    b. DoorsSchedules for Transparent Finish: Prime with stain and first coat of finish as indicated in Section 09 9000 - Painting and Coating.

2. Door Finish: Per Section 09 9000 - Painting and Coating.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install Work of this section as specified in ANSI/WDMA I.S. 1-A. Install fire doors in accordance with NFPA 80.

B. Provide each door accurately cut, trimmed, and fitted to its frame and hardware. Clearance at lock and hanging stile and at top shall not exceed 1/8 inch, and bottom shall not exceed 1/4 inch except where otherwise indicated. Arises shall be rounded to a 1/16 inch radius, and lock rail edges shall be slightly beveled. Screws for hardware shall not be driven but screwed into pre-drilled holes.

C. Doors shall operate freely, but not loosely, without sticking or binding, without hinge-bind conditions and with hardware properly adjusted and functioning.

3.02 CLEAN UP

A. Remove rubbish, waste and debris 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 08 3116

ACCESS PANELS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel access panels, except those specified under Divisions 22 - Plumbing, 23 - HVAC, or 26 - Electrical.

B. Related Sections:

1. Division 01 - General Requirements.
2. Section 09 2423 - Cement Plaster and Metal Lath.
3. Section 09 2900 - Gypsum Board.
4. Section 09 3000 - Ceramic Tiling.
5. Section 09 9000 - Painting and Coating.
6. Division 22 - Plumbing.
7. Division 23 - HVAC.
8. Division 26 - Electrical.
9. Division 27 - Communications.

1.02 SUBMITTALS

A. Shop Drawings:

1. Indicate sizes, materials, thickness, fabrication methods, panel door and frame reinforcement, anchorage, and installation details.
2. Provide layout drawings, indicating dimensioned locations of proposed access panels, size of each panel, and installation details. Determine and indicate required access panels in finished surfaces, whether furnished under this section or as part of Work of Divisions 22-Plumbing, 23- HVAC, and 26-Electrical.

1.03 QUALITY ASSURANCE

A. Panels shall be provided with UL listings and labels.

B. Access panels and frames shall be products of one manufacturer.

C. Coordinate access panels with plumbing, HVAC, and electrical work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Panels and Frames: Provide protection as required by manufacturer to protect panels from damage during storage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Access Panels:

Non-Rated	Milcor	Karp	Nystrom
Ceramic Tile	MS	DSC214M	NT
Plaster	K	DSC214M	NP
Drywall, Plaster Veneer	DW	DSC214M	NW
Fire Rated			
Ceramic Tile	MS	KRP150FR	IT
Plaster	M	KRP150PR	IP
Drywall, Plaster Veneer	M	KRP150FR	IW

Equal.

B. Unless otherwise indicated, provide brushed stainless steel finish for panels installed in ceramic tile. Provide prime coat finish suitable for field painting for panels installed in other finishes.

C. Access Panels shall be 18 gage minimum with vandal-proof lock operated by Allen wrench or other special tool. Exposed fastenings shall be secured with vandal-proof screws.

PART 3 - EXECUTION

3.01 GENERAL

A. Provide access panels in finish construction, where indicated on Drawings, wherever required for access to concealed mechanical and electrical equipment, and where required by codes. Panels indicated on architectural Drawings shall be furnished under this section. Required panels for access to equipment, but not indicated on architectural Drawings, shall be furnished as part of Work requiring access.

3.02 INSTALLATION

A. Install panels accurately in location, perfect alignment, plumb, straight and true. Brace to prevent displacement by adjacent Work.

B. Examine panels after installation for proper opening, closing and clearances. Replace damaged or defective panels.

3.03 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.04 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 08 3113

COILING COUNTER DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Coiling counter doors as indicated.

B. Related Sections:

1. Division 01 - General Requirements.

2. Section 08 7100 - Door Hardware.

3. Section 07 6000 - Flashing and Sheet Metal.

4. Section 26421 - Fire Alarm

1.02 SYSTEM DESIGN REQUIREMENTS

A. Drawings indicate locations, sizes, profiles and general details of coiling counter door construction and installation.

B. Fire rated coiling doors shall bear a UL label, Warnock Hersey, FMG or other nationally recognized testing laboratory for the fire ratings listed in the drawings, and shall be approved for use by the California State Fire Marshal and DSA.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, rough-in diagrams, installation instructions and manufacturer's data. Submit manufacturer's data on locking devices that are included in this Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Provide protection as required by manufacturer to protect products from damage during shipping and storage.

1.05 WARRANTY

A. Provide manufacturer's one year warranty against defects in materials, fabrication, and installation.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Provide coiling counter doors manufactured by The Cookson Company, Lawrence Roll-Up Doors, Inc., Cornell Iron Works, or equal.

2.02 GENERAL REQUIREMENTS

A. Coiling counter doors shall be stainless steel, manually operated, push-up type. Cookson Model ESC10-1SS, Lawrence Model CDFP-SS, or equal.

B. Locking Devices: Furnish sliding locks surface mounted on a single angle bottom bars that locks into each side guide. Devices shall be substantially constructed and properly adjusted to operate as required.

1. Unless otherwise specified, doors shall be provided with have sliding at each side, arranged to operate separately from inside face of door. Sliding locks shall positively engage side guides.

2. Doors, where slide-up wicket windows occur, shall be provided with have sliding bolts concealed within tubular bottom bar feature, operated from inside face of door by a single turn knob in center of bottom bar.

C. Curtain slats shall be 22 gage stainless steel type 304, brush finish.

D. Door guides shall be stainless steel type 304, brush finish.

E. Hood shall be 24 gage stainless steel type 304, brush finish.

F. Push-up operation shall not exceed 30 pounds of force.

G. Furnish sheet metal Work to dimensions and shape required. Brake metal shapes true, sharp, straight lines and angles to a precise fit.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be provided by an authorized representative of coiling overhead door manufacturer.

B. Install shutters and operating equipment plumb, in true alignment, free of springing, forcing, racking, or distortion.

C. Provide necessary hardware, jamb anchors, inserts, hanger, and equipment supports as required in manufacturer's literature.

D. Fasten curtain guide assembly to adjacent supports with galvanized fasteners at 24 inches on center for a rigid installation.

E. Upon completion of installation, lubricate, test and adjust doors to operate easily, free from warp, twist or distortion and fitting weathertight for entire perimeter.

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 08 4113

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Aluminum framed entrances and storefronts.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 07 2719 – Plastic Sheet Air Barriers.
3. Section 07 9200 - Joint Sealants.
4. Section 08 5116 - Aluminum Windows.
5. Section 08 7100 - Door Hardware.
6. Section 08 8000 - Glazing.
7. Section 09 2423 – Cement Plaster and Metal Lath.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and tubes.
2. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors by Uniform or Cyclic Static Air Pressure Difference.
3. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
4. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
5. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage through Installed Windows and Doors.

6. ASTM E1105 Standard test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls and Doors by Uniform or Cyclic Static Air Pressure Difference.

B. American Architectural Manufacturers Association (AAMA):

1. AAMA 611 – Voluntary Specification for Anodized Architectural aluminum.

2. AAMA 1503.1 – Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

3. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. National Fenestration Council Rating (NFRC):

1. Component Modeling Approach (CMA).

D. Code of Federal Regulations, Title 16, Part 1201 (16 CFR 1201):

1. Consumer Product Safety Commission Safety Standard for Architectural Glazing Materials.

1.03 PERFORMANCE REQUIREMENTS

A. Water-Resistance test: In accordance with ASTM E331. No water leakage when tested at 12 PSF (pounds per square foot) static pressure differential.

B. Air-Infiltration: In accordance with ASTM E283. Air infiltration shall not exceed 0.06 cfm/SF at a static air pressure difference of 6.24 psf.

C. Structural Performance: In accordance with ASTM E330. Deflection under design load shall not exceed L/175 of the clear span.

D. Condensation Resistance Factor (CRF): In accordance with AAMA 1503.1. Shall not be less than 67 for the frame and 65 for the glass.

E. Energy-Related Performance Ratings:

E. 1. Thermal Performance U-Factor:

2. Solar Heat Gain Coefficient (SHGC):

3. Visible Transmittance (VT):

1.04 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings for the Work of this section, prepared and reviewed before fabrication. Include plans, elevations, opening, identification symbols, sizes, and complete details for materials, finishes, sizes, profiles, moldings, dimensioned locations of hardware items with reinforcement, methods of anchoring, assembly,

installation, isolation, glazing procedure as well as reglazing procedures, materials, flashing and caulking.

B. Product Data: Submit manufacturer's Product Data.

C. Test Reports: Submit test reports from AAMA accredited laboratories certifying the performance requirements of Article 1.03.

D. Material Samples: Submit the following:

1. Storefront, door and frame sections with specified finish, fasteners and accessories.

2. Cured sealant colors.

E. Calculations: Provide structural calculations, signed and sealed by a structural engineer licensed in the State of California, indicating that materials furnished for installation conform to requirements specified.

F. Deferred Approval by Division of the State Architect:

F. 1. Submit to the OWNER a complete set of drawings, calculations and specifications for approval by the Division of the State Architect (DSA).

2. Documents must be signed by an engineer licensed in the State of California.

3. Allow six months in the schedule for DSA review.

4. Respond to DSA comments and resubmit until final approval is received.

G. Provide test data showing compliance with Shop and Field Testing requirements.

1.05 QUALITY ASSURANCE

A. Certification and Labeling of Fenestration Products: Storefront manufacturer shall submit a project specific label certificate using NFRC CMA protocol, listing the U-Factors, solar heat gain coefficients (SHGC), visible transmittance (VT) and air leakage for the fenestration products to adhere to the prescriptive requirements of Title 24 Part 6.

B. Mock-ups: Provide mock-up of one typical door and window unit for review by the ARCHITECT. Coordinate with mock-up requirements of Section 09 2423, Cement Plaster and Metal Lath.

C. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities and preparations for the installation of storefronts and other related work of this Section.

1.06 WARRANTY

A. Manufacturer shall provide a 10 year material warranty for aluminum storefront.

B. Manufacturer shall provide a 10 year material warranty for doors.

C. Anodized finish of storefronts, doors and related components shall be warranted for 10 years against cracking, crazing, flaking, or blistering,

C.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Offset Glazing:

A. 1. Arcadia AFG-451T Series.

2. EFCO Series 433.

3. Kawneer Co. Trifab 451T.

4. Equal.

B. Centered Glazing:

1. Arcadia AG-451T Series.

2. EFCO Series 403.

3. Kawneer Co. Trifab 451T.

4. Equal.

2.02 MATERIALS

A. Extrusions shall be 6063-T6 alloy and temper, per ASTM B221.

B. Fasteners: Aluminum, stainless steel, or zinc-plated steel at exposed conditions. Perimeter anchors shall be aluminum or steel. Steel anchors shall be isolated from aluminum members.

C. Glazing Gaskets: EPDM elastomeric extrusions or vinyl reinforced with fiberglass cord.

D. Glazing Sealants: As recommended by manufacturer for joint type.

E. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

F. Joint Sealants: For installation at perimeter of storefront system shall be as specified in Section 07 9200, Joint Sealants.

G. Hardware: Finish hardware shall be as specified in Section 08 7100 - Door Hardware.

H. Glazing: Glazing shall be as specified in Section 08 8000, Glazing.

2.03 FABRICATION

A. Framing sections shall be 2 inch by 4-1/2-inch thermally broken by one inch glazing.

1. Major portions of door sections, except glazing beads, shall be nominal 0.125 inch.

2. Wall thickness of frame members shall be nominal 0.093 inch.

B. Framing system shall provide continuous head and sill channels spliced together with formed brake metal sleeves at center of vertical mullions. The framing system shall provide for flush glazing on sides with no projecting stops. Vertical and horizontal framing members shall have a nominal face dimension and overall depth as noted above. Diverters shall be provided to collect water infiltration and divert to the exterior.

C. Door framing members shall match storefront framing appearance. Door stiles and rails shall be tubular sections, accurately joined at corners with heavy concealed reinforcement brackets secured with bolts and screws, and shall be metal inert gas (MIG) welded. Doors shall be furnished with snap-in stops with bulb glazing gasket both sides of glass. Exposed screws are not permitted. Each door leaf shall be furnished with an adjusting mechanism, located in the top rail near the lock stile, which provides for minor clearance adjustments after installation. A hard-backed poly-pile weatherstrip shall be installed in both stiles of center hung single doors.

2.04 FINISH

A. Storefronts and accessories shall be furnished with an electronically deposited color anodic finish-Class AAM10C22A44. Thickness shall be 0.7 mil minimum thickness
A. conforming to AAMA 611.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, air barriers, and other built-in components to ensure a coordinated, weather tight aluminum framed storefront installation.

3.02 INSTALLATION

A. Install storefronts in accordance with approved shop drawings and manufacturers installation instructions. Installation shall be level, square, plumb and in proper relation to wall flashing and adjacent construction.

B. Apply sealants to provide a weather tight installation at joints, intersections and opening perimeters. Tool sealants to fill the joint and provide a smooth finished surface.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's representative shall provide periodic site visits to attend pre-installation conference, verify substrate conditions and installation of storefronts are adequate, and resolve issues pertaining to the work of this Section.

B. OWNER will retain a testing agency to conduct on-site air and water infiltration tests. On-site tests shall be conducted with CONTRACTOR, storefront manufacturer's representative, OWNER and ARCHITECT present. The ARCHITECT will select units to be tested.

C. Ten percent of installed windows will be selected for air and water testing. If one or more windows fail, an additional ten percent of windows (not including the ones previously tested) will be selected for further testing. Selection of additional ten percent of units and retesting will be preformed until no leaks occur.

D. Water-Infiltration Test: Test will be conducted according to requirements of ASTM E1105. No water leakage is permitted. Windows will be tested at 8 pounds per square foot test pressure differential.

E. Air-Infiltration Test: Test will be conducted according to requirements of ASTM E783. Allowable infiltration shall not exceed 0.9 cfm/SF when tested at 6.24 pounds per square foot field test pressure differential.

F. Field Test report will be submitted to the OWNER, CONTRACTOR and ARCHITECT. Field Test report will include the following:

1. Name of the testing agency and testing agency's credentials.
2. Date of test.
3. Standards complied with during testing.
4. Number and locations of specimens tested.
5. Thorough analysis of test result indicating passing or failing of specimens at pressures specified.
6. Photos illustrating conditions of failed compliance at pressures required.

G. Credit to the OWNER the cost of failed tests.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.05 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 08 4413

ALUMINUM DISPLAY CASE DOORS AND WINDOWS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Aluminum framed sliding doors and hinged windows at display cases.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 07 9200 - Joint Sealants.

3. Section 08 8000 - Glazing.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and tubes.

2. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage through Installed Windows and Doors.

B. American Architectural Manufacturers Association (AAMA):

1. AAMA 611 – Voluntary Specification for Anodized Architectural aluminum.

C. National Fenestration Council Rating (NFRC):

1. Component Modeling Approach (CMA).

D. Code of Federal Regulations, Title 16, Part 1201 (16 CFR 1201):

1. Consumer Product Safety Commission Safety Standard for Architectural Glazing Materials.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: In accordance with ASTM E330. Deflection under design load shall not exceed L/175 of the clear span.

B. Condensation Resistance Factor (CRF): In accordance with AAMA 1503.1. Shall not be less than 67 for the frame and 65 for the glass.

1.04 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings for the Work of this section, prepared and reviewed before fabrication. Include plans, elevations, opening, identification symbols, sizes, and complete details for materials, finishes, sizes, profiles, moldings, dimensioned locations of hardware items with reinforcement, methods of anchoring, assembly, installation, isolation, glazing procedure as well as reglazing procedures, materials, flashing and caulking.

B. Product Data: Submit manufacturer's Product Data.

C. Test Reports: Submit test reports from AAMA accredited laboratories certifying the performance requirements of Article 1.03.

D. Material Samples: Submit the following:

1. Door and frame sections with specified finish, fasteners and accessories.

2. Cured sealant colors.

E. Calculations: Provide structural calculations, signed and sealed by a professional engineer licensed in the State of California, indicating that materials furnished for installation conform to requirements specified.

1.05 QUALITY ASSURANCE

A. Mock-ups: Provide mock-up of one typical door and window unit for review by the ARCHITECT. Mock-up may be left in place as completed work if approved by ARCHITECT and OWNER.

B. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference to review the progress of construction activities and preparations for the installation of storefronts and other related work of this Section.

1.06 WARRANTY

A. Manufacturer shall provide a 2 year material warranty for aluminum frames.

B. Manufacturer shall provide a 2 year material warranty for doors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Sliding Glass Doors:

1. Western Window Systems Series 600

2. Equal.

B. Hinged Windows Casement and Awning:

1. Western Window Systems Series 670.

2. Equal.

2.02 MATERIALS

A. Extrusions shall be 6063-T6 alloy and temper, per ASTM B221.

B. Fasteners: Aluminum, stainless steel, zinc-plated steel or non-metallic materials to resist deterioration and corrosion. Perimeter anchors shall be aluminum or steel. Steel anchors shall be isolated from aluminum members.

C. Glazing Gaskets:

1. Sliding glass doors shall have black woven polypropylene pile in the head and threshold adjacent to the sliding panel and in all panel interlock stiles. Provide two finger vinyl in the head and jamb adjacent to the fixed panel. Extruded vinyl in the sliding panel bottom rails and surrounding all glazing. Provide Q-LON bulb in the locking jamb.

2. Bulb vinyl and closed cell foam tape at hinged windows.

D. Glazing Sealants: As recommended by manufacturer for joint type.

E. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

F. Joint Sealants: For installation at perimeter of storefront system shall be as specified in Section 07 9200, Joint Sealants.

G. Hardware:

1. Sliding glass doors shall have sliding panels that are equipped with a full mortised locking mechanism, stainless steel case and adjustable hardened steel bolt, extruded aluminum interior pull and durable die-cast aluminum exterior pull. Provide optional cylinder lock with Schlage 5-pin keyway. Each sliding panel shall be equipped with two tandem wheel assemblies containing stainless steel ball bearing rollers with a diameter of 1.81" or 3". Each door frame shall be equipped with a stainless steel adjustable strike and stainless steel roller track cover.

2. Hinged window hardware finish shall match frame finish or brushed nickel finish. Windows shall be equipped with optional cylinder lock with Schlage 5-pin keyway. Windows over 24 inches wide on the hinge side shall have two locking points. Hinges shall be type and number recommended by manufacturer.

H. Glazing: At display doors and windows provide single glazing conforming to ASTM C1036, Standard Specification for Flat Glass. All glazing shall be fully tempered. Provide 3/16 inch thick glass for units up to 32 square feet and ¼ inch thick for units over 32 square feet.

2.03 FABRICATION

A. Frame members shall be neatly fitted, mechanically joined at the corners with stainless steel screws and sealed with high grade silicone sealant.

B. Sash members shall be mitered, mechanically joined with crimped aluminum corner keys and sealed with high grade silicone sealant.

C. Structural framing shall be full hollow extrusions. Horizontal members shall nest with vertical members to eliminate daylight and shine from cut edges. Panel lead stiles, interlock stiles and intermediate frame jamb members shall be full hollow extrusions.

D. All operating and fixed glazing shall be held in place with extruded snap-in stops which are removable for re-glazing.

2.04 FINISH

A. Class 1 satin anodized aluminum.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances.

3.02 INSTALLATION

A. Install sliding doors and hinged windows in accordance with approved shop drawings and manufacturers installation instructions. Installation shall be level, square, plumb and in proper relation to wall flashing and adjacent construction.

B. Apply sealants to provide a sealed installation at joints, intersections and opening perimeters. Tool sealants to fill the joint and provide a smooth finished surface.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's representative shall provide periodic site visits to attend pre-installation conference, verify substrate conditions and installation of storefronts are adequate, and resolve issues pertaining to the work of this Section.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.05 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 08 5113

ALUMINUM WINDOWS

PART 1 - GENERAL

1.01 SUMMARY

a. Section Includes:

1. Aluminum windows as indicated.

b. Related Requirements:

1. Division 01 - General Requirements.
2. Section 07 2719 – Plastic Sheet Air Barrier.
3. Section 07 9200 - Joint Sealants.
4. Section 08 4113 - Aluminum Entrances and Storefront.
5. Section 08 8000 - Glazing.
6. Section 09 2423 - Cement Plaster and Metal Lath.

1.02 REFERENCE STANDARDS

A. ASTM International:

1. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors by Uniform or Cyclic Static Air Pressure Difference.
2. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
3. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
4. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage through Installed Windows and Doors.
5. ASTM E1105 Standard test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls and Doors by Uniform or Cyclic Static Air Pressure Difference.

B. American Architectural Manufacturers Association (AAMA):

1. AAMA/WDMA/CSA 101/I.S.2/A440-08 NAFS Specifications for Windows, Doors and Skylights.

2. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum

3. AAMA 800, Voluntary Specifications and Test Methods for Sealants.

4. AAMA 803.3 Narrow-Joint Seam Sealer.

5. AAMA 902 - Voluntary Specification for Sash Balances

6. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

7. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels.

C. National Fenestration Rating Council (NFRC):

1. NFRC 100-2014 - Standard Procedure for Determining Fenestration Product U-factors.

1.03 PERFORMANCE REQUIREMENTS

A. Windows shall conform to AAMA/WDMA/CSA 101/I.S. 2/A440.

B. Performance Class and Grade: As indicated on Part 2 Products, for each specific window type.

C. Structural Performance: Deflection under design load shall not exceed L/175 of the span when tested in accordance to ASTM E330.

D. Water Resistance: No water leakage when window is tested at 10 PSF static air pressure differential, in accordance to ASTM E331.

E. Air Infiltration:

1. Single Hung and Double Hung Windows: Air infiltration rate shall not exceed 0.30 cfm/SF at a static air pressure differential of 6.24 PSF.

2. Fixed, Awning, Hopper Casement and Horizontal Sliding Windows: Air infiltration rate shall not exceed 0.10 cfm/SF at a static air pressure differential of 6.24 PSF.

F. Condensation Resistance Factor (CRF): CRF of frame and glass shall not be less than 55 when tested in accordance with AAMA 1503.

G. Windows will be designed for inside factory glazing.

1.04 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings for the Work of this section including plans, elevations, opening identification symbols, sizes, and complete details for materials, finishes, sizes, profiles, moldings, dimensioned locations of hardware items with reinforcement, methods of anchoring, assembly, erection, isolation, glazing procedure as well as re-glazing procedures, materials, and caulking.

B. Product Data: Submit manufacturer's Product Data, recommendations and standard details for aluminum windows units, including independent laboratory certified tests as necessary to demonstrate compliance with specified requirements.

C. Material Samples:

1. Finish: When factory-finish color coating is specified, submit:

a. Five color charts of standard factory coatings.

b. Five coated six inch long sections of aluminum sheets finished with color selected by ARCHITECT.

2. Window Samples: Submit a window Sample fabricated of the materials, fasteners, glazing, panning and caulking system specified.

D. Certificates:

1. AAMA Certified Test Reports: Window manufacturer shall affix AAMA Quality Certified label on every unit, or shall submit a certified test report from an approved testing laboratory, certifying that specified window complies with ANSI/AAMA requirements.

2. Building Energy Efficiency Standards Certified Test Reports: Window manufacturer shall affix a clearly visible temporary label to the window or supply a project specific label certificate using NFRC CMA protocol, listing the U-Factors, solar heat gain coefficients (SHGC), visible transmittance (VT) and air leakage for the fenestration products to adhere to the prescriptive requirements of Title 24, CEC.

3. Submit a certificate bearing official and legal signature of window supplier stating that the finish complies with AAMA 2605 for Superior Performing Organic Coatings.

1.05 QUALITY ASSURANCE

A. Installer Qualifications:

1. Minimum five year experience installing windows of the type specified by this Section,

2. Installer shall be approved by the window manufacturer as an approved installer.

B. Window manufacturer technical representative shall provide field services to verify window installation is in accordance to manufacturer's written instructions.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's packaging to protect windows during transportation and storage.

B. Store windows indoors in a clean ventilated area and stack vertically on edge with wood or plastic shims between components to provide water drainage and air circulation.

1.07 WARRANTY

A. Window installation shall be warranted by CONTRACTOR against defects under normal use and service, for a period of two years.

B. Windows shall be warranted by window manufacturer against defects in material and fabrication under normal use and service, for a period of five years.

C. Pigmented organic finished window and related components shall be warranted for 15 years against blistering, cracking, peeling or chipping or fading beyond AAMA 2605.

D. Factory glazed insulated glass units shall be warranted to be free from obstruction of vision as a result of dust or film formation on the internal glass surfaces caused by failure of the hermetic seal due to defects in material and workmanship for a period of ten years.

PART 2 – PRODUCTS

2.01 FIXED WINDOWS

A. Acceptable Manufacturers:

1. EFCO: 2700.

2. Kawneer; TR-2800.

3. Peerless: G641.

4. Arcadia: N200T.

5. Equal.

B. Fixed aluminum windows shall conform to AAMA/WDMA/CSA 101/I.S.2/A440 AW-PG100-FW.

2.02 HORIZONTAL SLIDING WINDOWS

A. Acceptable Manufacturers:

1. EFCO: 3500.

2. Traco: TR6800.

3. Peerless: GSL6.

4. Arcadia: 500T.

5. Equal.

B. Horizontal sliding aluminum windows shall conform to AAMA/WDMA/CSA 101/I.S.2/A440 HS-AW-50.

C. Frame and sliding sections shall be extruded aluminum sections, 6063-T6 alloy.

D. Nominal wall thickness of sections shall be at least 0.062 inch, except that frame sill members shall have a nominal wall thickness of at least 0.078 inch. Extrusions shall be selected for straightness and angularity. Meeting stiles, vent stiles and muntins shall be one piece tubular sections.

E. Frame members consisting of head, sill and jamb sections shall be assembled so as to provide a rigid assembly with permanently weathertight joints. Sill sections shall be sloped and offset and provided with weep holes for water drainage of sloped lower sill section to exterior. Sliding panel shall be removable from inside for maintenance cleaning. Active or inactive sliding panels, when in locked position, shall not be removable from exterior.

F. Sliding panels shall be fitted into frame assembly to ensure dimensional control of lap and tightness of fitted contacting surfaces to meet air infiltration requirements.

G. Sliding panels shall be furnished with bottoms rolling on adjustable sheaves or rollers furnished with sealed pre-lubricated bearings.

H. Weatherstripping in stiles and top and bottom rails shall be woven pile, installed in a continuous length so weather stripping is under equal compression around entire perimeter of sliding panel. Weather stripping shall be continuous and replaceable without disassembly of frame.

I. Hardware: Sliding panels shall be furnished with locking hardware consisting of aluminum, stainless steel, or other corrosion resistant materials compatible with aluminum. Vent stiles shall be furnished with continuous integral pulls.

2.03 SHOP TESTING

A. Water-resistance test: Conduct according to requirements of ASTM E331. No water leakage is permitted.

1. 11 pounds per square foot test pressure differential for hung windows

2. 12 pounds per square foot test pressure differential for projected windows.

3. 10 pounds per square foot test pressure differential for sliding windows.

B. Air-infiltration test: Conduct according to requirements of ASTM E283. Windows shall be tested at 6.24 pounds per square foot test pressure differential.

C. Structural performance test: Conduct according to requirements of ASTM E330. Windows shall be tested at pressure differential not lower than 30 pounds per square foot.

2.04 FINISH

A. Windows and accessories shall be furnished with an organic finish applied over a five stage aluminum pre-treatment. Finish shall be a two coat pigmented organic coating system with a minimum of 1.2 mil thickness and conforming to AAMA 2605.

B. Finish shall be available in a minimum of five standard colors. Finish color shall be selected by the ARCHITECT.

PART 3- EXECUTION

3.01 INSTALLATION

A. Panning System: Panning shall be either a receiver or attached type. The panning extrusions shall be Project site secured at the corners with stainless steel screws in integral screw ports with the joints back sealed to prevent water intrusion. Exposed screws or fasteners on the exterior of the panning are not permitted. Panning and trim shall be furnished in the same color and finish as window system.

B. Receptor System: A two piece snap together receptor shall be furnished to fasten windows in place. The receptor shall aluminum finish to match window. When snapped together, system shall fasten window securely in place with no water penetration at specified test pressure.

C. Windows and operators shall be installed by manufacturer or an authorized representative, and shall be set plumb, square, level, and true within their respective openings. Adjoining units of windows or assembly of windows shall be installed in the same plane and with rails, muntins, and like members accurately aligned.

D. Aluminum in contact with plaster, concrete or steel shall be separated from dissimilar material with self-adhering, plastic or synthetic rubber tape, 5-mils minimum thickness. Screws, rivets, bolts and other fastening devices shall be of aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with aluminum. Cadmium- plated fasteners are not permitted.

E. Upon completion of the Work of this section, including glazing, inspect windows and operating devices for proper installation and operation. Operate vents and hardware and adjust to ensure proper fitting and functioning and leave in smoothly operating condition.

3.02 FIELD QUALITY CONTROL

A. Conduct on-site tests with window manufacturer's technical representative, OWNER and ARCHITECT present. The ARCHITECT will select units to be tested. Testing shall be performed by a qualified independent testing agency acceptable to the OAR.

B. Ten percent of installed windows shall be selected for water testing. If one or more windows fail, additional ten percent of windows (not including the ones previously tested) shall be selected for further testing. Selection of additional ten percent of windows and retesting will be preformed until no leaks occur.

C. Water-resistance test: Conduct according to requirements of ASTM E1105. No water leakage is permitted. Windows shall be field tested at 8 pounds per square foot field test pressure differential.

D. Air-infiltration test: Conduct according to requirements of ASTM E783. Allowable infiltration shall not exceed 1.5 times the amount required. Windows shall be tested at 6.24 PSF (pounds per square foot) field test pressure differential.

E. Field Test report shall be submitted to the OWNER, CONTRACTOR and ARCHITECT. Field Test report must include the following:

1. Name of the testing agency and testing agency's credentials.

2. Date of test.

3. Standards complied with during testing.

4. Number and locations of specimens tested.

5. Thorough analysis of test result indicating passing or failing of specimens at pressures specified.

6. Photos illustrating conditions of failed compliance at pressures required.

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 08 5115

FIRE-RATED ALUMINUM WINDOWS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fire-rated aluminum fixed window including frame and glazing.

1.02 RELATED SECTIONS

A. Section 09 2900 – Gypsum Board.

B. Section 09-2216 – Non-Structural Metal Framing.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
   2. ASTM E2010 Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.
   3. ASTM E 283-04, Test Method for Determining Rate of Airflow Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.
   4. ASTM E 330-02, Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
   5. ASTM E 331-00, Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

B. National Fire Protection Association (NFPA):
   1. NFPA 80: Standard for Fire Doors and Fire Windows.
   2. NFPA 257: Standard on Fire Test for Window and Glass Block Assemblies.

C. Uniform Building Code (UBC):
   1. UBC-7-4: Methods for Fire Tests of Window Assemblies.

D. Underwriters Laboratories, Inc. (UL):
   1. UL 9: Fire Tests of Window Assemblies.
   2. UL 263: Fire Tests of Building Construction and Materials

E. Standard Council of Canada:
   1. ULC Standard CAN4-S101: Fire Tests of Building Construction and Materials.

2. ULC Standard CAN4-S106: Fire Tests of Door Assemblies.

F. American National Standards Institute (ANSI):
   1. ANSI Z97.1 Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

G. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201 Categories I and II: Safety Standard for Glazing Materials.

H. American Architectural Manufacturers Association (AAMA)
   1. AAMA 501.1-05, Standard Test Method for Metal Curtain Walls for Water Penetration Using Dynamic Pressure.

1.04 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Fire Rating: 45 minutes.
2. Certification: Windows shall be tested in accordance with ASTM E 2010, NFPA 252, UBC 7-4, UL 9, UL263, CAN4-S106.
3. Testing Laboratory: Fire tests shall be conducted by an approved independent testing laboratory, similar to Underwriter's Laboratories, Inc.
4. Air Infiltration: The test specimen shall be tested in accordance with ASTM E283 at a minimum frame size of 97" x 145". Air infiltration rate shall not exceed 0.01 cfm/ft of area at a static air pressure differential of 6.27 psf.
5. Static Water Resistance: The test specimen shall be tested in accordance with ASTM E331 at a minimum frame size of 97" x 145". There shall be no leakage as defined in test method at a static pressure differential of 10 psf.
6. Dynamic Water Resistance: The test specimen shall be tested in accordance with AAMA 501.1 at a minimum frame size of 97" x 145". There shall be no leakage as defined in test method at a dynamic pressure differential of 10 psf.
7. Uniform Load Deflection: A minimum static air pressure difference of 60 psf shall be applied in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of L/175 of the span of any framing member.
8. Uniform Load Structural Test: A minimum static air pressure difference of 90 psf shall be applied in the positive and negative direction in accordance with ASTM E330.
9. Thermal Transmittance (U-value): When tested to AAMA Specification 503.1, the thermal transmittance (U-value) shall not be more than 0.48 BTU/hr/sf/°F.

1.05 SUBMITTALS

A. Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedure Section.
   1. Shop Drawings: Submit shop drawings showing layouts, profiles and product components.
   2. Samples: Submit samples for finishes, colors and textures.
   3. Technical Information: Submit latest edition of manufacturer's product data providing product description, technical data and installation instructions.

1.06 QUALITY ASSURANCE

A. Listings and Labels:
   Fire rated framing and glazing shall be under current follow-up services by an approved independent agency and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

1.07 DELIVERY, STORAGE AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Deliver materials to specified destination in manufacturer's packaging undamaged, complete with installation instructions.

C. Storage and Protection: Store off ground, under cover, protected from weather, direct sunlight, construction activities and at temperature conditions recommended by manufacturer, +10°F to +110°F.

D. Handling: Protect materials and finish during handling and installation to prevent damage.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

PART 2 - PRODUCTS

2.01 FIRE-RATED ALUMINUM FIXED WINDOWS

A. Manufacturer: Aluflam North America or Equal
   1. Contact: 16604 Edwards Road, Cerritos, CA 90703: Telephone 562.926.9520 Fax 562.404.1394 E-mail info@aluflam-usa.com Website www.aluflam-usa.com, or local representative (www.aluflam-usa.com/contact/representatives.php).

2.02 MATERIALS – ALUMINUM FRAMING

A. Frame construction: Integral structure and glazing stops from extruded and thermally broken aluminum profiles. Filled internally with cement composite material.

B. Dimensions:
   1. Perimeter framing face dimension: 2-½ inch
   2. Depth of framing: 3-7/16 inch
   3. Cross rail (if applicable): 3-9/16 inch

C. Assembly: Frame corners assembled by means of crimped and bonded miter joints.

D. Sealing: Framing system shall insulate against effects of fire, smoke, and heat transfer from either side. Perimeter of the framing system to the rough opening shall be firmly packed with mineral wool insulation.

2.03 MATERIALS – FIRE RESISTANT GLAZING

A. Assemblies shall be glazed with 45 minute rated ¾ inch thick SGG Contraflam 45 fire resistant glazing material as manufactured by Vetrotech Saint-Gobain (www.vetrotechusa.com).
   1. Individual lites shall be permanently identified with a listing mark.
   2. Glazing material installed in "Hazardous Locations" (subject to human impact) shall be certified to meet the applicable requirements for fire rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used In Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
   3. Visible daylight transmission shall be a minimum of 81%. Glazing material shall be optically clear, colorless and free from unusual distortion.

B. Substitutions: Not permitted.

2.04 MATERIALS – GLAZING AND ASSEMBLY ACCESSORIES

A. Fasteners: All fasteners, setting pads, and glazing clips, shall be stainless or zinc-plated steel.

B. Glazing Accessories: The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant intumescent glazing tape. Ceramic setting blocks shall be placed between the metal setting pads and the glazing material. Setting pads and blocks provided by manufacturer.

2.05 FABRICATION

A. Window frames shall be furnished pre-assembled. Window assemblies shall be field glazed.

B. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall guarantee dimensions within required tolerance (+ - 1/8"). Obtain approved shop drawings prior to fabrication.

2.06 FINISHES

A. Framing shall be chemically cleaned and pretreated, then finished on all exposed areas with: Anodized – Clear

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Slight variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine area to receive windows. Openings shall be plumb, square and within allowable tolerances. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Window installation shall be by a specialty contractor with appropriate experience qualifications; and in strict accordance with the approved shop drawings.

3.03 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Glass and frame should be cleaned using soft clean cloth, chamois leathers, sponges or soft paper. Use clean warm water with a mild detergent. Do not use detergent that contains either alkaline, acids or fluoride! Abrasive cleaning methods can damage surfaces! Clean prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Door hardware.
2. Storefront and entrance door hardware.
3. Third-party inspection report for fire-rated door assemblies.
4. Wall or floor-mounted electromagnetic hold-open devices.
5. Cylinders for doors fabricated with locking hardware.

B. Related Divisions:

1. Division 06 – door hardware installation
2. Division 07 – sealant at exterior thresholds
3. Division 08 – metal doors and frames, interior aluminum frames, wood doors, storefront and glazed curtainwall systems.
4. Division 10 – operable partitions
5. 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.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Sliding aluminum doors.
8. Access doors and panels.
9. Corner Guards.

1.2 REFERENCES:

A. Use date of standard in effect as of Bid date.

1. American National Standards Institute
   a) ANSI 156.18 – Materials and Finishes.
2. BHMA – Builders Hardware Manufacturers Association
3. 2014 California Building Code
   a) Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing
4. DHI – Door and Hardware Institute
5. NFPA – National Fire Protection Association
   a) NFPA 80 2016 Edition – Standard for Fire Doors and Other Opening Protectives.
   b) NFPA 105 – Smoke and Draft Control Door Assemblies
   c) NFPA 252 – Fire Tests of Door Assemblies

6. UL – Underwriters Laboratories
    a) UL10C – Positive Pressure Fire Tests of Door Assemblies.
    b) UL 305 – Panic Hardware
7. WHI – Warnock Hersey Incorporated State of California Building Code
8. Local applicable codes
9. SDI – Steel Door Institute
10. WI – Woodwork Institute
11. AWI – Architectural Woodwork Institute
12. NAAMM – National Association of Architectural Metal Manufacturers

B. Abbreviations

1. Manufacturers: see table at 2.1.A of this section
2. Finishes: see 2.7 of this section.

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per D. 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. Minimum 10pt font size. 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. Location of hardware set coordinated with floor plans and door schedule.
6. Explanation of abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, materials and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.
11. Manufacturer's technical data and installation instructions for electronic hardware.

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. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, riser and point-to-point wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.4 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 (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.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

1.5 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.

1.6 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. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation by placing a strip of insulation, wood, or foam, on the back of the hollow metal frame behind the rabbet section for continuous hinges, as well as at rim panic hardware strike locations, silencers, coordinators, and door closer arm locations. When the frame is grouted in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.
5. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
6. Coordinate: flush top rails of doors at out swinging exteriors, and throughout where adhesive-mounted seals occur.
7. Manufacturers' 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.

D. Environmental considerations: segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

1.7 WARRANTY:

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties.

B. Include factory order numbers with close-out documents to validate warranty information, required for Owner in making future warranty claims:

C. Minimum warranties:

1.	Locksets:	Three years
2.	Extra Heavy Duty Cylindrical Lock:	Seven Years
3.	Exit Devices:	Three years mechanical
4.	Closers:	Thirty years mechanical
5.	Hinges:	One year
6.	Other Hardware	Two years

1.8 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 and stairwell pressurization system both at rest and while in full operation.
2. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

1.9 REGULATORY REQUIREMENTS:

A. Locate latching hardware between 34 inches to 44 inches above the finished floor, per-2016 California Building Code, Section 11B-404.2.7.

1. Panic hardware: Comply with CBC 1010.1.10, locate between 36 inches to 44 inches above the finished floor.

B. Handles, pull, latches, locks, other operable parts:

1. Readily openable from egress side with one hand and without tight grasping, tight pinching, or twisting of the wrist to operate. 2016 California Building Code Section 11B-309.4.
2. Force required to activate the operable parts: 5.0 pounds maximum, per 2016 California Building Code Section 11B-309.4.

C. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2016 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 15-pounds.

1. Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.

D. Adjust door closer sweep periods so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door, per 2016 California Building Code Section 11B-404.2.7.

1. Spring hinges: adjust for 1.5 seconds minimum for 70 degrees to fully-closed.

E. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2016 California Building Code Section 11B-404.2.10.

1. Applied kick plates and armor plates: bevel the left and right edges; free of sharp or abrasive edges.
2. Tempered glass doors without stiles: bottom rail may be less than 10 inches if top leading edge is tapered 60 degrees minimum.

F. Door opening clear width no less than 32 inches, measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 30 inches and below 80 inches, and the hardware projects no more than 4 inches. 2016 California Building Code Section 11B-404.2.3.

1. Exception: doors not requiring full passage through the opening, that is, to spaces less than 24 inches in depth, may have the clear opening width reduced to 20 inches. Example: shallow closets.
2. Door closers and overhead stops: not less than 78 inches above the finished floor or ground, per 2016 California Building Code 11B-307.4.

G. Thresholds: floor or landing no more than 0.50 inches below the top of the threshold of the doorway, per 2016 California Building Code Section 11B-404.2.5. Vertical rise no more than 0.25 inches, change in level between 0.25 inches and 0.50 inches: beveled to slope no greater than 1:2 (50 percent slope). 2016 California Building Code Section 11B-303.2 & ~.3.

H. Floor stops: Do not locate in path of travel. Locate no more than 4 inches from walls, per DSA Policy #99-08 (Access).

I. Pairs of doors with independently-activated hardware both leafs: limit swing of right-hand or right-hand-reverse leaf to 90 degrees to protect persons reading wall-mounted tactile signage, per 2016 California Building Code Section 11B-703.4.2.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers and their abbreviations used in this schedule:

GLY	Glynn-Johnson Hardware
IVE	H. B. Ives
LCN	LCN Closers
SCH	Schlage Lock Company
VON	Von Duprin
ZER	Zero International

2.2 HINGING 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 approved 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. Geared-type aluminum.

a) Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.
b) If units are used at storefront openings, color-coordinate hinge finish with storefront color. Custom anodizing and custom powder coat finishes subject to Architect approval.

2. Pinned steel/stainless steel type: continuous stainless steel, 0.25-inch 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 inches.

2.3 LOCKSETS, LATCHSETS, DEADBOLTS:

A. Mortise Locksets and Latchsets: as scheduled.

1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
2. Universal lock case – 10 functions in one case.
3. Floating mounting tabs automatically adjusts to fit a beveled door edge.
4. Latchbolts: 0.75 inch throw stainless steel anti-friction type.
5. 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 hubworks to gain wrongful entry.
b) Inside lever applied by screwless shank mounting – no exposed trim mount screws.
c) Levers rotate up or down for ease of use.
d) Vandalgard locks: locked lever freely rotates down while remaining securely locked. This feature prevents damage to internal lock components when subjected to excessive force.

6. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
7. Turnpieces: accessible offset turn-lever design not requiring pinching or twisting motions to operate.
8. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
9. Scheduled Lock Series and Design: Schlage L series, 06A design.
10. Certifications:

a) ANSI A156.13, 1994, Grade 1 Operational.
b) ANSI/ASTM F476-84 Grade 31 UL Listed.

11. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2016 11B-404.2.7 and 11B-309.4.

B. Extra Heavy Duty Cylindrical Locks and Latches: as scheduled.

1. Chassis: cylindrical design, corrosion-resistant plated cold-rolled steel, through-bolted.
2. Locking Spindle: stainless steel, integrated spring and spindle design.
3. Latch Retractors: forged steel. Balance of inner parts: corrosion-resistant plated steel, or stainless steel.
4. Latchbolt: solid steel.
5. Backset: 2.75 inches typically, more or less as needed to accommodate frame, door or other hardware.
6. Lever Trim: accessible design, independent operation, spring-cage supported, minimum 2.00 inches clearance from lever mid-point to door face.
7. Strikes: 16 gage curved steel, bronze or brass with 1.00 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
8. Lock Series and Design: Schlage D series, "Rhodes" design.
9. Certifications:

a) ANSI A156.2, 1994, Series 4000, Grade 1.
b) UL listed for A label and lesser class single doors up to 4 feet x 8 feet.

10. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2016 11B-404.2.7 and 11B-309.4.

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features:

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. Deadlocking latchbolts, 0.75 inch projection.
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-pound maximum operating force per UBC Standard 10-4, and with 32-pound maximum pressure under 250-pound load to the door.
8. Accessibility: Require not more than 5 lb to retract the latchbolt, per CBC 2016 11B-404.2.7 and 11B-309.4.
    a) Mechanical method: Von Duprin "AX-" feature, where touchpad directly retracts the latchbolt with 5 lb or less of force. Provide testing lab certification confirming that the mechanical device is independent third-party tested to meet this 5 lb requirement.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging with security indicator.
2. Lever Trim: breakaway type, forged brass or bronze escutcheon min. 0.130 inch 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.
4. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.

2.5 CLOSERS

A. Surface Closers: 4040XP

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 particular header, door and wall conditions and neighboring hardware.
6. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2016 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 15-pounds.
    a) Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.

7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
10. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
11. Non-flaming fluid, will not fuel door or floor covering fires.
12. Pressure Relief Valves (PRV) not permitted.

2.6 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: Four beveled edges, .050 inches 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 floor type with appropriate fasteners. Where floor type cannot be used, provide wall 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 deadstop. Note degree of opening in submittal.

E. Seals: Four-fingered type at head & jambs. Inelastic, rigid back, not subject to stretching. Self-compensating for warp, thermal bow, door settling, and out-of-plumb. Adhesive warranted for life of installation.

1. Proposed substitutions: submit for approval.
2. Three-fingered type at hinge jambs of doors fitted with continuous hinges where jamb leaf of hinge is fastened to the frame reveal.

F. Thresholds: As scheduled and per details. Comply with CBC 2016 11B-404.2.5. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.

1. Saddle thresholds: 0.125 inches minimum thickness.
2. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Minimum 0.25 inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors. National Guard Products' "COMBO" or Pemko Manufacturing's "FHSL".
3. Fire-rated openings, 90-minutes 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, include a 0.25in high 5in wide saddle in the bid, and request direction from Architect.
4. Fire-rated openings, 3-hour duration: Thresholds, where scheduled, to extend full jamb depth.

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.

G. Through-bolts: Do not use. 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. Exception: surface-mounted overhead stops, holders, and friction stays.

H. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Leave no unfilled/uncovered pre-punched silencer holes. Intent: door bears against silencers, seals make minimal contact with minimal compression – only enough to effect a seal.

2.7 FINISH:

A. Generally: BHMA 626 Satin Chromium.

1. Areas using BHMA 626: furnish push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.

B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

2.9 KEYING REQUIREMENTS:

A. Key System: (Verify with Owner) Schlage Everest utility-patented keyway, interchangeable core. Utility patent protection to extend at least until 2014. Key blanks available only from factory-direct sources, not available from after-market key blank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner to determine system keyway(s), keybow styles, structure and degree of geographic exclusivity. Furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner. Contractor will install permanent cylinders/cores.

B. Keys

1. Existing factory registered master key system.
2. 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.
3. Furnish 10 construction keys.
4. Furnish 2 construction control keys.

C. Key Cylinders: furnish utility patented, 6-pin solid brass construction.

D. Cylinder cores: furnish keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders same manufacturer.

E. Permanent keys: use secured shipment direct from point of origination to Owner.

1. For estimate: 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.
2. For estimate: VKC stamping plus "DO NOT DUPLICATE".
3. Bitting List: use secured shipment direct from point of origination to Owner upon completion.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

A. Can read and understand manufacturers' templates, suppliers' hardware schedule 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.

3.2 PREPARATION:

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

1. Notify Architect of code conflicts before ordering material.
1. Locate latching hardware between 34 inches to 44 inches above the finished floor, per California Building Code, Section 1008.1.9.2 and 11B-404.2.7.
2. Locate panic hardware between 36 inches to 44 inches above the finished floor.
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.

3.3 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. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
3. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more than 4 inches 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. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.

D. Drill pilot holes for fasteners in wood doors and/or frames.

E. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.4. 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.

a) Door closer valves: turn valves clockwise until at bottom – do not force. Turn valves back out one and one-half turns and begin adjustment process from that point. Do not force valves beyond three full turns counterclockwise.

3. Adjust door closers per 1.9 this section.

B. Inspection of fire door assemblies and means-of-egress panic-hardware doors: Per 2016 NFPA-80 5.2.1: hire an independent third-party inspection service to prepare a report listing these doors, and include a statement that there are zero deficiencies with the fire-rated assemblies and the openings with panic hardware.

C. Fire-rated doors:

1. Wood doors: adjust to 0.125 inches clearance at heads, jambs, and meeting stiles.
2. Steel doors: adjust to 0.063 inches minimum to 0.188 inches maximum clearance at heads, jambs, and meeting stiles.
3. Adjust wood and steel doors to 0.75 inches maximum clearance (undercut) above threshold or finish floor material under door.

D. Final inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:

1. Has re-adjusted hardware.
2. Has evaluated maintenance procedures and recommend changes or additions, and instructed Owner's personnel.
3. Has identified items that have deteriorated or failed.
4. Has submitted written report identifying problems.

3.5 DEMONSTRATION:

A. Demonstrate mechanical hardware, including adjustment and maintenance procedures.

3.6 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.

3.7 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.

SPEXTRA: 368868-3

HARDWARE GROUP NO. 01

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 02

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-35A-NL-OP-388	626	VON
1	EA	MORT CYL TURN-CD	09-900 X XQ11-935 (XB11-720 ADA T-TURN)	626	SCH
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	90 DEG OFFSET PULL	8190HD 12" O	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	PA MOUNTING PLATE	4040-18PA AS REQ'D	689	LCN
1	EA	FLOOR STOP	FS18L/FS18S AS REQ'D	BLK	IVE
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER

WEATHER SEALS BY DOOR MANUFACTURER/SUPPLIER.

HARDWARE GROUP NO. 03

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB-MT54	689	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-35A-EO	626	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-35A-NL-OP-388	626	VON
2	EA	MORT CYL TURN-CD	09-900 X XQ11-935 (XB11-720 ADA T-TURN)	626	SCH
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX	626	SCH
2	EA	FSIC CORE	23-030	626	SCH
2	EA	90 DEG OFFSET PULL	8190HD 12" O	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040-18PA AS REQ'D	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18L/FS18S AS REQ'D	BLK	IVE
1	EA	MULLION SEAL	8780N	N	ZER
2	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER

WEATHER SEALS BY DOOR MANUFACTURER/SUPPLIER.

HARDWARE GROUP NO. 04

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB-MT54	689	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-35A-EO	626	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-35A-NL-OP-388	626	VON
2	EA	MORT CYL TURN-CD	09-900 X XQ11-935 (XB11-720 ADA T-TURN)	626	SCH
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX	626	SCH
2	EA	FSIC CORE	23-030	626	SCH
2	EA	90 DEG OFFSET PULL	8190HD 12" O	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040-18PA AS REQ'D	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18L/FS18S AS REQ'D	BLK	IVE
1	EA	MULLION SEAL	8780N	N	ZER

WEATHER SEALS BY DOOR MANUFACTURER/SUPPLIER.

HARDWARE GROUP NO. 05

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06A L583-363 L283-711	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER

WEATHER SEALS BY DOOR MANUFACTURER/SUPPLIER.

HARDWARE GROUP NO. 06

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	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	FS436/FS438 AS REQ'D	626	IVE

WEATHER SEALS BY DOOR MANUFACTURER/SUPPLIER.

HARDWARE GROUP NO. 07

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 08

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 09

PROVIDE EACH CO DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	NOTE	NO HARDWARE THIS OPENING		

HARDWARE GROUP NO. 10

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP H	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

HARDWARE GROUP NO. 11

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 12

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB61P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2 AS REQ'D	626	IVE
1	EA	DBL CYL STORE LOCK	ND66TD RHO	626	SCH
2	EA	FSIC CORE	23-030	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB/MB2 AS REQ'D	689	IVE
2	EA	SURFACE CLOSER	4040XP H	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1	EA	MEETING STILE	41AA	AA	ZER

CONNECT MAG HOLDERS TO FIRE LIFE SAFETY SYSTEM.

HARDWARE GROUP NO. 13

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	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	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 14

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP H	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 15

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 16

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 17

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	OH STOP	100S ADJ	630	GLY
1	EA	SURFACE CLOSER	4040XP H ST-1630	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 18

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CORRIDOR LOCK	L9456T 06A L583-363 L283-722	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 19

PROVIDE EACH RU DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	SET	NOTE	ALL HARDWARE BY ROLL UP DOOR MFGR./SUPPLIER		B/O

HARDWARE GROUP NO. 20

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 21

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB61P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2 AS REQ'D	626	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB/MB2 AS REQ'D	689	IVE
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	MEETING STILE	41AA	AA	ZER

HARDWARE GROUP NO. 22

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

HARDWARE GROUP NO. 23

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 24

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	FIRE EXIT HARDWARE	PA-AX-98-L-NL-F-06-SNB	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

HARDWARE GROUP NO. 25

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SH 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER

HARDWARE GROUP NO. 26

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1		EXISTING DOOR, FRAME AND HARDWARE TO REMAIN		

HARDWARE GROUP NO. 27

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB61P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2 AS REQ'D	626	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
2	EA	OH STOP & HOLDER	90F J	630	GLY
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	MEETING STILE	41AA	AA	ZER

HARDWARE GROUP NO. 28

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1		EXISTING DOOR, FRAME AND HARDWARE TO REMAIN		

HARDWARE GROUP NO. 29

PROVIDE EACH SL DOOR(S) WITH THE FOLLOWING:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1		EXISTING DOOR, FRAME AND HARDWARE TO REMAIN		

HARDWARE GROUP NO. 30

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	90 DEG OFFSET PULL	8190HD 12" O	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	PA MOUNTING PLATE	4040-18PA AS REQ'D	689	LCN
1	EA	FLOOR STOP	FS18L/FS18S AS REQ'D	BLK	IVE
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER

WEATHER SEALS BY DOOR MANUFACTURER/SUPPLIER.

HARDWARE GROUP NO. 31

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4041 DEL	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8402 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1			MARBLE THRESHOLD BY OTHERS		
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

HARDWARE GROUP NO. 32

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-L-NL-06	626	VON
1	EA	MORT CYL TURN-CD	09-900 X XQ11-935 (XB11-720 ADA T-TURN)	626	SCH
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	FSIC CORE	23-030	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	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O

HARDWARE GROUP NO. 33

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HW HINGE	5BB1HW SH 4.5 X 4.5 NRP	630	IVE
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB-MT54	689	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-DT	626	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-NL	626	VON
1	EA	MORT CYL TURN-CD	09-900 X XQ11-935 (XB11-720 ADA T-TURN)	626	SCH
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX	626	SCH
2	EA	FSIC CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS18L/FS18S AS REQ'D	BLK	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	MULLION SEAL	8780N	N	ZER
1	EA	MEETING STILE	155AA	AA	ZER
1	EA	MEETING STILE	55AA	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER

HARDWARE GROUP NO. 34

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

HARDWARE GROUP NO. 35

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

HARDWARE GROUP NO. 36

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW 5 X 5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06A L583-363 L283-711	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM 7800 SERIES AS REQ'D	689	LCN
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

CONNECT MAG HOLDER TO FIRE LIFE SAFETY SYSTEM.

HARDWARE GROUP NO. 37

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

HARDWARE GROUP NO. 38

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8402 4" X 1" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

HARDWARE GROUP NO. 39

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM 7800 SERIES AS REQ'D	689	LCN
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

CONNECT MAG HOLDER TO FIRE LIFE SAFETY SYSTEM.

HARDWARE GROUP NO. 40

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM 7800 SERIES AS REQ'D	689	LCN
1	SET	SEAL	DOOR SEALS BY FRAME MANUFACTURER/SUPPLIER		B/O
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER
1	SET	NOTE	INTUMESCENT SEALS BY DOOR MANUFACTURER		B/O

CONNECT MAG HOLDER TO FIRE LIFE SAFETY SYSTEM.

HARDWARE GROUP NO. 41

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM 7800 SERIES AS REQ'D	689	LCN
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	547A-MSLA-10 OR AS DETAILED	A	ZER

CONNECT MAG HOLDER TO FIRE LIFE SAFETY SYSTEM.

END OF SECTION

Door Schedule

Qty	Door #	HW Set	Mode	Width	Height	Thick	Door	Frame	Rating	Outside Loc	Inside Loc
1	100A	01	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	FITNESS	STORAGE
1	100B	02	SGL	3' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	EXTERIOR	FITNESS
1	100C	03	PR	6' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	EXTERIOR	FITNESS
1	100D	03	PR	6' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	EXTERIOR	FITNESS
1	101A	03	PR	6' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	EXTERIOR	WEIGHT ROOM
1	101B	04	PR	6' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	CORRIDOR	WEIGHT ROOM
1	102A	05	SGL	3' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	EXTERIOR	ACADEMIC STUDENT SUCCESS
1	102B	05	SGL	3' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	EXTERIOR	ACADEMIC STUDENT SUCCESS
1	103A	05	SGL	3' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	EXTERIOR	MEETING
1	103B	06	SGL	3' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	CORRIDOR	MEETING
1	104	03	PR	6' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	EXTERIOR	CORRIDOR
1	104A	07	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	VESTIBULE
1	104B	08	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	VESTIBULE	WOMEN'S STAFF LOCKERS
1	104C	09	CO	3' 0"	7' 0"	0"	UNK	HMF	NONRTD	WOMEN'S STAFF LOCKERS	WOMEN'S STAFF SHOWERS
1	104D	09	CO	3' 0"	7' 0"	0"	UNK	HMF	NONRTD	WOMEN'S STAFF LOCKERS	WOMEN'S STAFF SHOWERS
1	105	10	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	OFFICE
1	106A	11	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	GYM	CORRIDOR
1	106B	11	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	GYM	CORRIDOR
1	106C	12	PR	6' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	HALL
1	106D	12	PR	6' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	HALL
1	107	34	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	HALL	STORAGE

Qty	Door #	HW Set	Mode	Width	Height	Thick	Door	Frame	Rating	Outside Loc	Inside Loc
1	108	08	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	HALL	WOMEN'S RESTROOM
1	109	08	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	HALL	MEN'S RESTROOM
1	110	34	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	HALL	STORAGE
1	111	03	PR	6' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	EXTERIOR	CORRIDOR
1	112	10	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	OFFICE
1	113	13	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	VESTIBULE
1	113A	09	CO	4' 0"	7' 0"	0"	UNK	HMF	NONRTD	VESTIBULE	MEN'S LOCKERS
1	113B	14	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	MEN'S LOCKERS	MEN'S ASSISTANT LOCKERS
1	113C	15	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	MEN'S LOCKERS	FIRE SPRINKLER
1	114	01	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	COPY
1	115	39	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	CORRIDOR	STAIR
1	116	08	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	MEN'S STAFF LOCKERS
1	116A	09	CO	3' 0"	7' 0"	0"	UNK	HMF	NONRTD	MEN'S STAFF LOCKERS	MEN'S STAFF RESTROOM
1	117	10	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	OFFICE
1	118	10	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	OFFICE
1	119	35	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	CORRIDOR	OFFICE
1	120	16	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	VESTIBULE
1	120A	13	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	VESTIBULE	WOMEN'S LOCKERS A
1	120B	17	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	WOMEN'S LOCKERS A	WOMEN'S LOCKERS B
1	120C	17	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	WOMEN'S LOCKERS A	WOMEN'S LOCKERS C
1	121A	13	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	VESTIBULE	WOMEN'S LOCKERS SHOWERS

Qty	Door #	HW Set	Mode	Width	Height	Thick	Door	Frame	Rating	Outside Loc	Inside Loc
1	121B	09	CO	3' 0"	7' 0"	0"	UNK	HMF	NONRTD	WOMEN'S LOCKERS A	WOMEN'S LOCKERS SHOWERS
1	121C	13	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	VESTIBULE	WOMEN'S LOCKERS A
1	121D	13	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	VESTIBULE
1	122	18	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	RESTROOM
1	123A	11	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	MEN'S LOCKERS RESTROOM
1	123B	14	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	MEN'S LOCKERS RESTROOM	MEN'S LOCKERS
1	124A	08	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	WET ROOM
1	124B	17	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	TRAINING ROOM	WET ROOM
1	125	10	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	EQUIPMENT OFFICE
1	125A	19	RU	4' 0"	6' 0"	1 3/4"	STL	STF	NONRTD	CORRIDOR	EQUIPMENT OFFICE
1	125B	09	CO	3' 6"	7' 0"	0"	UNK	HMF	NONRTD	EQUIPMENT	EQUIPMENT OFFICE
1	125C	36	SGL	4' 0"	7' 0"	1 3/4"	WD	HMF	45MIN	EQUIPMENT	LAUNDRY
1	126	08	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	TRAINING ROOM
1	126A	03	PR	6' 0"	7' 0"	1 3/4"	AG	ALF	NONRTD	EXTERIOR	TRAINING ROOM
1	126B	20	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	TRAINING ROOM	OFFICE
1	126C	20	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	TRAINING ROOM	OFFICE
1	126D	20	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	TRAINING ROOM	PRIVATE CONSULTATIO N

Qty	Door #	HW Set	Mode	Width	Height	Thick	Door	Frame	Rating	Outside Loc	Inside Loc
1	127	10	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	OFFICE
1	128	10	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	OFFICE
1	129	10	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	OFFICE
1	130	21	PR	6' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	WEIGHT ROOM	MECHANICAL ROOM
1	131	15	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	MEN'S LOCKERS	IDF 1
1	132	22	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	90MIN	CORRIDOR	ELEV. MACHINE ROOM
1	133	23	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CORRIDOR	ELEV. MACHINE ROOM
1	134	24	SGL	4' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	CORRIDOR	ELECTRICAL ROOM
1	135	25	SGL	3' 0"	7' 0"	1 3/4"	HMD	HMF	NONRTD	EXTERIOR	MECHANICAL ROOM
1	136	26	SGL	3' 0"	7' 0"	1 3/4"	EX	EX	NONRTD	EXTERIOR	ELECTRICAL ROOM
1	137	37	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	GYM	STAIR
1	138	27	PR	4' 4"	7' 0"	1 3/4"	WD	ALF	NONRTD	GYM	STORAGE
1	139	37	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	GYM	STAIR
1	140	28	PR	6' 0"	6' 6"	1 3/4"	EX	EX	NONRTD	EXTERIOR	GYM
1	141	28	PR	6' 0"	6' 6"	1 3/4"	EX	EX	NONRTD	EXTERIOR	GYM
1	144	10	PR	3' 0"	7' 0"	1 3/4"	EX	EX	NONRTD	EXTERIOR	GYM
1	200A	29	SL	6' 6"	6' 8"	1 3/4"	EX	EX	NONRTD	EXTERIOR	LOBBY
1	200B	30	SGL	3' 0"	7' 0"	1 3/4"	AG	ALF	45MIN	LOBBY	HALL
1	200C	11	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	HALL	STAIR
1	201	31	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	HALL	MEN'S RESTROOM
1	203	08	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	HALL	TEAM ROOM A
1	204	38	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	HALL	TEAM ROOM B
1	205A	09	CO	4' 8"	7' 0"	0"	UNK	HMF	NONRTD	HALL	HALL
1	205B	40	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	STAIR	HALL

Qty	Door #	HW Set	Mode	Width	Height	Thick	Door	Frame	Rating	Outside Loc	Inside Loc
1	205C	26	SGL	3' 0"	7' 0"	1 3/4"	EX	EX	NONRTD	EXTERIOR	HALL
1	206A	32	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	HALL	FITNESS
1	206B	28	PR	7' 0"	6' 6"	1 3/4"	EX	EX	NONRTD	EXTERIOR	FITNESS
1	206C	01	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	FITNESS	STORAGE
1	206D	33	PR	7' 0"	7' 0"	1 3/4"	HMD	HMF	NONRTD	EXTERIOR	FITNESS
1	207A	29	SL	6' 6"	6' 8"	1 3/4"	EX	EX	NONRTD	EXTERIOR	LOBBY
1	207B	30	SGL	3' 0"	7' 0"	1 3/4"	AG	ALF	45MIN	LOBBY	HALL
1	208	31	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	HALL	WOMEN'S RESTROOM
1	210	08	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	HALL	TEAM ROOM C
1	211A	09	CO	4' 8"	7' 0"	0"	UNK	HMF	NONRTD	HALL	HALL
1	211B	40	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	STAIR	HALL
1	211C	26	SGL	3' 0"	7' 0"	1 3/4"	EX	EX	NONRTD	EXTERIOR	HALL
1	212	38	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	45MIN	HALL	TEAM ROOM D
1	213	32	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	HALL	CARDIO
1	213A	01	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	CARDIO	STORAGE
1	213B	28	PR	7' 0"	6' 6"	1 3/4"	EX	EX	NONRTD	EXTERIOR	CARDIO
1	213C	28	PR	7' 0"	6' 6"	1 3/4"	EX	EX	NONRTD	EXTERIOR	CARDIO
1	230	26	SGL	3' 0"	7' 0"	1 3/4"	EX	EX	NONRTD	EXTERIOR	ELEV. MACHINE ROOM
1	231	15	SGL	3' 0"	7' 0"	1 3/4"	WD	ALF	NONRTD	HALL	CUSTODIAL
1	301	28	PR	6' 0"	7' 0"	1 3/4"	EX	EX	NONRTD	STAIR	CLOSET
1	302	26	SGL	3' 0"	7' 0"	1 3/4"	EX	EX	NONRTD	STAIR	PA EQUIPMENT
1	302A	26	SGL	3' 0"	7' 0"	1 3/4"	EX	EX	NONRTD	PA EQUIPMENT	PA EQUIPMENT
1	303	41	SGL	3' 0"	7' 0"	1 3/4"	HMD	HMF	45MIN	STAIR	ROOF

SECTION 08 8000

GLAZING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Glass and glazing as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 08 1113 – Hollow Metal Door Frames.
3. Section 08 1116 – Interior Aluminum Doors and Frames.
4. Section 08 4113 - Aluminum Entrances and Storefronts.
5. Section 08 4413 - Aluminum Display Case Doors.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and installation recommendations for glass, glazing, and accessories.

B. Material Samples: Submit 6-inch square units of each type of glass specified.

1.03 QUALITY ASSURANCE

A. Labeling: Label each piece of glass and glazing and mirrors with manufacturer's name, and the grade or quality of the material. Labels shall be intact before and after installation. Fire-protection-rated glazing shall bear a label or other identification in accordance to CBC 716. For glass in doors - CBC 716.5.6.1.1

B. Comply with the following as a minimum requirement:

1. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
2. ASTM C1036 - Standard Specification for Flat Glass.
3. ASTM C1048 - Standard Specification For Heat-Treated Flat Glass —Kind HS, Kind FT Coated and Uncoated Glass.
4. CPSC 16 CFR 1201 - Safety Standards for Architectural Glazing Materials issued by the Consumer Products Safety Commission.

5. GANA - Glazing Manual.

C. Qualifications of Installer: Minimum five years experience installing glass in projects of similar scope and complexity.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver glass and glazing materials with manufacturer's labels intact.

B. Do not remove labels until glass has been installed and inspected by the Project Inspector.

C. Protect glass from staining, marking, and damage.

D. Putty and glazing compound shall be delivered to the Project site in manufacturer's original unbroken containers labeled to identify contents.

1.05 PROJECT CONDITIONS

A. Perform glazing when ambient temperature is above 40 degrees F.

B. Perform glazing on clean, dry surfaces only.

1.06 WARRANTY

A. Manufacturer shall provide a ten year material warranty.

B. Manufacturer shall provide a twenty year material warranty for coatings and thermally or acoustically rated insulation units against deterioration in acoustic or thermal rating.

C. Installer shall provide a three year fabrications and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS AND FABRICATORS

A. To maximum extent possible, provide domestically manufactured and fabricated glass, and provide glass from one manufacturer.

B. Types of glass specified or indicated shall be manufactured or fabricated by one of the following:

1. Pilkington LOF (fire rated glazing).

2. PPG Glass Technology.

3. Visteon Float Glass Operations.

4. Viracon.

5. Southwest Technologies.

6. Equal.

2.02 GLASS MATERIALS

A. General: Conform to ASTM C1036, ASTM C1048 and to ANSI Z97.1. Label factory cut panes.

B. Float Glass: Type I, (transparent glass flat), Class 1 (clear), Quality q3, (glazing select), minimum 1/4 inch thickness unless otherwise indicated or required.

C. Tinted Float Glass: Type I (transparent glass), Class 2 (tinted heat absorbing and light reducing), quality q3 (glazing select), manufactured by PPG or LOF, color as selected by Architect, minimum 1/4 inch thickness unless otherwise indicated or required.

D. Tempered Glass: Condition A (uncoated surfaces), Type I or II, Class 1, Quality q3 (glazing select), Kind FT (fully tempered glass), match color of clear or tinted glass as applicable; fully thermal tempered, heat strengthening or chemical tempering is not permitted. Perform tempering by horizontal oscillating roller hearth or high speed roller hearth process. Do not permit fabrication processes leaving gripper or tong marks. Handle and size glass according to manufacturer's written instructions.

E. Clear Laminated Glass: Two layers of 1/8 inch clear float glass with 0.030 inch thick high strength polyvinyl butyral laminating sheet.

F. Tinted Laminated Glass: One layer of 1/8 inch clear float glass and one layer of tinted glass to match other windows, with 0.030 inch thick high strength polyvinyl butyral laminating sheet. Edges of laminated glass shall be treated with Argotec, Argo Edge Seal Plus, or equal, edge protection to prevent contact of laminating sheet with sealants.

G. Low Emissivity Glass (Low E Glass): Provide units with thin metallic high-transmittance coating applied to the number 3 surface of the unit, unless otherwise indicated. The U-value for the IGU shall be no greater than 0.34, unless otherwise indicated.

H. Obscure Glass: Type II (patterned), Class 1 (clear), Form 3 (patterned), Quality q7 (decorative), patterned one side, pattern as indicated or selected.

I. Unframed Mirrors: Category II safety backed mirror-quality float glass, ¼ inch thick, , edges finished and polished, double silvered with electro-deposited copper coating plus an organic protective coating, equal to Palmer Products Mirro-Bac Paint. Include polished stainless steel edge channels at top and bottom edges, plus mirror adhesive bonding to wall.

J. Framed Mirrors: Fabricated of one-piece Type 304 stainless steel angle frame, ¾ inch by ¾ inch, with continuous integral stiffener on sides and beveled front to hold frame tightly against mirror. Corners shall be heliarc welded, ground and polished smooth. Exposed surfaces shall have stain finish with vertical grain. Mirror shall be fabricated of 1/4 inch Category II safety backed mirror quality float glass, free from tong marks. Edges shall be protected by plastic filler strips. Full-size, shock-absorbing, water-resisting, non-abrasive 1/8 inch thick polyethylene padding shall protect backs of mirrors. Mirrors shall be provided with 24 gage galvanized steel back with integral

hanging brackets for mounting on concealed, rectangular wall hangers, and shall be secured with concealed Phillips head locking screws on bottom of frame.

K. Thermoplastic Glazing: Polycarbonate sheet shall be ultra-violet stabilized material, clear or glare reducing as indicated, 1/4 inch thick as manufactured by General Electric Company "Lexan", DuPont, or equal. Glare reducing glazing shall be gray in color, providing a light transmission of 14 percent.

2.03 GLASS SETTING MATERIALS

A. Glass setting materials for protected openings shall comply with CBC Chapter 7.

B. Setting Blocks: ASTM C864, channel shape; having ¼ inch internal depth, Shore A hardness of 80 to 90 Durometer. Blocks shall be a minimum 2 inch long. Block width shall be approximately 1/16 inch less than the full width of the rabbet. Block thickness shall be at least 3/16 inch, sized for rabbet depth as required.

C. Spacers: ASTM C864, channel shape, with ¼ inch internal depth, 3/32 inch flanges, eb, 1/8 inch thick, one to 3 inches long. Spacers shall provide Shore A hardness of 40 to 50 Durometer.

D. Vinyl Glazing Channels: Profile compatible with framing system and designed to accommodate glass of specified thickness, light gray in color. Provide for dry glazing aluminum frames where indicated or permitted.

E. Glazing Tape: Poly-isobutylene based sealant tape, conforming to AAMA 804.1, with adhesive one side protected by temporary paper cover, Extru-Seal manufactured by Pecora Corp., No. 303 by Protective Treatments, Inc., or equal.

F. Spring Steel Spacers: Galvanized steel wire or strip designed to position glazing in channel or rabbet sash with stops.

G. Glazing Clips: Galvanized steel spring wire designed to hold glass in position in rabbet sash without stops.

H. Glazing Points (Sprigs): Pure zinc stock, thin, flat, triangular or diamond-shaped pieces, 1/4 inch minimum size.

I. Glazing Sealants for Metal Sash: GE Silicones Silglaze II 2800, GE Silicones Silpruf, GE Silicones 1200 Silicone, and Dow Corning 999A. Polybutylene, oleoresinous, asphalt, and oil base sealants are not permitted. Provide sealant of same color as structural silicone sealant unless otherwise required.

J. Glazing Compound for Wood Sash: Provide acrylic latex glazing compound for bedding and sealing glass in wood frames

K. Glazing Compounds and Sealants for Thermoplastic: Provide silicone, butyl, or polysulfide glazing compound.

L. Mirror Setting Materials: Manufactured by Palmer Products Corporation, or equal, for installation of mirrors, and as follows:

1. Mirror backing paint: Mirro-Bac Paint, or equal, formulated to protect mirror silvering.

2. Mirror bond coat: Mirro-Mastic Bond, or equal, formulated to isolate deleterious backing materials from mastic and mirror.

3. Mirror mastic: Mirro-Mastic, or equal, formulated for adhering mirrors and glass to substrates.

PART 3 - EXECUTION

3.01 TOLERANCES

A. Thickness indicated or specified are nominal within standard tolerances. Maximum size of vertical panes shall not exceed the following:

Float Thickness:	1/8 inch	3/16 inch	1/4 inch
Maximum Areas in Square Feet:	12	16	20

When exceeding these square foot measurements glass is to be safety glazed.

3.02 INSTALLATION, GENERAL

A. Glazing tapes or sealants shall be installed wherever glass contacts wood or metal surfaces. Width of strips shall be as required.

B. Glazing compound shall be neatly and cleanly installed in straight lines, even with inside edge of sash members. Thumb puttying is not permitted.

C. Glazing Aluminum Sash: Glazing material in aluminum sash shall be installed in compound and secured in place with aluminum glazing beads. In addition, horizontal beads shall be installed with 6-inch by 1 inch, type A, self-tapping, stainless steel, Phillips-head screws, installed into pre-drilled, counter-sunk holes and spaced 2 inches from each end and 9 inches on centers.

3.03 INSTALLATION OF GLASS

A. Conform to requirements of GANA Glazing Manual.

B. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

C. Provide compressible filler rods or equivalent back-up material to prevent sealant from extruding into glass channel weep systems, from adhering to back surface of joints and to control depth of sealant for optimum performance.

D. Force sealants into glazing channels, in manner to eliminate voids and to ensure complete bond of sealant to glass and channel surfaces.

E. Tool exposed surfaces of sealants to provide for drainage away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

F. Where dry glazing of aluminum frame is indicated or permitted, provide vinyl glazing channels installed in accordance with frame manufacturers written recommendations. Do not stretch channels. Miter corners.

G. For tape glazing, furnish tape of thickness to provide approximately 30 percent compression. Cut tape to proper length and install to permanent stops, the entire length of the head and sill first, then to jambs. Butt tape together with no overlap and remove paper backing. Install glass on setting blocks at quarter points and maintain uniform glass edge clearance around entire perimeter of glass. Maintain manufacturer's recommended edge clearance and bite on glass. Install glass firmly into tape with a slight lateral movement to assure proper adhesion. Install tape to removable stop with evenly distributed firmness, smoothing out wrinkles in tape. Secure removable stop in proper position so tape makes contact with glass as stop is installed, forcing contact with glass and completely sealing joint. Remove excess tape from both sides at slight angle over sight line. Do not undercut.

H. Laminated Glass: Sashes, which are to receive laminated glass, shall be weeped to the outside to permit water in the channel to drain from the frame.

I. Unframed Mirrors: Walls shall be clean, dry, plumb, rigid and smooth. Install mirror backing paint to back of mirror and to edges. Install mirror bond coat over painted backing, wood backing, concrete and masonry to receive mirrors. Bond coat is not required over vitreous surfaces. Install sufficient mirror mastic coverage when mirror is installed. Mirror mastic will be applied 4 inches from edge and at a maximum of every 12 inches at the size of a golf ball. Install mirror into place, providing 3/16 inch clearance between mirror and substrate. Support mirrors with temporary edge channels to allow mastic set-up and provide permanent top and bottom edge channels.

J. Framed Mirrors: Walls shall be clean, dry, plumb, rigid and smooth. Install mirrors with concealed mounting devices, and secure with concealed screws on bottom of mirror. Conform to manufacturers written recommendations.

3.04 PROTECTION AND CLEANING

A. Protect exterior glass from breakage by furnishing crossed streamers attached to framing and away from glass surface. Do not directly install markers to glass surfaces. Remove non-permanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer. Glazing, which cannot be cleaned to a required condition, shall be deemed defective Work.

D. Remove and replace glass, which is broken, chipped, cracked, abraded, or damaged during construction.

E. Remove protective covering from thermoplastic not more than 4 days before Substantial Completion, and immediately before cleaning. Methods of final cleaning and finishing shall be as prescribed by thermoplastic glazing publications referenced above.

F. Wash glass on both faces not more than four days before Substantial Completion. Wash glass by method recommended by glass manufacturer. Do not furnish harsh cleaning agents, caustics, abrasives, or acids for cleaning. Polish glass both sides and leave free of soil, streaks, and labels.

3.05 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.06 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 089000

LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed, galvanized steel louvers.

B. Related Sections:

1. See Section 081113 "Hollow Metal Doors and Frames" for louvers in hollow-metal doors.
2. See Section 081416 "Flush Wood Doors" for louvers in flush wood doors.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on pressures as required by local codes and as indicated on Drawings.
2. Wind Loads: Determine loads based on a uniform pressure as required by local codes, acting inward or outward.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7, and CBC 2016.

1. Design earthquake spectral response acceleration, short period (Sds) for Project is as required by local codes.
2. Component Importance Factor is as required by local codes.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.3 SUBMITTALS

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

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized-Steel Sheet: ASTM A 653/A 653M, G60 (Z180), G90 (Z275) zinc coating, mill phosphatized.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, No. 4 finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
2. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view; welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, FORMED-METAL LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Air Flow Company, Inc.
   b. Airolite Company, LLC (The).
   c. Greenheck Fan Corporation.
   d. Industrial Louvers, Inc.
   e. Vent Products Company, Inc.

2. Louver Depth: 5 inches .
3. Frame and Blade Material and Nominal Thickness: Galvanized-steel sheet, not less than 0.052 inch for frames and 0.040 inch for blades.

4. Louver Performance Ratings: As indicated on drawings.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.

C. Louver Screening:
   1. Bird Screening: Galvanized steel, 1/2-inch square mesh, 0.041-inch wire.

2.5 GALVANIZED-STEEL SHEET FINISHES

A. Finish louvers after assembly.

B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair according to ASTM A 780.

C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

   1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

END OF SECTION

SECTION 09 2216

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Non-structural metal framing.

2. Slotted system for positive attachment of metal studs to overhead structural elements for head of wall expansion joint movement (cyclic).

B. Related Requirements:

1. Division 01 - General Requirements.

3. Section 09 2423 - Cement Plaster and Metal Lath.

4. Section 09 2900 - Gypsum Board.

1.02 PROJECT REQUIREMENTS

A. Regulatory Requirements: Comply with DSA and CBC requirements.

B. Design Requirements:

1. Metal Studs: Studs for interior partitions shall be roll-formed channel or C-shapes.

2. Track: Stud track for floor and ceiling anchorage shall be channel configuration, sized to fit studs. Galvanized steel as manufactured for installation with specified metal studs.

3. Design: Design is based on minimum 5 pounds per square foot load applied perpendicular to walls. Deflection shall not exceed 1/240 under design load.

B. Performance Requirements:

1. The top track fire-rated assembly, when incorporated into stud systems and tested in conjunction with products specified in Sections 07 8116 and/or 07 8413, shall exhibit the following performance characteristics:

a. Cyclic System: When tested for cyclical movement, in accordance with UL 2079. Assembly shall achieve 500 cycles of wall movement at 35 to 40 cycles per minute.

b. When subsequently tested for 1 and 2 hour fire-resistive rated construction, in accordance with ASTM E119 and ASTM E814, assembly shall conform to requirements for hose stream resistance.

1.03 SUBMITTALS

A. Shop Drawings: Submit drawings showing framing, connection details, accessories and anchorage. Indicate location of assemblies and size and spacing of framing components.

B. Product Data: Submit manufacturer's catalog data for each item proposed for installation.

C. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.04 DEFINITIONS

A. Cyclic Anchoring Method: A system which provides for positive attachment (as described in ASTM C754) of studs to upper track, and of track to overhead fluted deck, while permitting up to 1-inch of vertical movement.

B. System: The application of the above products in their entirety as tested. There can be no intermixing of components unless specifically outlined in the appropriate test reports.

1.05 QUALITY ASSURANCE

A. Coordinate with related Work to provide blocking for items mounted on finished surfaces and to provide allowances for pipes and other items inside partitions and walls.

B. Comply with following as a minimum requirement:

1. American Welding Society (AWS): Structural Welding Code Steel (D1.1); and Structural Welding Code Sheet Steel (D1.3).

2. ASTM Standards:

a. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

b. ASTM A1003 –Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

c. ASTM A641 – Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire.

d. ASTM C645 – Standard Specification for Non-Structural Steel Framing Members.

e. 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.

f. ASTM C954 – Standard Specification for Steel Drill Screws for Application of Gypsum Panel Products or Metal Bases to Steel Studs From 0.033 Inch to 0.112 Inch in Thickness.

g. ASTM E1190 – Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.

C. Tolerances: Install walls and partitions on straight lines, plumb, free of twists or other defects, and contacting a 10 foot straightedge for its entire length at any location within a 1/8 inch tolerance. Install horizontal framing level within a tolerance of 1/8 inch in 12 feet in any direction.

D. Manufacturers shall be members of Steel Stud Manufacturers Association (SSMA).

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered in their original unopened packages and stored protected from damage. Do not store material directly on grade. Provide adequate support to prevent bowing of material prior to installation.

B. Store welding electrodes in accordance with AWS D12.1.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Non-structural metal framing:

1. ClarkWestern Building Systems, Inc.

2. Dietrich Industries, Inc.

3. Marino/Ware.

4. Cemco.

5. Equal.

B. Top Track Systems:

1. Sliptrack System by Dietrich Industries., Inc. or equal. Down-standing legs shall be nominally 2 1/2-inch and shall be provided with 1 1/2-inch slots at 1 inch on center.

2. VertiTrack or VertiClip System by The Steel Network, Inc. or equal. Pre-assembled track with clips installed to match stud spacing. Clips with attached bushing and screws to allow stud movement.

3. System must provide for minimum tested overall movement of 1 inch: ½ inch in each direction.

4. Track shall be provided in standard widths of 4 and 6 inches and in 16, 18, and 20 gage (54, 43, and 33 mil) sheet steel thickness, as required by Project conditions and detailed.

2.02 MATERIALS

A. Light Gage Metal Framing:

1. Metal framing shall be formed from corrosion resistant-steel conforming to requirements of ASTM A653, 33 ksi minimum.

2. Metal framing shall be zinc coated in conformance to requirements of ASTM A924, G60.

3. Metal framing shall be manufactured in conformance to ASTM C645.

4. Install metal framing according to ASTM C1007, Standard Specification for Installation of Load-Bearing (Transverse and Axial) Steel Studs and Related Accessories.

B. Studs: SSMA, ICC-ES ER-4943P, minimum yield 33 ksi, hot-dipped galvanized or electro galvanized sheet steel, G-60, C Stud type, punched web (except tracks and joists), C-shaped, sizes required to conform to details and scheduled wall thicknesses. Studs shall be rolled from new steel sheet and shall not be produced from re-rolled steel. Stud flanges shall not be less than 1 5/16-inch wide; track flanges, not less than 1 ¼-inch wide.

1. Wall Framing and Furring for Plaster and Mortar Beds: Studs and tracks shall be 18 gage (43 mil) minimum, unless otherwise indicated.

2. Wall Framing and Furring for Gypsum Wallboard: Studs and tracks shall be 20 gage (33 mils) minimum, unless otherwise indicated.

3. Load-Bearing Studs: Studs and members thicker than 18 gage (43 mil) shall conform to requirements of Section 05 4100 - Structural Metal Stud Framing.

4. Stud gages indicated on Drawings or specified are the minimum. Where required stud height and/or loads exceed code requirements or manufacturer's recommendations, provide heavier gage studs and/or decrease stud spacing as necessary to conform to code requirements.

C. Suspended and Furred Ceiling Systems and Wall Furring: Suspended ceiling framing system shall support finished ceiling, light fixtures, air diffusers, and accessories, as required. Suspension system shall provide a maximum deflection of L/240. Carrying channels shall be fabricated from minimum 0.0548 inch thick cold-rolled steel, 1 ½-inch wide by 7/16 inch deep. Carrying channels for supports under ducts shall be 2 inches in size as specified. Carrying channels shall be fabricated from hot-dip galvanized coated sheet.

1. Gypsum Wallboard Ceilings: Furring members shall be fabricated from cold-rolled steel, 7/8 inch by 2 9/16-inch. Furring members shall be fabricated from hot-dip galvanized coated sheet.

D. Framed Ceilings: Framed ceiling framing system shall support finished ceiling, light fixtures, air diffusers, and accessories, as required. Suspension system shall provide a maximum deflection of L/240.

1. Plaster and Gypsum Wallboard Ceilings: Ceiling joists shall conform to ASTM C645, hot-dip galvanized coated steel, C-shaped, unpunched, 20 gage (30 mil) minimum, unless noted otherwise.

E. Shaft Wall Framing Members: CH studs and J runners, 20 gage (30 mil) minimum for 2, 4 or 6 inch studs, conforming to ASTM C645, fabricated of steel conforming to ASTM A653, hot-dip galvanized.

F. Framing Accessories: Provide standard related accessories including floor and ceiling tracks, clips, web stiffeners, anchors, and similar items, of same manufacture as each type of stud specified, and as required for a complete installation.

G. Splay Wires and Compression Struts: Approved manufacturers acceptable to manufacturer of ceiling grids, gages and types as required by building codes for ceiling types and weights specified.

H. Wires: Soft-annealed galvanized steel wire, 8 gage for hanger wires and 16 gage for framing unless otherwise specified.

I. Fasteners: Wafer-head screws, self-drilling type for 20 gage (30 mil) metal and heavier. ASTM C954 self-drilling, self-tapping screws, Type S-12 pan head, ½ inch long.

J. Fire Rated Acoustical Foam Tape: Compressible, closed cell polyvinyl chloride foam with pressure sensitive adhesive, in rolls with protective release liner on non-adhesive face, 6 pounds per cubic foot density, 1 inch wide x not less than 1/4 inch thick, self-extinguishing, UL 94 recognized, Norseal V740FR, manufactured by Norton Performance Plastics Corporation, or equal.

K. Acoustical Sealant: Permanently resilient type, non-hardening, as specified in Section 07 9200.

L. Zinc-Rich Paint: Conform to Fed Spec DOD-P-21035A, Z.R.C. "Cold Galvanizing Compound", manufactured by ZRC Products Company, or equal. Provide for touch-up of galvanized surfaces.

M Steel Backing Plates: Provide a minimum 4 inch wide by 16 gage (54 mil) steel, or sections of studs and stud track welded or fastened to web of studs, except as otherwise indicated. Apply shop coat of metal primer.

N. Anchorage Devices Powder Actuated: Minimum 0.177 inch diameter by 1-7/16 inch long fasteners in regular concrete and 0.145 inch diameter by 1 1/8-inch long fasteners in lightweight concrete. Allowable shear and tension values as permitted in ICC ES reports shall be reduced to 80 percent.

O. Anchorage Devices, Drilled Expansion Anchors: Minimum 3/8 inch diameter with 2-1/4 inch embedment. Allowable shear and tension values as permitted in ICC ES reports shall be reduced to 80 percent.

P. Top Track System Materials:

1. Forming steel shall be mill certified prime steel:

a. For 0.064 inch sections, conform to ASTM A1011, Grade 50 with a minimum yield point of 50,000 psi.

b. For 0.048 and 0.036 inch sections, conform to ASTM A1008, Grade C, with a minimum yield point of 33,000 psi.

c. Formed steel shall be provided with galvanizing in accordance with ASTM A653 for a Class G90 zinc coating.

2. Fasteners:

a. For attachment of steel studs to slotted track or deflection clip, minimum No.8 corrosion resistant by ½ inch waferhead screws.

b. For attachment of track system to overhead structural element or metal decking, as provided for by the structural details affecting the Work.

3. Sprayed-on Fireproofing

a. Sprayed-on fireproofing shall be as specified in Section 07 8116 - Cementitious Fire Proofing.

4. Dry Method.

a. Dry mineral wool and sealant system shall use only such products as are represented to have been fully tested and approved under UL 2079 and as specified in Section 07 8413 - Penetration Firestopping.

b. Mineral wool shall be compressed to the degree as used on approval fire and hose stream test.

c. The system supplier shall provide a measuring device capable of determining compression to determine compliance with required density.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that overhead or concealed Work is completed, tested, inspected, and finished as required before starting Work of this section.

3.02 INSTALLATION

A. Walls and Partitions:

1. Fasten floor runners for exterior walls and interior partitions to concrete slab with required power driven fasteners. Spacing of fasteners not to exceed 24 inches on center. Fasten ceiling runners to structure as by top track system manufacturer.

2. Sound insulated walls and partitions: Embed floor runner tracks in two beads of acoustical sealant or two runs of compressible tape seal. Install top track nested into slotted track system, in same manner for full height of walls. Where wall ends abutting concrete, masonry, or steel set end studs in two beads of acoustical sealant or two tape seals and secure at 4-foot centers vertically.

3. Space studs not over 16 inch on center unless indicated otherwise. Studs shall be located approximately 2 inches from door frame jambs, abutting partitions and partition corners, except those providing support for door and window openings.

4. Furnish and install manufacturer's standard floor track. Fasten track to floor by means of 1/4 inch by 1 1/4-inch Star "Dryvin" hammer drive anchors or 3/16 inch by 1 inch round head, "Rawl-Drives" one-piece expansion bolts spaced not to exceed 3 feet, and installed in drilled holes in slab, or to wood joist with nails as indicated. Track may be fastened to concrete floor slabs with, power-driven fasteners.

5. Studs shall be seated squarely in track with stud web and flanges abutting track web, plumbed and securely fastened with sheet metal screws, to flanges or web of both floor and top tracks. Provide 4 screws per stud.

6. Where there is no suspended ceiling, tops of stud walls shall be provided with track and shoes and be fastened as specified for floors. Welding of studs to ceiling track will not be permitted except where bearing studs are installed.

7. Over metal door frames, install a cut-to-length section of runner track, with flanges slit and web-bent to allow flanges to overlap adjacent vertical studs, and securely fasten to studs. At doorjambs, extend studs continuous to structure above.

8. Bridging, or horizontal bracing of 1 1/2-inch, cold-rolled channels shall be fastened in a manner to prevent stud rotation. Bridging shall be furnished as follows: walls up to 10 feet high, one row at mid-height; walls exceeding 10 feet high, bridging or bracing rows spaced not to exceed 5 feet on center.

9. Wind bracing shall be fastened where indicated on Drawings. Minimum size of strap shall be as indicated on Drawings. Track where strap terminates shall be anchored as indicated on Drawings.

B. Gypsum Wallboard Ceiling Suspension and Framing: Suspended ceiling system framing shall be installed in accordance with ASTM C754, and as follows.

1. Hangers shall be spaced not more than 48 inches along runner channels and 36 inches in other direction or 42 inches in both directions unless otherwise indicated. Locations of hanger wires shall be coordinated with other Work. Hangers at ends of runner channels shall be located not more than 6 inches from walls. Hanger wire shall be fastened to structural elements with required fasteners. Sags or twists, which develop in suspended system, shall be adjusted. Damaged or faulty parts shall be replaced.

2. Main Runners: Hanger wires shall be double strand saddle-tied to runner channels and ends of hanger wire shall be twisted three times around itself. Main runners shall be located to within 6 inches of parallel wall to support ends of cross furring. Main runners shall not come in contact with abutting masonry or concrete walls. Where main runners are spliced, ends shall be overlapped 12 inches with flanges of channels interlocked, and shall be securely tied at each end of splice with wire looped twice around channels.

3. Furring channels shall be fastened to runner channels and to structural supports at each crossing with tie wire, hairpin clips, or required fastenings. Furring channels shall be located within 2 inches of parallel walls and beams, and shall be cut 1/2 inch short of abutting walls.

4. Ceiling Openings: Support members shall be provided as required at ceiling openings for access panels, recessed light fixtures, and air supply or exhaust. Support members shall be not less than 1 1/2-inch main runner channels and vertically installed suspension wires or straps shall be located to provide at least minimum support specified for furring and wallboard attachment. Intermediate structural members not a part of structural system, shall be provided for attachment or suspension of support members.

5. Light fixtures and air diffusers shall be supported directly from suspended ceiling runners. Wires shall be provided at required locations to support weight of recessed or surface mounted light fixtures and air diffusers.

6. Control Joints: Ceiling control joints for expansion and contraction shall be located where indicated on drawings. A control joint or intermediate blocking shall be installed where ceiling framing members change direction.

   a. Interior Ceilings with Perimeter Relief: Control joints shall be installed so linear dimensions between control joints shall not exceed 50 feet in either direction or more than 2,500 square feet in area.

   b. Interior Ceilings without Perimeter Relief: Control joints shall be installed so linear dimensions between control joints shall not exceed 30 feet in either direction nor more than 900 square feet in area.

C. Splay Wires and Compression Struts: Install as detailed and as required to prevent upward and sideward motion under seismic conditions, as required by code.

D. Suspension Under Ducts: For hangers spaced at 4 to 5 ½-foot centers, provide 6 gage (0.192 inch diameter) hanger wires with minimum 2 inch runner channels spaced at

maximum 48 inch centers. For greater spans, design system for live load of l0 pounds per square foot of area plus dead load and provide a detail in Shop Drawings.

E. Furring: Provide framing for horizontal furring as shown or required. Conform to above requirements as applicable.

3.03 CONNECTIONS TO METAL DECKING

A. Provide pre-molded neoprene filler strips matching flute profile for non-fire-rated walls and partitions covered on one or both sides up to metal decking.

B. The top runner track of fire-rated partitions shall be a minimum of 20 gage (33 mils) and fastened to metal deck with required fasteners at spacing required for fire rating, but in no case over 16 inches on center. Neither wallboard nor metal studs shall be fastened to top runner to allow for slab deflection. Areas above runner shall be friction fit with a minimum depth of 2 1/2-inch of 4 pounds per cubic foot mineral wool insulation. A minimum of 1/2 inch of firestopping compound shall be installed to each side of mineral wool insulation for 1-hour system, and 1 inch of firestopping for a 2-hour system. Install required special tracks, angles, fasteners and strips of gypsum wallboard as required to achieve required fire resistance rating.

C. Proprietary fire-rated top tracks are installed in accordance with manufacturer's recommendations and fire rating approval requirements.

3.04 CLEANING

A. Remove debris, rubbish, and waste material and legally dispose of off Project site.

3.03 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 2423

CEMENT PLASTER AND METAL LATH

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Lath and Portland cement plaster and stucco.

2. Lath and scratch coat of Portland cement plaster as a substrate for ceramic wall tile.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 3000 – Cast-in-Place Concrete.

3. Section 05 4100 - Structural Metal Stud Framing.

4. Section 07 2100 – Thermal Insulation.

5. Section 07 2719 – Plastic Sheet Air Barriers.

6. Section 09 2216 - Non-Structural Metal Framing.

7. Section 09 3013 - Ceramic Tiling.

1.02 SYSTEM DESCRIPTION

A. Three coat 7/8" cement plaster on metal lath over water resistive barrier over plastic sheet air barrier over sheathing over metal studs.

B. Soffits and ceilings: Three coat 7/8" cement plaster on metal lath over suspended metal framing.

C. One coat cement plaster base for ceramic tile installation.

1.03 REFERENCES

A. ASTM International (ASTM):

1. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

2. ASTM A510 - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.

3. ASTM A641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

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

5. ASTM C150 – Standard Specification for Portland Cement.

6. ASTM C206 – Standard Specification for Finishing Hydrated Lime.

7. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring.

8. ASTM C847 - Standard Specification for Metal Lath.

9. ASTM C897 – Standard Specification for Aggregate for Job Mixed Portland Cement-Based Plasters.

10. ASTM C926 – Standard Specification for Application of Portland Cement-Based Plaster.

11. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.

12. 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.

13. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

14. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.

15. ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.

16. ASTM E1190 – Standard Test Methods for Power-Actuated Fasteners Installed in Structural members.

B. Federal Specifications (FS):

1. FS FF-N-105: Nails, Brads, Staples and Spikes: Wire, Cut and Wrought.

2. UU-B-790A: Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent, and Fire Resistant).

C. International Code Council (ICC):

1. ICC-ES AC11: Acceptance Criteria for Cementitious Exterior Wall Coatings.

2. ICC-ES AC 191: Acceptance Criteria for Metal Plaster Bases (Lath).

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each material and component proposed for installation.

B. Plaster Samples: Submit minimum 48-inch by 48-inch samples of each stucco and Portland cement plaster texture for review. Samples shall be representative of texture, color, and proposed fabrication and finish quality. Maintain reviewed Samples on Project site for reference.

C. Accessories Samples: Submit 12 inch long samples of metal lath accessories: control joints, expansion joints, corner reinforcements, reveals and screeds.

D. Certificates: Submit test reports or ICC Evaluation Reports indicating that materials are in compliance with CBC requirements. Cementitious materials shall meet the acceptance requirements of ICC AC11, and metal lath the acceptance requirements of ICC AC191.

1.05 QUALITY ASSURANCE

A. Mock-ups:

1. Constructed as part of the building.

2. Provide a mock-up at least 10-foot wide by 10-foot high. Include at least one control joint and, corner condition and one window opening flashing. Locate where indicated by the ARCHITECT.

3. Mock-up shall be constructed by the same personnel who will be erecting the different components of the wall assembly on the project, overseen by the same personnel who will be acting as acting as supervisors during actual construction, and built with the same construction techniques and materials that will be used on the project.

4. Wall/window assembly will be tested by a lab retained by the OWNER for air and water infiltration in accordance to ASTM E1105 and ASTM E783.

B. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities and preparations for the installation of metal lath and cement plaster and other related work of this Section.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store weather sensitive materials under cover, off the ground, and kept in a dry condition until ready for use.

B. Deliver materials to the Project site in manufacturer's sealed and labeled packages.

PART 2 - PRODUCTS

2.01 METAL LATH AND WEATHER RESISTIVE BACKING

A. Metal Lath:

1. Walls and Ceilings: Diamond mesh expanded metal lath, in conformance to ASTM C847, without paper backing. 3.4 pounds per square yard, hot-dip galvanized coating G60 in accordance with ASTM A653. Alabama Metal Industries Corporation (AMICO), California Expanded Metal Products Company (CEMCO), ClarkDietrich, Marino-Ware, or equal.

   a. V-grooved self-furring type for installation over sheathing. Lath shall be furred out a minimum of 1/4 inch when installed over a solid surface in accordance to DSAIR 25-4.

   b. Flat type for installation over spaced framing.

2. Walls: Self-furring Welded Wire Lath: Weight 1.95 pounds per square yard, with Class 1 galvanized coating in conformance to ASTM A641. Structa Mega Lath per ICC ESR-2017, as manufactured by Structa Wire Corp, or equal.

3. Walls & Ceilings: Self-furring Welded Wire Lath: Weight 2.2 pounds per square yard, with Class 1 galvanized coating in conformance to ASTM A641 with heavy perforated Kraft paper. V-Truss per ICC ESR-2017, as manufactured by Structa Wire Corp, or equal.

B. Water Resistive Barrier Backing for Metal Lath:

1. One layer of air barrier membrane per Section 07 2719, Plastic Sheet Air Barriers.

1.

2. One layer of asphalt saturated, water resistant Kraft paper backing conforming to Fed Spec UU-B-790A, Type 1, Grade D60, manufactured by Fortifiber, Davis Wire, Leather back, or equal. Furnish for exterior plastering (except on soffits and ceilings), and for mortar-set ceramic wall tile.

C. Self-Adhered Flashing:

1. Compatible with the Plastic Sheet Air Barrier, minimum 25 mils thick, self-sealing and waterproof.

2. Adhesives, primers and sealers for self-adhered flashings and water repellant backing shall be as recommended by manufacturer for installation with specified products and substrates, and shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

2.02 METAL LATH ACCESSORIES

A. Materials: Minimum 0.0172 inch galvanized steel or 0.0207 zinc alloy with expanded wings. PVC is not permitted. Furnish casing beads, expansion and control joints, weep and vent screeds.

B. Manufacturers: Alabama Metal Industries Corporation (AMICO), California Expanded Metal Products Company (CEMCO), ClarkDietrich, Stockton Products, Marino-Ware, equal.

C. Products:

1. Exterior Stress Relief Joints: Sizes and profiles, indicated or required. Control joints shall have expanded wings when attachment flange is installed above the primary water-resistant barrier.

2. Expansion Joints: Two piece sections designed to accommodate expansion, contraction and shear forces. Industry generic name: #40-2 piece joint.

2.

3. Control Joints: One-piece sections, with flange designed to engage plaster. Grounds shall provide full 7/8 inch thickness of cement plaster. Industry generic name: XJ-15.

4. Soffit Drip Screed: Similar to Stockton Products No. 5, with key holes.

5. Casing Beads: Expanded or standard flange type with 7/8 inch grounds to establish plaster thickness. Industry generic names: J-Mold or # 66.

6. Welded Wire Corner Reinforcement: 2-5/8 inch wire wings square or bullnose. Industry generic name: CornerAid.

7. Inner Corner Reinforcement: Shaped reinforcing expanded metal with 3 inch legs, for angle reinforcement. Industry generic name: Cornerite.

8. Lath Reinforcement: Flat expanded metal lath reinforcing units. Industry generic name: Striplath.

9. Outside Corner Reinforcing: 2 1/2" legs Class 1 Galvanized Coating complying with ASTM A641. VTruss Straight Corner per ICC ESR-2017, as manufactured by Structa Wire Corp, or equal.

10. Ventilating Screeds: Soffit, attic, fascia, edge, channel and expansion channel vent screeds, perforated web type, with integral plaster grounds, of sizes indicated on drawings.

11. Foundation Weep Screeds: Integral plaster ground and weep screed; 3-1/2" minimum attachment flange. Industry generic name: #7 Weep Screed.

2.03 LATH FASTENERS

A. Fasteners at Locations with no Continuous Insulation:

1. Metal Studs: Wafer head type S or S-12, corrosion resistant, with length to penetrate framing steel thickness plus three threads minimum.

a. Screws for fastening to steel members from 0.033 inch to 0.112 inch in thickness shall be in accordance to ASTM C954.

b. Screws for fastening to steel members 0.033 inch in thickness and less shall be in accordance to ASTM C1002.

B. Wire: Wire for fastening lath to supports, tying ends and edges of lath sheets, and securing accessories to lath, 0.0475 inch diameter (# 18 wire). Galvanized soft-annealed steel wire in conformance to ASTM A641.

2.04 PLASTER MATERIALS

A. Factory Blended Portland Cement Plaster Basecoats and Finish: Products as fabricated by California Stucco, La Habra, Shamrock Stucco, Merlex, Omega Stucco, Inc., Expo Stucco, Spec Mix, Quikrete or other manufacturer member of the Stucco Manufacturer's Association (SMA).

1. Material Standards:

a. Portland Cement: ASTM C150.

b. Hydrated Lime: ASTM C206.

c. Sand: ASTM C897.

d. Fibers: ASTM C1116.

2. Three Coat Systems:

a. Scratch and Brown Coats: Factory blended fiber reinforced plaster and sand mix conforming to ASTM C926, and requiring only the addition of water. Total thickness of coats: 3/4 inch.

b. Finish Coat: Factory blended cementitious stucco color coat, integrally colored with fade-resistant pigments. Coat thickness 1/8 inch.

1) Finish: **Light Sand**

2) Color: As selected by ARCHITECT.

3. Two Coat Systems:

a. Brown Coat: Factory blended fiber reinforced plaster and sand mix conforming to ASTM C926, and requiring only the addition of water. Coat thickness 3/8 to ½ inch.

b. Finish Coat: Factory blended cementitious stucco color coat, integrally colored with fade-resistant pigments. Coat thickness 1/8 inch.

1) Finish: **Light Sand**

2) Color: As selected by ARCHITECT.

B. Water: Clean, potable and from domestic source.

C. Plaster Bonding Agent: In conformance to ASTM C932 and formulated for exterior use. "Weld-Crete", manufactured by Larsen Products Co., or equal.

D. Plaster Patching Materials:

1. Bonding Agent: Acrylic resin type, Acryl 60, LHP Bonder, or equal.

2. Patching Plaster: Manufactured by Merlex Stucco, Inc., or equal. Furnish fast setting, compatible with existing plaster materials, "Exterior Pronto Patch," Portland cement base coat material, requiring only addition of water. Material shall provide initial set within 20 minutes and final set within one hour.

E. Flashing: Single ply self-adhesive waterproofing membrane as manufactured by W.R. Grace Company, Jiffy-Seal by Protecto Wrap, W.R. Meadows, Inc., or equal. Furnish for installation behind stress relief joints and backing on horizontal and vertical surfaces exposed to weather; under metal copings and flashings; and window jambs and sills.

F. Continuous Insulation: Refer to Section 07 2100, Thermal Insulation.

G. Miscellaneous Materials: Provide additional components and materials required for a complete installation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that installation of plastic sheet air barrier and flashings, per Section 07 2719, and continuous insulation per Section 07 2100 are complete before starting Work of this Section.

3.02 INSTALLATION-OF WATER RESISTIVE BARRIER

A. Install one layer of water resistant barrier over air barrier. Install Kraft paper horizontally with each course weather lapped 2 inches over layer below and 6 inches on ends.

B. Repair and seal tears and holes in water resistive barrier prior to installing lath.

C. Install single ply self-adhesive flashing per manufacturer's recommendations in areas indicated on the Drawings and at locations where the plaster will be in less than a 60 degree plane or where water can pond, with a six inches extension onto the vertical wall surface. Apply self-adhesive flashing in a "shingle fashion".

3.03 INSTALLATION OF LATH AND LATH ACCESSORIES

A. Exterior Lathing, General: Install in conformance to ASTM C1063 and CBC Chapter 25.

B. Install longest length of metal lath as possible. Do not use pieces shorter than six feet in length. Attach lath to framing supports not more than seven (7) inches apart along framing supports only.

C. Apply metal lath with long dimension at right angles to framing or furring supports and lap lath a minimum 1/2 inch at sides and minimum 1 inch on ends. Lap wire lath minimum one mesh on sides and ends. Stagger vertical laps at least 16 inches. Lath shall lap flanges of solid flanged trim accessories by a minimum of 50%.

D. Ends of lath on open framing (unsheathed) shall occur over supports. Where necessary, install additional studs to provide support for lath ends and support for separate flanges of stress relief joints.

E. Install trim accessories plumb, level and straight, attachments should not exceed 24 inches on center.

F. Lath shall not be continuous through control joints. Two-piece Expansion Joints shall have the lath cut, be attached to framing and lath lap the flanges. Place control joints as indicated on elevations. Water resistant barrier shall be continuous behind all control joints and vertical reveals.

G. Install a weep screed at or below foundation plate line on exterior stud walls in conformance to CBC section 2512. Screed shall be of a type permitting water to drain to exterior of building. Weather-resistant barrier and exterior lath shall cover and terminate on attachment flange of screed.

H. Powder Actuated Fasteners shall be used on concrete/masonry substrates when lath is applied. Fasteners shall be driven home and avoid spalling of concrete. Pattern shall simulate that of framed walls.

I. Interior Lathing, General: Install in conformance to ASTM C841 and CBC Chapter 25.

J. Metal lath shall be fastened to metal supports with specified fastener spaced not more than 6 inches apart or with other recognized fasteners.

3.04 PLASTER APPLICATION - GENERAL

A. Verify that installation of lath is complete prior to start plastering. Notify the Technical Service Information Bureau upon completion of lath and prior to start of plaster to schedule a lathing installation compliance meeting. TSIB will submit a written field observation report delineating any deficiencies. Site meeting shall be coordinated with OAR.

B. Proportion, mix, apply, and cure plaster in conformance with ASTM C926 and CBC Chapter 25.

C. Install each plaster coat to an entire wall or ceiling panel without interruption to avoid cold joints and abrupt changes in uniform appearance of succeeding coats. Wet plaster shall abut existing plaster at naturally occurring interruptions in plane of plaster (such as corner angles, openings and control joints) wherever possible. Cut joining, where necessary, square and straight and at least 6 inches away from a joining in preceding coat.

D. Provide sufficient moisture or curing methods to permit continuous and complete hydration of cementitious materials, considering climatic and Project site conditions. If water cured, each basecoat shall be continuously damp for at least 48 hours, including

weekends and holidays. Other curing methods, spray applied curing compounds, or OEHS approved equal are permitted.

E. Provide sufficient time between coats to permit each coat to cure or develop enough rigidity to resist cracking or other damage when next coat is installed.

3.06 EXTERIOR PLASTERING

A. Concrete surfaces, except where noted as "Exposed Concrete" or "Painted Concrete," shall be finished with stucco **light sand** finish coats, as specified.

B. Mixing: Provide plaster mix: cementitious materials and aggregate in proportions specified, furnishing only sufficient water to obtain proper consistency before installation. Do not mix any more material at any time than can be installed within 1/2 hour after mixing. Do not re-temper. Add only enough water to allow proper application of cement plaster.

C. Application:

1. Scratch Coat: Install with sufficient material to completely cover laths and scratch across supports.

2. Brown Coat: Rod to a straight, true, even within 1/4 inch tolerance in 5 feet of surface and consolidate surface with a wood or neoprene float. Surface shall be left open and course, suitable to receive finish coat.

3. Stucco Finish Coat: Install in two coats to a total thickness of 1/8 inch, each coat covering surface uniformly. First coat shall completely cover basecoat with uniform color. Second color shall provide a uniform texture.

a. First coat shall be installed adequately to cover surface and fill minor imperfection in the brown coat.

b. The second coat shall be installed by doubling back same day, when first coat is sufficiently dry.

c. Over concrete surfaces, second coat shall be installed 24 hours after installation of first coat. In warm weather, first coat shall be cured by light water spray after material has set.

d. Protection: Protect those surfaces, which are not to receive dash finish coats. Such surfaces shall be shielded and shall have any sand left from dashing operation removed.

e. Provide smoothed plaster finish to comply with ADA requirements behind handrails.

D. Curing Exterior Plaster: Adhere to current edition of CBC for curing requirements.

E. Option for Machine Application, Scratch and Brown Coats: Instead of hand installed plaster, the furnishing of plastering machines for interior or exterior scratch and brown coats or single base coat is permitted. Machine installation shall be in accordance with the following:

1. Qualifications: Provide proper equipment and apparatus.

2. Apparatus: Pump shall be equipped with an air pressure gage or factory installed blow-off valve and required safety devices. Hoses and connections shall be tight and pressure shall be maintained constant.

3. Proportion and Application: Proportioning, mixing, number of coats and thickness shall be same as specified for hand application. Cement aggregate and water shall be mixed to plaster machine. Plaster mix shall be projected into and conveyed through a hose to the nozzle at end of hose and deposited by pressure in its final position ready for manual straightening and finishing.

4. Follow-Up: Perform scoring operation of plaster, based on settings and drying conditions at time of installation. Curing shall be as previously specified.

5. Protection: Before installing any plaster, thoroughly protect other adjacent Work.

3.07 INTERIOR PLASTERING

A. Portland Cement Plaster, Scratch Coat: Install to vertical lathed surfaces where ceramic tile is indicated, and install Portland cement plaster finishes where indicated.

B. Preparation for Plastering:

1. Verify that lath has been installed securely and that grounds, screeds, casing beads and other accessories are straight, in correct position, and securely fastened in place.

2. Bonding Agent: Install to vertical concrete or masonry surfaces to receive ceramic tile.

3. Concrete and masonry surfaces on which suction must be reduced shall be sufficiently moistened before plastering operations start.

4. Install galvanized expanded metal lath on supports in conformance with requirements of ASTM C1063 and CBC.

C. Number of Coats and Thickness: Interior plastering to receive paint shall consist of the following, with thickness measured from face of supports or surface:

1. On Concrete or Masonry: two coats, brown and finish, 5/8 inch thick.

2. On Metal Lath: three coats, scratch, brown and finish 7/8 inch thick.

D. Proportions for Interior Plaster: Adhere to current edition of CBC for proportions and curing requirements.

1. Admixtures shall be proportioned, mixed and installed in accordance with printed directions of manufacturer.

E. Mix factory blended plaster using only sufficient water to obtain proper consistency before installation. Do not mix any more material at any time than can be installed

within ½ hour after mixing. Do not allow material to remain in mixer or mixing boxes overnight.

F. Application:

1. Dash Bond Coat: Dash on surface, leave undisturbed, and maintain damp at least 24 hours following installation. Omit Dash bond coat when liquid bonding agent is used.

2. Scratch Coat: Install with sufficient material to form good keys, thoroughly cover lath, and cross scratch.

3. Brown Coat: Rod to a straight, true and even surface. Brown coat must be 1/16 inch below face of grounds to provide adequate space for finish coat. Float surface to increase density.

4. Smooth Finishes: Install two coats for a thickness of 1/8 inch. Install second coat after finish coat begins to set. Install to a true, even plane and trowel to a smooth finish, free from blemishes.

5. Float Finishes: Install to a thickness between 1/16 inch to 1/8 inch, install and uniformly float to true planes.

6. Plaster Screeds: On metal lath or wire fabric lath, install plaster screeds wherever permanent grounds are too far apart to serve as guides for rodding.

G. Curing Interior Plaster: Adhere to requirements of CBC.

3.08 QUALITY CONTROL

A. Finish interior and exterior plaster to a uniform texture, free of imperfections and flat within 1/4 inch in 5 feet. Form a suitable foundation for paint and other finishing materials. Avoid joining marks in finish coats.

3.09 REPAIR OF DAMAGED PLASTER

A. Plaster Detached from Framing:

1. Remove loose and broken plaster.

2. Repair or replace damaged water-resistant backing and lath in compliance with specified standards.

3. Remove stucco finish from surrounding area in the same plane by sandblasting.

4. Install a scratch coat and a brown coat mixed with liquid bonding agent instead of water to the areas devoid of plaster.

5. Install a coat of liquid bonding agent to entire wall plane.

6. Install a 1/8 inch thick stucco finish coat to entire wall plane and match existing texture and color.

B. Cracked Plaster 1/8 inch to 1/2 inch:

1. Remove loose material from crack with a wire brush.

2. Fill crack with slurry of stucco and liquid bonding agent.

3. Install a coat of liquid bonding agent to entire wall plane.

4. Install 1/8 inch thick stucco finish to entire wall plane and match existing texture and color.

C. Cracks Larger than ½ inch - Painted:

1. Remove loose material from crack with a wire brush.

2. Fill crack with slurry of one part Portland cement to three parts masonry or stucco sand and liquid bonding agent to match existing texture of adjacent surface.

3. Paint entire wall plane, color to match existing.

4. Where patching of plaster over existing lath is feasible, fasten loose lath and install new lath with nails at 6 inch centers. Where metal is furnished, lap new lath over existing 6 inches and tie at 6 inch centers. Install paper backings as required, shingled into existing.

5. Patching of Holes, Cracks, and Gouges: Holes, cracks, gouges, missing sections, and other defects in existing improvements shall be patched. For holes over 1 inch in size, cut small sections of lath and place in opening attached to existing material. Install 3 coats of plaster. For holes one inch and smaller, install bonding agent to existing surfaces and neatly fill hole with plaster, installing necessary coats to match adjacent surfaces, eliminate cracks and match existing surface texture. Cracks, gouges, and other defects shall be filled with plaster or spackle as required and neatly finished to match adjacent existing improvements.

3.10 CLEANING

A. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

3.11 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 2900

GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Gypsum board, sheathing and tile backer systems and accessory.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 4100 - Structural Metal Stud Framing.
3. Section 07 8413 – Penetration Firestopping.
4. Section 07 9200 - Joint Sealants.
5. Section 09 2216 - Non-Structural Metal Framing.

1.02 PROJECT REQUIREMENTS

A. Design Requirements: Provide systems capable of resisting deflection as required by CBC and authorities having jurisdiction.

B. Regulatory Requirements: Comply with CBC requirements for design and installation.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating complete suspension system including connections, anchorage, and trim features.

B. Material Samples: Submit 18 inch by 18 inch Samples of the texture coat of gypsum board panels with edges taped.

C. Product Data: Submit manufacturer's catalog data for each product proposed for installation.

1.04 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. ASTM C474 - Standard Test Methods for Joint Treatment Materials for Gypsum Board Construction.

2. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

3. ASTM C514 – Standard Specification for Nails for the Application of Gypsum Board.

4. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.

5. ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications.

6. 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 inch to 0.112 inch in Thickness.

7. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

8. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

9. ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

10. ASTM C1178 – Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.

11. ASTM 1325 – Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.

12. ASTM C1396 – Standard Specification for Gypsum Board.

13. ASTM C1629 - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

14. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

15. ASTM D3274 - Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation.

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

17. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

18. ASTM E695 - Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.

19. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

20. Underwriters Laboratories (ULI) requirements and listings for fire-rated materials and products classification.

21. GA 214 - Gypsum wallboard finish shall conform to requirements of GA 214, Application and Finishing of Gypsum Panel Products, published by the Gypsum Association, and as specified herein.

22. GA 600 - Gypsum wallboard shall conform to requirements of GA 600 Fire Resistance Design Manual, published by the Gypsum Association.

23. American National Standards for the Installation of Ceramic Tile.

24. ANSI A118.9 - Specification for Cementitious Backer Units.

B. Qualifications: Installer shall have a minimum 5 years experience in installing and finishing gypsum board.

C. CHPS Low-Emitting Materials table: Materials submitted must meet the CHPS Low-Emitting criteria and be listed as Low-Emitting on the following web site: www.CHPS.net.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, factory sealed packages, containers or bundles bearing brand name and name of manufacturer.

B. Materials shall be kept dry. Gypsum wallboard shall be neatly stacked flat; avoid sagging and damage to edges, ends, and surfaces.

C. Fire-rated materials shall have fire classifications numbers attached and legible.

D. Provide all means necessary to protect gypsum board systems before, during, and after installation.

E. Gypsum wallboard showing any evidence of water damage shall not be installed. Gypsum wallboard showing evidence of water damage after installation shall be removed and replaced.

1.06 TESTING AND INSPECTION

A. Testing and inspection shall comply with CBC 110.3.4, 110.3.5 and 110.3.6.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Georgia-Pacific, National Gypsum Co., U.S. Gypsum Co., James Hardie, or equal.

2.02 MATERIALS

A. Gypsum Board Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 16-foot long conforming to ASTM C1396 with long edges tapered.

GYPSUM BOARD SYSTEM			
Panel	**Fasteners**	**Joint Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch Sheetrock regular, type X, Firecode Core, or Firecode C Core Gypsum panels, as required by UL design.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	Sheetrock paper tape Heavy Duty to meet ASTM C 475.	Sheetrock Setting Type, Lightweight Setting, Sheetrock Taping, Topping, or All-Purpose, Sheetrock Ready-Mixed Taping, Topping, or All-Purpose, or Sheetrock Lightweight All-Purpose or Ready-Mixed - Plus 3
Georgia-Pacific: 5/8 inch ToughRock regular, Fireguard or Fireguard C gypsum, as required by UL design.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	Sheetrock paper tape Heavy Duty to meet ASTM C475.	Same as above
National Gypsum Co. 5/8 inch Gold Bond regular, Fire-Shield or Fire-Shield C gypsum wallboard, as required by UL design.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	ProForm Joint Tape, ProForm Multi-Flex Tape Bead, ProForm Fiberglass Mesh Tape to meet ASTM C 475.	ProForm Multi-Use, ProForm All Purpose, ProForm Lite, ProForm Ultra, ProForm Taping, ProForm Triple-T, ProForm Topping, or ProForm Sta-Smooth, Sta-Smooth Lite, Sta-Smooth HS Joint Compound.

B. Impact Resistant Gypsum Board, Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 16-foot long complying with one of the following:

1. Fire resistant rated gypsum core with additives to enhance impact resistance, faced with moisture and mold resistant paper, and complying with ASTM C1396.

2. Fire resistant, high density paperless gypsum with reinforcing fiber mesh.

3. Fire resistant fiberglass-mat faced gypsum board panels

GYPSUM BOARD IMPACT RESISTANT SYSTEMS			
Panel	**Fasteners**	**Joint. Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch Fiberock VHI Gypsum fiber panels.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S-12 drywall screw.	Sheetrock paper tape Heavy Duty.	Sheetrock Setting compound.
Georgia-Pacific: 5/8 inch DensArmor Plus Impact Resistant Panels	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S-12 drywall screw.	Glass mesh.	Same as above.
National Gypsum Co.: 5/8 inch Hi-Impact XP gypsum wallboard.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S-12 drywall screw.	ProForm joint tape	Proform XP all-purpose joint compound.

C. Mold and Water Resistant Gypsum Board, Type X (fire-resistant): (Use mold resistant Liner Panel at elevator shaft interior), 5/8 inch thick 4-foot wide, up to 16-foot long conforming to ASTM C1396 with long edges tapered.

1. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.

2. Resistance to Fungi: Maximum score of "0" when tested in accordance to ASTM G21.

GYPSUM BOARD MOLD RESISTANT SYSTEM			
Panel	**Fasteners**	**Joint Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch Sheetrock Mold Tough, Firecode Core, or Firecode C Core Gypsum panels.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	Glass Mesh.	Setting-type joint compound rated 10 when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.
Georgia-Pacific: 5/8 inch Dens Armor Plus Fireguard or Fireguard C Interior Panels (Fire-Rated).	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	Same as above.	Same as above.
National Gypsum Co.: 5/8 inch Gold Bond XP regular, Fire-Shield or Fire-Shield C gypsum wallboard.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	Same as above.	Same as above.

D. Gypsum Liner, Type X (fire-resistant): 1 inch thick 24-inch wide, up to 14-foot long, conforming to ASTM C1396 or C1658.

1. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.

2. Resistance to Fungi: Maximum score of "0" when tested in accordance to ASTM G21.

GYPSUM BOARD SHAFTWALL SYSTEMS			
Panel	**Fasteners**	**Joint. Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch Mold Tough Type X Firecode Core, Gypsum panels, ¾ inch Mold Tough Ultracode Core and 1 inch Mold Tough Liner panels.	1 ¼-inch, 1 5/8-inch, or 2 ¼-inch Type S or S-12 drywall screw.	Glass Mesh.	Setting-type joint compound rated 10 when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.

Georgia-Pacific: 5/8 inch ToughRock Fireguard, or ToughRock Fireguard, C gypsum board or DensArmor Plus Fireguard or Fireguard C Interior Panels (Fire-Rated) and 1 inch DensGlass Ultra Shaftliners panels.	1 ¼-inch, 1 5/8-inch, or 2 ¼-inch Type S or S-12 drywall screw.	Same as above.	Same as above.
National Gypsum Co.: 5/8 inch Gold Bond regular, Fire-Shield or Fire-Shield C gypsum wallboard and 1 inch Gold Bond Fire-Shield Shaftliner.	1 ¼-inch, 1 5/8-inch, or 2 ¼-inch Type S or S-12 drywall screw.	ProForm XP all-purpose joint compound.	Same as above.

E. Tile Backer Board, Type X (fire-resistant):

1. Water resistant panels, 5/8 inch thick, 4-foot wide and up to 8-foot long conforming to conforming to one of the following requirements:

   a. Aggregated Portland cement board with polymer-coated, woven glass-fiber mesh embedded in front and back surfaces.

   b. Fiberglass-mat faced gypsum backing board complying with ASTM C1178.

   c. Cementitious board surfaced with fiberglass reinforcing mesh on front and back and complying with ANSI A118.9 and ASTM C1325.

2. Tile backer boards shall meet the following requirements:

   a. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.

   b. Resistance to Fungi: Maximum score of "0" when tested in accordance to ASTM G21.

TILE BACKER BOARD SYSTEMS			
Panel	**Fasteners**	**Joint. Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch DUROCK Cement Board.	Wood: 1 ½-inch galvanized roofing nails or 1 1/4-inch 1 5/8 inch, or 2 ¼-inch DUROCK No. 8 wood screws. Steel:1 1/4-inch or 1 5/8 inch DUROCK No. 8 screws.	DUROCK glassfiber tape.	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1acrylic latex modified dry-set mortar or ANSI A118.4 Latex Portland cement mortar.
Georgia-Pacific: 5/8 inch DensShield Fireguard Tile Backer.	Wood: 1 ¾-inch galvanized roofing nails or 1 5/8 inch Buglehead corrosion resistant, course thread, drywall screws. Steel: 1 1/4-inch Buglehead, corrosion resistant, fine	2-inch wide fiberglass mesh tape.	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1 acrylic latex modified dry-set mortar or ANSI A118.4 Latex Portland cement mortar.

	thread, drywall screws.		
National Gypsum Co.: 5/8 inch PermaBase Brand Cement Board.	Wood: 1 ½-inch galvanized roofing nails or 1 1/4-inch or 1 5/8 inch, PermaBase corrosion resistant screws. Steel: 1 1/4-inch or 1 5/8 inch Type S-12 screws.	PermaBase mesh tape. 2-inch wide polymer-coated (alkali resistant) mesh tape for interior applications. 4-inch wide polymer coated (alkali resistant) mesh tape for exterior applications.	Treat joints and set facing material with latex-Portland cement mortar or dry-set (thin-set) mortar. Mortars shall comply with ANSI A118.1 or A118.4 standards. Type I organic adhesive meeting ANSI A-136.1 for interior use only.
James Hardie Building Products Inc.: ½ inch or ¼ inch Hardibacker 500 Cement Board (for floor and countertop application at existing schools only).	Wood: 1 ½-inch galvanized roofing nails. Wood and Steel: 1 1/4-inch No. 8 by 0.375 HD self drilling, corrosion resistant ribbed wafer head screws.	2-inch Wide High Strength. Coated, alkali-resistant, glass fiber reinforcing tape.	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1acrylic latex modified dry-set mortar or ANSI A118.4 Latex Portland cement mortar.

F. Sheathing, Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 10-foot long fiberglass-mat faced gypsum backing board complying with ASTM C1177 or ASTM C1178.

1. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.

2. Resistance to Fungi: Maximum score of "0" when tested in accordance to ASTM G21.

GYPSUM BOARD SHEATHING SYSTEMS			
Panel	**Fasteners**	**Joint. Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch Securock Glass-Mat Sheathing.	Wood: 1 ¼-inch # 6 buglehead corrosion-resistant fasteners. Steel: 1 ¼-inch Type S-12 drywall screw.		
Georgia-Pacific: 5/8 inch Densglass Gold Type "X"	Wood: 1 ¼-inch # 6 buglehead corrosion-resistant fasteners. Steel: 1 ¼-inch Type S-12 drywall screw.		
National Gypsum Co.: Gold Bond Brand e2XP Fire-Shield Extended Exposure Gypsum Sheathing.	Wood: 1 ¼-inch # 6 buglehead corrosion-resistant fasteners. Steel: 1 ¼-inch Type S-12 drywall screw.		

2.03 ACCESSORIES

A. Metal Trim: Paper-faced metal drywall beads and trim meeting ASTM C1047, as manufactured by USG/Beadex, National Gypsum, or equal. Trim units shall be of size and type to fit gypsum board construction and shall include corner beads, casings, edge trim and other shapes indicated and required.

B. Mold Resistant Joint Compound: As recommended by board manufacturer, OnePass by CTS Cement Manufacturing Co., or equal, meeting the following requirements:

1. Minimum score of "10" when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.

2. Shall conform to ASTM C475.

C. Joint Tapes: Shall conform to ASTM C475.

D. Finishing Materials:

1. High solids primer shall be SHEETROCK Brand First Coat manufactured by USG or High-build primer by Sherwin Williams, or equal.

2. Texture coat finish material shall be manufactured by U.S. Gypsum, Hamilton, or Highland Stucco and Lime Products, Inc., or equal.

E. Acoustical Sealant: Non-hardening, non-shrinking, for use in conjunction with gypsum board, as recommended by Board Manufacturer and conforming to ASTM C919.

F. Fasteners:

1. Self-drilling, self-tapping bugle-head drywall screws; in conformance to ASTM C1002. No. 6 Type S or S12, 1 ¼--inch long for metal framing,

2. Wood framing:

a. Nails: Hot dip, 0.016 inch diameter galvanized nails with 7/16 inch head and 1 ¼-inch minimum length.

b. Screws: Type W 1 ¼-inch minimum length for single-layer panels. Screws shall be furnished with a corrosion-resistant treatment.

3. Adhesive: as recommended by board manufacturer and in compliance to ASTM C557.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Metal Trim:

1. Provide corner beads at outside corners and angles, metal casing where gypsum board terminates at uncased openings, metal edge trim where board edges abut horizontal and vertical surfaces of other construction.

2. Install trim in accordance with manufacturer's directions with appropriate joint compound. Install trim in longest practical pieces.

B. Gypsum Board:

1. Install gypsum board in conformance with ASTM C840.

2. Gypsum board shall be cut by scoring and breaking or by sawing, working from face side. Where board meets projecting surfaces it shall be scribed and neatly cut. Unless conditions require otherwise, gypsum board shall be installed first to ceilings, then to walls. End joints shall occur over a support. Install panels of maximum practical length so a minimum number of end joints occur.

3. End joints shall be staggered and joints on opposite sides of a partition shall be arranged to occur on different studs. Joint layout at openings shall be installed so no end joints will align with edges of openings.

4. Except where specified otherwise, fasteners shall be spaced not less than 3/8 inch from edges and ends of gypsum board. Do not stagger fasteners at adjoining edges and ends.

5. Install gypsum board vertically or horizontal as permitted by specific UL Design at walls. Fasten board with drywall screws spaced not to exceed 8 inches on centers around perimeter of boards and 8 inches on centers on intermediate studs. Space screws at 8 inches on centers along top and bottom runners. Screws shall be driven to provide screwhead penetration just below gypsum board surface without breaking surface paper. Where electrical outlet and switch boxes are indicated, provide adjustable attachment brackets between studs.

6. Install gypsum board to ceiling framing with long dimension at right angles to furring channels, or wood framing members, and fasten with specified drywall screws or nails spaced 6 inches to 7 inches on centers across board. Screws or nails shall be not less than 1/2 inch from side joints and 3/8 inch from butt end joints. Abutting end joints shall occur over furring channels and end joints of boards shall be staggered. Support cutouts or openings in ceilings with furring channels.

7. Install access doors, furnished under another section, in correct location, plumb, or level, flush with adjacent construction, and securely fastened to framing.

3.02 TOLERANCES

A. Install gypsum board flat within 1/8 inch in 10 feet.

3.03 JOINT TREATMENT AND FINISHING

Level	Joints	Interior Angles	Accessories	Fasteners	Surface
1	Tape set in compound	Tape set in joint compound			Tool marks and ridges acceptable

Level	Joints	Interior Angles	Accessories	Fasteners	Surface
2	Tape set in joint compound and one separate coat of joint compound	Tape embedded in joint compound and wiped to leave a thin coat of compound over tape, and one separate coat	Covered by one separate coat of joint compound	Covered by one separate coat of joint compound	Free from excess joint compound. Tool marks and ridges acceptable.
3	After taping, cover with two separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 2 separate coats of joint compound	Smooth and free of tool marks and ridges *
4	After taping, cover with 2 separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 3 separate coats of joint compound	Smooth and free of tool marks and ridges *
5	After taping, cover with 2 separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 3 separate coats of joint compound	Skim coat of joint compound applied to entire surface. Surface free from tool marks and ridges. *

*At completion of specified taping and finishing, install one coat of high solids primer as specified hereafter

B. Levels: Install tape bedding compound, tape, and finishing cement on joints in wallboard as required for specified levels of finish.

C. Levels 2 through 5:

1. Install joint cement and finishing cement over screw heads. Treat all inside corners with joint cement, tape, and finishing cement. Treat outside corners with corner beads and finishing cement.

2. Provide metal casing beads at all edges of gypsum wallboard, which abut ceiling, wall, or column finish, and elsewhere as required, such as openings, offsets, etc. Install all exposed joints, trims, and attachments non-apparent following installation of paint or other finishes. If joints and fasteners are visibly apparent, correct defects as required.

3. Seal raw edges of plumbing openings and boards that have been cut to fit with sealing compound brushed on.

4. When entire installation is completed, correct and repair broken, dented, scratched or damaged wallboard before installation of finish materials by other trades.

D. Levels 3 and 4: Install one coat of high solids primer over entire surface.

E. Level 5: Install one coat of skim coat over entire surface, followed by one coat of high solids primer over entire surface.

3.04 REQUIRED LEVELS OF FINISH

A. Unless otherwise indicated or specified, levels of finish required shall be as follows:

1. Level 1: Plenum areas above ceilings, insides of shafts, and other concealed areas. Taping to be as required for fire rated assemblies.

2. Level 2: Water-resistant wallboard backing for high moisture areas to be covered with a water resistant surface other than tile, vinyl or paint, i.e stainless steel cladding etc.

3. Level 3: Backing for vinyl wall covering and adhered acoustic tile. Also, provide where textured finish is indicated.

4. Level 4: Exposed painted wallboard in classrooms, utility rooms, and similar spaces not requiring Level 5 finish.

5. Level 5: Exposed, painted wallboard in offices and corridors.

3.05 TEXTURE COAT

A. Spray install texture coat to interior gypsum board surfaces where indicated on Drawings.

B. Texture coat shall provide a uniform splatter pattern finish with an 80 percent minimum coverage of surface.

C. Provide protection from spray for interior surfaces of electrical boxes and wiring.

3.06 CLEAN-UP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.07 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 3015

PORCELAIN TILING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Waterproof membrane for tile.
3. Stone thresholds.
4. Mortar setting beds for floor and wall tile.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
4. Section 07 9200 - Joint Sealants
5. Section 09 2423 - Cement Plaster and Metal Lath.
6. Section 09 2900 - Gypsum Board.

1.02 SUBMITTALS

A. Product Data: Manufacturer's data, standard specifications, Material Safety Data Sheets, and other technical information for each product specified.

B. Material Samples: Manufacturer's standard palette, indicating full range of tile colors, textures, and grout colors.

C. Mock-Ups: For each type, color, and texture, minimum one foot square or three full tile courses, on Plexiglas to demonstrate proper bond mortar and coverage; grout color, hardness and depth.

D. Installation Instructions: Manufacturer's preparation and installation instructions.

E. Product Certificates: Signed by manufacturer certifying that products furnished comply with requirements of this Specification.

1.03 QUALITY ASSURANCE

A. Comply with applicable parts of the following codes or standards as a minimum requirement:

1. ANSI A108, American National Standard Specifications for the Installation of Ceramic Tile.

2. ANSI A118, American National Standard Specifications for Ceramic Tile Installation Materials.

3. ANSI A136.1, Standard Specifications for Ceramic Tile.

4. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

5. ASTM C185 - Standard Test Method for Air Content of Hydraulic Cement Mortar.

6. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

7. ASTM C150 - Standard Specification for Portland Cement.

8. ASTM C241 - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.

9. ASTM C206 - Standard Specification for Finishing Hydrated Lime

10. ASTM C503 - Standard Specification for Marble Dimension Stone.

11. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

12. ASTM D4551 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane.

13. Tile Council of North America (TCNA) – Current edition of "Handbook for Ceramic Tile installation".

14. CHPS Low-Emitting Materials Table: Materials submitted for tile assemblies must bee listed as low emitting on the CHPS website www.CHPS.net.

B. Grade Certificate and Labeling: With each delivery of tile, furnish manufacturer's "Master Grade Certificate" to the Project Inspector.

C. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

D. Consistent Quality: Products shall be consistent in appearance and physical properties.

E. Comply with requirements of California Building Code and ADAAG.

F. Qualifications of Tile Manufacturer: Company specializing in ceramic tile, mosaics, pavers, trim units, and thresholds with five years minimum experience.

G. Qualification of Installation System Manufacturer: Company specializing in installation systems/ mortars, grouts/ adhesives with ten years minimum experience.

H. Qualifications of Installer: Company specializing in installation of ceramic tile, mosaics, pavers, trim units and thresholds with five years experience with installations of similar scope, materials, and design.

I. Pre-Construction Meetings: Prior to start of Work of this section and after approval of submittals, schedule an on-site meeting between Contractor, OAR, Project Inspector, and representatives of the material manufacturer and tile installer to review construction conditions and Drawings for conformance with the requirements of this Specification for each substrate.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver tile and other materials in sealed containers, with manufacturer's labels intact.

B. Keep all materials clean and dry.

1.05 MAINTENANCE

A. Extra Materials: Provide a minimum of five percent of each type and color as the installed tile, in manufacturers' cartons and labeled.

1.06 WARRANTY

A. Manufacturer shall provide a five year material warranty.

B. Installer shall provide a five year fabrication and installation warranty.

C. For waterproofing, manufacturer shall provide a 10 year material warranty for waterproofing installation, tile setting, and grouting materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Tile: To establish quality, Specification is based on ANSI A137.1 tile products from the following manufacturers may be provided:

1. Product line equal to Ardesia by Ceramiche Piemme distributed by Pental Surfaces, www.pentalonline.com, (310) 339-3413.

2. Product line equal to Lafaenza Ceramica Pretiosa distributed by Tileshop Inc., (818) 994-9637.

B. Installation Materials: To establish quality for setting and waterproofing materials, Specification is based on ANSI A137.1. Products and methods of the following manufacturers may be provided:

1. Laticrete International, Inc.

2. Custom Building Products.

3. Mapei.

4. Equal.

2.02 MATERIALS

A. Colors, Textures, and Patterns: Ardesia, Bianco size 18 x 36 and Nero size 12 x 12 and 12 x 24; or Lafaenza Pretiosa 46W (16x24 White) and Pretiosa 36DG (12x24 Dark Gray).

B. Tile sizes: Tile sizes specified are modular dimensions and as shown on drawings unless otherwise indicated.

C. Mortar Sand: ASTM C144.

D. Portland Cement: ASTM C 50, Type I or II.

E. Hydrated Lime: ASTM C207, Type S; or ASTM C206 Type S

F. Portland Cement Mortar: ANSI 118.1

G. Portland Cement Mortar Bed: Sand-cement mortar mix gauged with Laticrete Acrylic Admix or Custom Building Products Thin-Set Mortar Admix.

H. Portland Cement Mortar Bed for Shower Areas: Laticrete 226 Thick Bed Mortar Mix Gauged with Laticrete 3701 Mortar and Grout Admix or on site mix per ANSI A108.1A with Custom Building Products Thin-Set Mortar Admix.

I. Latex Portland Cement Bond Mortar: Laticrete 317 Floor & Wall Thinset gauged with Laticrete 3701 Admix, or Custom Building Products Master Blend mixed with Thin-Set Mortar Admix.

J. Waterproof Membrane: Cold-applied, single component liquid with embedded reinforcing fabric where recommended by manufacturer: Laticrete Hydro Ban Waterproof Membrane or Custom Building Products Red Guard Waterproof Membrane.

K. Reinforcing Wire Fabric: 2-inch by 2-inch, 16 by 16 gage, galvanized electrically welded wire reinforcing, per ASTM A 185.

L. Latex Portland Cement Grout: Laticrete Sanded Grout (1500 Series), Custom Polyblend Sanded Grout or Laticrete Unsanded Grout 1600 Series (for joints smaller than 1/8"), Custom Polyblend Unsanded Grout.

M. Epoxy Grout for Quarry Tile: Laticrete Spectralock Pro Epoxy Grout for Floors and Walls or Custom 100 percent Solids Epoxy Grout.

N. Cleavage Membrane and Wall Backing Paper: Cleavage membrane shall be 15-pound asphalt-saturated felt manufactured according to ASTM D226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

O. Separation Material (for all sealed joints including perimeters and quarry-tile fields of floor mortar beds): Quality Foam, QF 200 white, 3/8 inch wide by 5-inch high.

P. Backer Rod for sealants (for ceramic mosaic fields): Polyethylene foam, closed-cell, flexible and compressible, 3/16 inch diameter.

Q. Cleaner and Sealer:

1. Cleaner and sealer shall be from one manufacturer, acceptable to tile and grout manufacturers. To establish quality, the Specification is based on Aqua Mix Inc. Equivalent products from Miracle Sealants Co., Watco Tile and Brick, or equal may be provided.

2. Cleaner: Aqua Mix Concentrated Tile Cleaner, neutral phosphate-free cleaner, or Custom Building Products Tile Lab Concentrated Tile and Stone Cleaner.

3. Sealer: Aqua Mix Penetrating Sealer, fungus- and bacteria-resistant, stain-resistant, and slip-resistant as specified for tile, Custom Building Products Tile Lab Surface Gard, or equal.

R. Sealants:

1. Sealant and primer shall be from one manufacturer, acceptable to tile and grout manufacturers. See Section 07 9200 - Joint Sealants.

2. Ceramic Mosaic Tile: One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

3. Quarry Tile: Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

S. Stone Thresholds:

1. Exterior installation: Marble thresholds with minimum abrasive hardness value of 10 tested in accordance with ASTM C241.

2. White honed marble complying with Marble Institute of America Group "A," unless other color indicated.

3. Size and profile shaped to provide transition between tile surfaces and adjoining finished floor surfaces, or as indicated. Width not less than 4 inches. Edges beveled on a slope of no greater than 1:2. Cut to fit door frame profile.

T. Pre-molded stainless steel cove base – Schluter – DILEX-EHK. Provide matching inside corners, outside corners, end caps and connectors.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Examine substrates and conditions for compliance with installation requirements. Verify that all penetrations through substrate have been installed. Proceed with Work only after all conditions are in compliance.

B. Substrates shall be firm; dry; clean and within flatness tolerances required by relevant ANSI A108 tile installation standards. Prepare surfaces as follows:

1. Concrete Floors: Allow concrete floors to cure for 28 days minimum before beginning tile and grout installation. Remove laitance, sand, dust, and loose particles.

C. Substrates to receive wall tile and base shall be:

1. Scratch coat of cement plaster, as specified in Section 09 2423 - Cement Plaster and Metal Lath (required in student restrooms, showers and locker rooms, and quarry tile bases).

2. Cementitious backing panels, as specified in Section 09 2900 - Gypsum Board.

D. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical items of Work, and similar items located in or behind tile has been completed before installing tile.

E. Verify that joints and cracks in tile substrates are coordinated with caulked-joint locations; if not coordinated, adjust as required by the Architect.

F. Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are maintained in compliance with referenced standards and manufacturer's written instructions.

G. Protect adjacent surfaces during progress of Work of this section.

3.02 TILE INSTALLATION, GENERAL

A. Install tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Center the tile fields in both directions for each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

B. For tile mounted in sheets: Joints between tile sheets shall be the same width as joints within tile sheets.

C. Extend Work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate Work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without damaging tile. Carefully grind the cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Locate joints, directly above joints in concrete substrates, at horizontal and vertical changes in plane, or where indicated during installation of mortar beds. In quarry tile floors, provide at 12 feet on center maximum. Provide 3/8-inch wide foam at joints. Do not saw-cut joints after installing tiles.

F. Prepare and clean joints to be sealed. Apply sealants to comply with requirements of Section 07 9200 - Joint Sealants.

G. Conform to manufacturers printed instructions, and applicable requirements of ANSI and TCNA Standards.

3.03 TILE INSTALLATION, FLOOR

A. Install reinforcing and latex Portland-cement mortar setting bed over cured concrete slab. Lap reinforcing at least one full mesh, and support or lift so that it is approximately in the middle of mortar bed. Do not abut against vertical surfaces. Install foam separation material at perimeters and expansion joint locations for caulked joints.

B. Mix setting mortar in accordance with ANSI recommendations.

C. Once begun, mortar installation must continue until room is completed. Discard any batch not floated and finished within ½ hour of mixing. Firmly compact before screeding. Screed to true plane and pitch as indicated. Slope mortar bed sufficiently that water flows to drain and no puddling will occur. Slope mortar down to floor drains

for proper installation of waterproof membrane. After screeding, firmly rub down with steel or wood float.

D. Cure mortar bed with a light fog spray of water and cover with 6-mil Visqueen for 72 hours.

E. Waterproof Membrane:

1. Install waterproof membrane where indicated and in all toilet, shower, and locker areas according to TCNA Standards. Extend membrane up wall mortar or backing board as follows:

   a. 3 inches above top of curb wall.

   b. 6 inches minimum above floor.

   c. In shower rooms, install from floor to ceiling.

2. Insure that layers of membrane are fully inserted into clamping ring of floor drain. After membrane installation and before tile setting, install pea gravel around sub drain to prevent blockage of weep holes and place mortar to proper level for setting tile.

3. For tile installations other than slab on grade, before setting tile and after seven days curing, water test membrane by damming drains and doors, filling floor with water to 4-inch minimum depth, and leaving for 24 hours. Correct any leaks and re-test before proceeding. After testing, protect membrane from traffic until tile Work begins.

F Thin Set Method: Confirm substrate is completely clean and free of dust. Cut foam at floor perimeters flush with top of mortar bed. Insure that bond coats do not intrude into joints to be sealed. Install tile over properly cured setting bed or waterproof membrane utilizing "thin-set" method with latex portland cement bond mortar, in accordance with manufacturer's printed instructions and ANSI A108.5.

G. Minimum coverage of bond mortar shall be 80 percent except 95 percent in shower areas, for quarry tile, and exterior installations. Place tile into fresh mortar press tile to insure full contact. Before setting proceeds, set and remove three tiles or sheets of tiles to confirm specified coverage of bond mortar. If coverage is insufficient, utilize a larger toothed trowel or back butter tiles until proper coverage is provided.

H. Install tile on floors with the following joint widths:

1. Porcelain Tile: 1/16 to 1/8 inch.

I. Install pre-molded stainless steel cove base in strict accordance with the manufacturer's recommendations.

3.04 TILE INSTALLATION, WALLS

A. Install wall mortar beds before floor mortar beds.

B. On plaster walls, clean scratch coat surface of loose or foreign materials, fog spray with water, and install brown coat mortar bed over scratch coat to a thickness not less than 3/8 inch and not greater than ¾ inch. Once started, wall mortar installation must continue until wall is completely floated. Discard any batch not floated and finished within ½ hour of mixing. As soon as wall mortar is dried to sufficient hardness, but still plastic, firmly rub with wood float.

C. Cover cure with 40-weight Kraft paper for 72 hours minimum.

D. Install tile over properly cured setting bed, waterproof membrane, or cementitious backing panels utilizing "thin-set" method with latex portland cement bond mortar, in accordance with manufacturer's printed instructions and ANSI A108.5. Confirm substrate is completely clean and free of dust. Insure that bond coats do not intrude into joints to be caulked.

E. Minimum coverage of bond mortar shall be 80 percent except 95 percent in shower areas or exterior installations. Set and test as specified for floors.

F. Lay out Work so tiles will be centered on each wall or section of wall in order to minimize tile cuts. Lay out tile wainscots to next full tile beyond dimensions indicated. Spot setting bed with mortared tile, set plumb and true, accurately indicate plane of finished tile surfaces.

G. Install tile on walls with following joint widths:

1. Porcelain Tile: 1/16 to 1/8 inch.

H. Horizontal joints shall be level, vertical joints plumb with surfaces true and plumb, edges of tiles flushed.

I. Rub exposed cuts smooth with a fine stone; no cut edge shall be set against a fixture or adjoining surface without a 1/16 inch joint to be caulked.

J. Install access doors where required, furnished under another section, in correct location, plumb or level, flush with adjacent construction, and securely fastened to framing.

3.05 GROUTING

A. Prior to starting, ensure that all tile surfaces are clean and excessive bond mortar is scraped and vacuumed from joints (approximately 2/3 depth of tile should be open for grouting). Follow manufacturer's instructions for mixing grout. Once grout Work commences, proceed until complete wall or floor area is finished utilizing one batch of grout.

B. Latex portland cement grouting: Dampen tile surface and joints with water using sponge, but leaving no puddles in joints. Force grout into joints using sufficient pressure on rubber float so as to fill joints completely, and scrape excess grout off tile surface with rubber float. Smooth or tool grout to uniform joint finish. Do not over water.

C. Curing latex Portland cement grout: Remove final grout haze with clean soft cloth, and cover with 40-weight Kraft paper to cure. Leave paper in place for protection. Cover wall surfaces with 40-weight Kraft paper for 72 hours.

D. Epoxy grouting: Do not dampen tile. Follow manufacturer's instructions for mixing grout. Force grout into joints with sufficient pressure on rubber float so as to fill joints completely, and scrape excess grout off tile surface with rubber float. Smooth or tool grout to uniform joint finish. Do not allow grout to harden on face of tile.

E. Curing epoxy grout: Do not cover floor, but do not allow foot traffic for 72 hours. Then, if grout is not tacky, cover with 40-weight Kraft paper for protection.

3.06 CLEANING AND SEALING

A. If grout scum is not visible on tile surface after curing, clean tile surface with clear water. Remove and replace cracked, broken or defective Work with proper material.

B. If, when curing membrane is removed, grout scum is visible on tile surface, use the following cleaning method:

1. Immediately recover floor with paper or felt and allow to continue curing for a minimum of 14 days; uncover floor and maintain entire tile surface saturated with clean cool water for not less than two hours.

2. Utilize a neutral cleaner acceptable to manufacturers of tile and grout, and follow manufacturer's instruction. Do not provide generic acid cleaners.

3. Wet tile floors and apply cleaning solution to floor surface, then scrub with a brush. Rinse area several times with clean water to flush solution off floor surface.

C. Apply penetrating sealer in accordance with manufacturer's instructions utilizing a dense sponge applicator, paint pad, sprayer or brush. Avoid overlapping, puddling, and rundown. Completely wipe surface dry within 3 to 5 minutes using cotton or paper towels; do not allow sealer to dry on tile. After two hours, test surface by applying water droplets to surface. If water is absorbed, apply a second coat. Avoid surface traffic for 24 hours.

3.06 SEALANTS

A. Insure joints to be sealed are free of setting and grouting materials and construction debris. Do not permit any foot traffic on installed sealants for a minimum of 48 hours or protect with hardboard strips.

B. Install in accordance with Section 07 9200 - Joint Sealants.

3.07 PROTECTION

A. Admit no traffic where tile is installed until mortar and grout has set for a minimum of 72 hours.

B. Protect Work of this section until Substantial Completion.

3.08 CLEAN UP

A. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

END OF SECTION

SECTION 09 5113

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Lay-in acoustical ceiling systems and metal suspension system.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 09 2216 - Non-Structural Metal Framing.
3. Section 09 2900 - Gypsum Board.
5. Section 11 5215 – Video/Multimedia Projector Mounting Plate.
6. Division 23 - HVAC.
7. Division 26 - Electrical.

1.02 QUALITY ASSURANCE

A. Ceiling systems shall consist of lay-in acoustical ceiling panels by a single manufacturer and suspension systems by a single manufacturer for the entire project.

B. Qualifications of Installer: Minimum five years experience in installing acoustical ceiling systems of the types specified.

C. Design Criteria:

1. Deflection of finished surface to 1/360 of span or less.
2. 1/8 inch maximum permissible variation from true plane measured from 10 foot straightedge placed on surface of finished acoustical fiber units.

D. Requirements of Regulatory Agencies:

1. Conform to CBC requirements and UL - Tunnel Test for Fire Hazard Classification of Building Materials.
2. CISCA: Acoustical Ceilings Use and Practice.
3. Division of the State Architect: Comply with requirements of IR 25-2.13.

E. American Society for Testing and Materials (ASTM):

1. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

4. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
5. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM E580 – Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
8. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
9. ASTM E1414 - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
10. ASTM E1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

F. American Society of Civil Engineers (ASCE):

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures, as amended by CBC 1615A.1.16.

G. CHPS Low-Emitting Materials Table: Materials submitted must be lsited as low emitting on the CHPS website, www.CHPS.net,

1.03 SUBMITTALS

A. Samples:

1. Lay-in panels of each specified type, 6-inch by 6-inch minimum size.
2. Suspension System: 12-inch long samples of suspension system members, connections, moldings and wall angles, for each color specified.

B. Shop Drawings:

1. Indicate complete plan layouts and installation details.
2. Indicate related Work of other sections which is installed in, attached to, or penetrates ceiling areas, such as air distribution and electrical devices.

C. Product Data:

1. Suspension System for Lay-in Ceiling: Printed data for suspension system components, including load tests, indicating conformance to specified tests and standards.
2. Acoustical units: Printed data indicating conformance to specified tests and standards.

D. Maintenance Materials: Provide extra panels equal to 1 percent of the area of each typical module size of acoustical panel, but not less than 8 of each specified size, style and color.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Project site in original sealed packages.

B. Storage: Store materials in building area where they will be installed, in original package. Keep clean and free from damage due to water or deteriorating elements.

C. Handle in a manner to prevent damage during storage and installation.

1.05 PROJECT CONDITIONS

A. Installation of acoustical ceiling system shall not begin until the building is enclosed, permanent heating and cooling is in operation, and residual moisture from plaster and concrete work has dissipated. Building areas to receive ceilings shall be free of construction dust and debris.

B. Environmental Requirements: Maintain temperature in space at 55 degrees F or above for 24 hours before, during, and after installation of materials.

C. Scheduling:

1. Before concealing Work of other sections, verify required tests and inspections have been completed.

2. Coordinate with related Work of other sections. Coordinate location and symmetrical placement of air distribution devices, electrical devices, and penetrations with related Work section.

1.06 WARRANTY

A. Manufacturer shall provide a 10 year material warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. USG Corporation.

B. Armstrong World Industries.

C. CertainTeed Ceilings Corp.

D. Rockfon.

E. Equal.

2.02 SUSPENSION SYSTEM

A. Metal suspension system for acoustical lay-in tile shall be hot-dipped galvanized steel conforming to ASTM A653. Main beams and cross tees shall be double-web steel construction with exposed flange design, with factory punched cross tee slots, hanger holes and integral couplings.

B. Metal suspension system for acoustical lay-in tile shall conform with ASTM C635, C636 and E580 and section 13.5.6 of ASCE 7, as amended by CBC Section 1615A.1.16, for installation in high seismic areas.

C. Structural classification of suspension systems shall be heavy-duty in conformance to ASTM C635.

D. Vertical Strut: USG Donn Compression Post, or equal, or as indicated; types and designs complying with requirements of authorities having jurisdiction and seismic Zones D, E and F requirements. Provide base attachment clip for connection of vertical strut to main beams.

E. Wall Molding: Fabricated from galvanized steel with 2-inch horizontal leg and hemmed edges, same finish as main and cross tees.

F. Spacer/Stabilizer Bars: Provide for tying together the ends of main runners and cross tees that are not attached to wall molding.

G. Hanger Wire: 0.106 inch diameter (0.144 inch diameter for pendant fixtures), galvanized soft annealed mild steel wire as defined in ASTM A641, Class 1 coating.

H. Provide attachment devices and any other required accessories for a complete suspended ceiling system installation.

2.03 ACOUSTICAL CEILING PANELS

A. Acoustical ceiling panels shall be class A in accordance to ASTM E1264.

B. Acoustical panels shall meet the following surface-burning characteristics when tested in accordance to ASTM E84 for Class A materials:

1. Maximum Flame Spread: 25.

2. Maximum Smoke Developed: 50.

C. Mold and Mildew Resistance: Panels and faces shall be treated with a biocide paint additive or an antimicrobial solution to inhibit mold and mildew.

2.04 CEILING TYPES

A. AC 1 – Corridors and Halls:

1. Acoustical Ceiling Panels:

a. Panel Name: Rockfon Alaska CDX 10600 or equal.

b. Panel Size: 2-foot by 2-foot.

c. Panel Thickness: 7/8 inch.

d. Edge Detail: Concealed – X.

e. Light Reflectance: 0.86 minimum, complying with ASTM E1477.

f. CAC: Minimum 22, UL Classified, complying with ASTM E1414.

g. NRC: Minimum 0.90, UL Classified, complying with ASTM C423.

h. Color: White.

i. Recycled Content: Up to 39 percent.

2. Suspension System:

a. Suspension System Name: 1200 Seismic Series, 15/16 inch grid by Chicago Metallic Corporation, or equal.

b. Color: White.

B. AC 2 – See Plans for Location:

1. Acoustical Ceiling Panels:

a. Panel Name: Rockfon Alaska SCD 10550 or equal.

b. Panel Size: 2-foot by 2-foot.

c. Panel Thickness: 3/4 inch.

d. Edge Detail: Semi-Concealed.

e. Light Reflectance: 0.86 minimum, in accordance with ASTM E1477.

f. CAC: Minimum 22, UL Classified, complying with ASTM E1414.

g. NRC: Minimum 0.90, UL Classified, complying with ASTM C423.

h. Color: White.

i. Recycled Content: Up to 39 percent.

2. Suspension System:

a. Suspension System Name: 1200 Seismic Series, 15/16 inch grid by Chicago Metallic Corporation, or equal.

b. Color: Satin Silver 44.

C. AC 3 - See Plans for Location:

1. Acoustical Ceiling Panel:

a. Panel Name: Armstrong Mesa Second Look – Scored 688, or equal.

b. Panel Size: 2-foot by 4-foot.

c. Panel Thickness: 3/4 inch.

d. Edge Detail: Angled Tegular.

e. Light Reflectance: 0.85 minimum, complying with ASTM E1477.

f. CAC: Minimum 35, UL Classified, complying with ASTM E1414.

f. NRC: Minimum 0.60, UL Classified, complying with ASTM C423.

g. Color: White.

h. Recycled Content: Minimum 28 percent.

2. High CAC Lay-In Acoustical Tile Backing Panel:

a. Panel Name: Acousthetics/Kinetics Quiet Tile, or equal.

b. Panel Size: 2-foot by 4-foot

c. Panel Thickness: 9/16 inch

d. Performance Requirements: Class A or Class 1 per ASTM E84

e. Flame Spread: 25, maximum.

f. Smoke Developed: 450, maximum.

g. CAC: Minimum 49, UL Classified, complying with ASTM E1414.

3. Suspension System:

a. Suspension System Name: Prelude XL by Armstrong, Donn DX by USG, 1200 Seismic Series, 15/16 inch grid by Chicago Metallic Corporation, or equal - capable of supporting panel weight up to 3.0 lbs. per sq. ft.

b. Color: White.

D. AC 4 – PA Equipment Rooms:

1. Acoustical Ceiling Panels:

a. Panel Name: Rockfon Alaska SLN 10200 or equal.

b. Panel Size: 2-foot by 2-foot.

c. Panel Thickness: 3/4 inch.

d. Edge Detail: Square Lay-In.

e. Light Reflectance: 0.86 minimum, in accordance with ASTM E1477.

f. CAC: Minimum 22, UL Classified, complying with ASTM E1414.

g. NRC: Minimum 0.90, UL Classified, complying with ASTM C423.

h. Color: White.

i. Recycled Content: Up to 39 percent.

2. Suspension System:

a. Suspension System Name: 1200 Seismic Series, 15/16 inch grid by Chicago Metallic Corporation, or equal.

b. Color: White.

PART 3 - EXECUTION

3.01 PREPARATION

A. Furnish layouts for inserts, clips or other supports and struts required to be installed by the Work of other trades that depend on the suspended ceiling system for support.

B. Coordinate related Work to ensure completion prior to installation of clips or fasteners.

C. Compare layouts with construction conditions. Tile shall be spaced symmetrically about the centerlines of the room or space, and shall start with a tile or joint line as required to avoid narrow tiles at the finish edges unless indicated otherwise. Joints

shall be tight with joint lines straight and aligned with the walls. Ceiling moldings shall be provided where tile abuts wall with matching caulking to eliminate any space.

3.02 INSTALLATION OF SUSPENSION SYSTEMS

A. General:

1. Install suspension system in accordance with ASTM C636 and ASTM E580.
2. System shall be complete; with joints neatly and tightly joined and securely fastened; suspension members shall be installed in a true, flat, level plane.
3. Hanger Wires: 0.106 inch diameter minimum; larger sizes as indicated or required.
   a. Fasten wires to panel points and structure above per most stringent requirements of fabricator and CBC and as indicated on Drawings.
   b. Wires exceeding 1:6 out-of-plumb shall be braced with counter-sloping wires.
   c. Maintain wires at least 6 inches from non-braced ducts, pipes, conduits, and other items.
   d. Install wire along main runners at 4 feet on center. Terminal ends of each main runner and cross tee must be supported within 8 inches of each wall with a perimeter wire or within one-fourth (1/4) of the length of the end tee, whichever is least, for the perimeter of the ceiling area.
   e. Where obstructions prevent direct suspension, provide trapezes or equivalent devices; 1 ½-inch minimum cold rolled channels back to back may be installed for spans to 6 feet maximum.
   f. Wire shall be straight, without extraneous kinks or bend. Hanger wire connections must be capable of carrying a 200 - pound pull without stretching or shifting the suspension clip.
4. Bracing Wires to Resist Seismic Forces: 0.106 inch diameter minimum, larger sizes as indicated or required.
   a. System for Bracing Ceilings: Lay-In Ceiling Systems: Install one four-wire set of sway-bracing wires and a vertical strut for each 144 square feet maximum of ceiling area. Locate wire-sets and struts at 12 feet maximum on center. At ceiling perimeters, wire-sets shall be installed within 6 feet of walls.
   b. Install four-wire sets and struts within 2 inches of cross-runner intersection with main runner; space wires 90 degrees from each other.
   c. Do not install sway bracing wires at an angle greater than 45 degrees with the ceiling plane.
   d. Wires shall be tight, without causing ceiling to lift.
   e. Fasten struts in accordance with CBC requirements.
   f. Maintain wires at least 6 inches from non-braced ducts, pipes, conduit, and other items.

5. Provide additional wires, 0.106 inch diameter minimum, necessary to properly support suspension at electrical devices, air distribution devices, vertical soffits, and other concentrated loads.

6. Suspension:

   a. Suspension members shall be fastened to two adjacent walls per ASTM 580; but shall be at least 3/4 inches minimum clear of other walls.

   b. Any suspension members not fastened to walls shall be interconnected to prevent spreading, near their free end, with a horizontal metal strut or stabilizer bar or 0.064 inch diameter taut tie wire.

   c. Provide additional tees or sub-tees to frame openings for lights, air distribution devices, electrical devices, and other items penetrating through ceiling, which do not have an integral flange to support and conceal cut edges of acoustic panels. Provide cross bracing necessary to securely support any surface mounted fixtures or other items.

7. Attachment of Wires:

   a. To Metal Deck or Steel Framing Members: Install as required by current code.

   b. To Suspension Members: Insert through holes in members or supporting clips.

   c. Wires shall be fastened with three tight turns minimum for hanger wires and four tight turns minimum bracing wires. Turns shall be made in a 1 ½-inch maximum distance.

B. Suspension System for 2-foot by 4-foot Lay-in Acoustical Ceilings:

1. Main Runners: Install main runners 48 inches apart; 0.106 inch diameter hanger wires space 48 inches on center maximum along runners, and within 8 inches of ends.

2. Install wall moldings with fasteners to studs. Install corner caps at molding intersections.

3. Cross-Tees: Install between main runners in a repetitive pattern of 2-foot spacings.

4. Sub-Tees: Install at edges of penetrations.

3.03 INSTALLATION OF ACOUSTICAL PANELS

A. Install panels into suspension system. Partial panels shall be neatly cut and fitted to suspension and around penetrations and/or obstructions. Duplicate tegular edges at partial panels; cuts to be straight. Repaint cut tiles to match color or as directed by manufacturer for mylar facing at visually exposed conditions or as required by the Architect.

B. Penetrations through the ceilings for sprinkler heads and other similar devices that are not integgrally tied to the celing system in the laeral direction shall have a 2 inch oversizzed ring, sleeve or adapter through the celing tile to allow freee movement of

one inch in horizontal directions. Alternateively per ASTM E580, a flexible sprinkler hose fitting that can accommodate one inch of celing movement shall be permitted to be used in lieu of the oversized ring, sleeve or adapter.

3.04 AIR DISTRIBUTION DEVICES

A. Refer to and coordinate with Division 23 - HVAC.

B. Install air distribution grilles and other devices into suspension system. Install 4 taut wires, each 0.106 inch diameter minimum, to each device within 3 inches of device corners, to support their weight independent of the suspension system.

3.05 LIGHT FIXTURES

A. Refer to and coordinate with Division 26 - Electrical.

B. Fixtures weighing less than 56 pounds: Install fixtures into suspension systems and fasten earthquake clips to suspension members. Install minimum 2 slack safety wires, each 0.106 inch diameter minimum, to each fixture at diagonally opposite corners, to support their weight independent of the system.

C. Fixtures weighing 56 Pounds or more: Install fixtures into suspension system and fasten earthquake clips to suspension system members as required by the Drawings and/or code. Install not less than 4 taut 0.106 inch diameter wires capable of supporting four times the fixture load.

D. Support pendant-mounted light fixtures directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting two times the weight of the fixture. Brace the pendant-mounted light fixtures by either a bracing assembly at the ceiling penetration or below the ceiling to the walls, as indicated in the drawings.

3.06 CLEANING

A. General: After installation of acoustical material has been completed, clean surfaces of the material, removing any dirt or discolorations. Replace panels as required.

B. Acoustical Panels: Minor abraded spots and cut edges shall be touched up with the same paint as was used for factory applied finish of the lay-in panels.

C. Remove and replace work that can not be succesfully cleaned and repaired to eliminate evidence of damage.

3.07 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose off of the Project site.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 6513

RUBBER BASE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Topset coved rubber base for installation with surface flooring.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 09 6566 – Synthetic Athletic Flooring.
3. Section 09 6723 - Resinous Flooring.
4. Section 09 6813 – Tile Carpeting.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation instructions. Submit technical data and installation instructions for each adhesive material.

B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care and cleaning of base.

C. Samples: Submit Samples of top set base in each available color. Following color selections, submit Samples, not less than 12 inches long of each selected color and type. Submit pint cans of each type adhesive.

D. Maintenance Materials: Before Substantial Completion, deliver at least 50 lineal feet and five outside corner units of each color of rubber base installed. Deliver the materials in unopened factory containers or in sealed cartons with labels identifying the contents, matching installed materials. Include unopened cans of adhesives adequate to install the maintenance materials.

1.03 QUALITY ASSURANCE

A. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

B. Comply with the following as a minimum requirement:

1. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM F1861: Standard Specification for Resilient Wall Base.

3. Comply with current CHPS requirements, www.chps.net.

4. Chemically based products such as sealers, primers, fillers, adhesives, etc. must be approved by Owner's Office of Environmental Health and Safety (OEHS).

5. Each selected color and configuration shall be from same dye lot and color.

1.04 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Store materials at room temperature, but not less than 70 degrees F, for a minimum of 48 hours before installation, unless otherwise indicated in manufacturer's printed instructions.

1.05 PROJECT CONDITIONS

A. Ventilation and Temperature: Verify areas that are to receive rubber base are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for site installation conditions.

1.06 WARRANTY

A. Manufacturer shall provide a five year material warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Burke/Mercer Wall Base.

B. Roppe, Pinnacle Rubber Base.

C. Flexco Company, Wallflower Premium Rubber Wall Base.

D. Johnsonite.

E. Equal.

2.02 MATERIALS

A. Rubber base: Conform to ASTM F 861; Group 2, solid (homogeneous); Type 1, TS, (thermoset) vulcanized rubber, Style A, 4-inch high unless otherwise indicated, integral colors as selected, non-shrinking, 1/8 inch thick, with matching molded outside corners.

B. Base Adhesive: Water based, low odor type, as recommended by manufacturer of rubber base.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate the Work of this section with other sections to provide a level, smooth and clean finish surfaces to receive rubber base.

3.02 EXAMINATION

A. Field verify dimensions and other conditions affecting the Work of this section before commencing the Work of this section.

B. Before Work is started, examine surfaces that are to receive rubber base. Deficiencies shall be corrected before starting the Work of this section.

3.03 PREPARATION

A. Do not start preparation until adjacent concrete floor slabs are at least 90 days old and finish flooring is installed.

B. Install rubber base when ambient temperature is 70 degrees F. or higher.

3.04 INSTALLATION

A. Install top set base at hard floors, including resilient flooring, concrete and wood, carpet and other soft floors.

B. Securely fasten cement base to backing in long lengths in accordance with manufacturer's recommendations. Lay out lengths so that not less than 18 inches long filler pieces are provided. Assure that top and toe continuously contact the wall and floor, and that all joints are tight. Install matching factory formed external corners at all offsets. Inside corners shall be coped; wrapped corners are not acceptable.

C. Use of adhesive gun is prohibited. Apply adhesive directly to substrate using the appropriate notched trowel or spreader according to manufacturer's instructions. Maintain 1/8 inch gap from top of base to prevent adhesive oozing onto adjacent surfaces.

D. Base and outside corners shall be rolled with a seam roller before adhesive sets.

3.05 CLEANING

A. Maintain surfaces of base clean as installation progresses. Clean rubber base when sufficiently seated and remove foreign substances.

B. Clean adjacent surfaces of adhesive or other defacement. Replace damaged and/or defective Work to the specified condition.

3.06 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.07 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 6518

RUBBER FLOOR COVERING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rubber tile flooring.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 3000 - Cast-in-Place Concrete.

3. Section 09 6513 - Rubber Base.

1.02 DEFINITIONS

A. Pop-up: A pop-up is defined as any surface deviation or looseness of substrate that is equal to or greater than 1/64 (0.015625) inch above the concrete floor level, regardless of the size.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's published technical data describing materials, construction, and recommended installation procedures Submit technical data and installation instructions for each adhesive material. Submit list and Product Data of recommended finish materials.

B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care, cleaning of rubber tile.

C. Samples: Submit Samples of rubber tile in each available color and pattern. Following color selections, submit full size Samples of each selected color and pattern. Submit pint cans of each type adhesive.

D. Maintenance Materials: Before Substantial Completion, deliver one unopened container of each color and pattern of rubber tile in each color and pattern installed. Label each container indicating locations installed. Include unopened cans of adhesives adequate to install the maintenance materials.

E. Installer's Experience Qualifications: Submit list of not less than five projects, extending over period of not less than five years, indicating installer's experience

record. Submit letter from manufacturer indicating manufacturer's approval for installer of the products.

1.04 QUALITY ASSURANCE

A. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

B. Comply with the following as a minimum requirement:

C. ASTM E84: Class A Flame Spread Rating of 25 or less.

D. Comply with current CHPS requirements, www.chps.net.

E. Chemically based products such as sealers, primers, fillers, adhesives, etcetera must be approved by Owner's Office of Environmental Health and Safety (OEHS).

F. Moisture Testing: ASTM F1869.

1.05 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Materials shall be stored at not less than 70 degrees F for not less than 48 hours before installation.

1.06 PROJECT CONDITIONS

A. Ventilation and Temperature: Verify areas that are to receive new flooring are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for Project site installation conditions.

1.07 WARRANTY

A. Manufacturer shall provide a two year material warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Nora Rubber Flooring.

B. Johnsonite.

C. Flexco Corporation.

D. Roppe Corporation.

E. Equal.

2.02 MATERIALS

A. Rubber Tile: ASTM F1344, Standard Specification for Rubber Floor Tile, Class I B, homogeneous rubber tile, through mottled pattern, 1/8 inch thick, conforming to CBC Chapter 11B and ADAAG requirements for non-slip materials.

B. Crack Filler and Leveling Compound: Cementitious type, Durabond's Webcrete # 95, Ardex SD-F, Armstrong S-194 or equal, as recommended by flooring manufacturer.

C. Adhesive: Water based, low odor type formulated specially for use with rubber tile, and manufactured or recommended by manufacturer of rubber tile.

D. Reducer Strips: Tapered rubber not less than one inch wide, and thickness to match tile.

E. Underlayment: One of the following, grade stamped on panels as indicated.

1. Halex (9 mm) flooring underlayment.

2. Matrixx (9 mm) by Traxx Corporation.

3. Equal.

F. Floor Finish: Polymer type recommended by manufacturer for rubber flooring, UL rated non-slip.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate with related Work to assure level, smooth, and clean finish surfaces to receive rubber floor tile and stair covering.

3.02 EXAMINATION

A. Field verify dimensions and other conditions affecting the Work of this section.

B. Before Work is commenced, examine surfaces that are to receive rubber tile and stair covering. Repair and/or replace defective Work before starting Work of this section.

1.03 3.03 PREPARATION

A. Wood Sub-floors:

1. Install underlayment according to manufacturer's instructions.

2. Sweep floors. Vacuum sanding dust.

3.04 INSTALLATION OF TILE

A. Color and pattern: Install tiles in a rectangular pattern, in one color without border in rooms or spaces, unless otherwise indicated.

B. Install rubber floor tile when ambient temperature is 70 degrees F. or higher.

C. Install the tile adhesive in a thin film evenly with a notched trowel. Trowel notches shall be as recommended by flooring manufacturer.

1. Mix adhesive in accordance with manufacturer's instructions. Provide safety precautions during mixing.

2. Install adhesive only in the area that can be covered by flooring material within the adhesive manufacture's recommended working time.

3. Remove any adhesive that has dried or filmed over.

4. Adhesive application rate shall be as required to avoid telegraphing trowel lines to the surface after maintenance coatings are applied. Adjust tile runoff during installation if necessary.

D. Provide reducer where floor covering edges are exposed, such as at center of the door or where floor coverings terminate.

E. Install rubber tile in accordance with manufacturer's recommendations. Tiles shall fit snugly at wall. Closely trim to pipes, jambs, outlets, and similar conditions.

F. Install tiles symmetrically about centerlines of areas while progressing toward walls. Adjust border tiles as required. Tiles shall be straight and joints close. Tile shall be cut to fit snugly at doorframes and walls.

G. Mechanically cut flooring material to provide square true edges.

H. As floor tile is installed, the floor shall be rolled with a clean, 150-pound roller in both directions.

3.05 CLEANING, WAXING, AND COMPLETION

A. Maintain flooring surfaces clean as installation progresses.

B. Clean flooring when sufficiently seated and remove foreign substances.

C. Before Substantial Completion, install at least two coats of floor finish on rubber tile flooring, in accordance with manufacturer's instructions. Do not buff polymeric floor finish unless specifically recommended by finish manufacturer.

D. Clean adjacent surfaces of adhesive or other deleterious conditions.

3.07 CLEAN UP

A. Remove rubbish, debris and waste material and legally dispose of off the Project site.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.09 INSTRUCTION

A. After Work of this section is complete, flooring manufacturer's technical representative shall provide a one hour instruction period to Owner staff in maintenance of flooring.

END OF SECTION

SECTION 09 6566

SYNTHETIC ATHLETIC FLOORING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Resilient synthetic athletic flooring with inlaid logos as shown.

B. Related Requirements:

1. Section 03 3000 - Cast-in-Place Concrete.

2. Section 07 1326 - Self-Adhering Sheet Waterproofing.

3. Section 09 6513 - Rubber Base.

1.02 DEFINITIONS

A. Pop-up: A pop-up is defined as any surface deviation or looseness of substrate that is equal to or greater than 1/64 (0.015625) inch above the concrete floor level, regardless of size.

1.03 SUBMITTALS

A. Product Data: Submit manufacturers published technical data describing materials, construction, and recommended installation procedures.

B. Samples: Submit Samples of each type of synthetic athletic flooring in each available color. Submit pint cans of each type of adhesive.

C. Shop Drawings: Submit shop drawings indicating installation layout and logo locations and details.

D. Installers Experience Qualifications: Submit list of not less than five projects, extending over period of not less than five years, indicating installers experience record. Submit letter from manufacturer showing manufacturer's approval for installer of the products.

E. Closeout Submittals: Submit manufacturer's cleaning, maintenance, and repair instructions.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

2. Installed surfaces and level changes shall be compliant with requirements of CBC Chapter 11B and ADAAG.

3. Permanent heat, light, and ventilation shall be installed and operating during and after installation, maintaining a temperature range of 55 to 78 degrees F. and a relative humidity range of 35 to 50 percent.

4. Environmental Limitations:

   a. Comply with requirements of athletic flooring material supplier's requirements.

   b. Comply with MSDS requirements for materials installed in the Work of the section. Protect persons from exposure to hazardous materials.

5. Material Fire Safety:

   a. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials: Class A Flame Spread Rating of 25 or less.

   b. Fire Test Data: ASTM E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source, NFPA 253.

6. Moisture Testing: ASTM F1869.

B. Qualifications:

1. Supplier: Synthetic athletic flooring manufacturer shall have been regularly engaged in business of manufacturing products of this section for at least five years.

2. Installer: Trained and certified by flooring manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Materials shall be stored at not less than 55 degrees F and 50 percent relative humidity for not less than 48 hours before installation.

1.06 PROJECT CONDITIONS

A. Ventilation and Temperature: Verify areas that are to receive new flooring are ventilated to remove fumes from installation materials and areas are within temperature range recommended by the material manufactures for Project site installation conditions.

1.07 WARRANTY

A. Manufacturer shall provide a two year material warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Ecore Athletic.

B. Connor Sport Court ElastiRoll Sports Flooring System

C. American Mat & Rubber Company.

D. Equal.

2.02 MATERIALS

A. Ecore Athletic Stacked Performance Collection Rolls and Interlocking Tiles.

1. Ecore Athletic Stacked Performance Motivate Rolls with itstru-5 technology. Consisting of a 5mm BL46 underlayment with a 2.5 mm EPDM surface wear layer.
2. Ecore Athletic Stacked Performance Beast Rolls with itstru-8 technology. Consisting of an 8mm 8032 underlayment with a 2.5 mm EPDM surface wear layer.
3. Colors: As noted on plans..

B. Concrete Primer: Non-staining type recommended by manufacturer of synthetic athletic flooring.

C. Crack Filler and Leveling Compound: Cementitious type, Durabond's Webcrete #95, Ardex SD-F, Armstrong S-194 or equal as recommended by flooring manufacturer.

D. Adhesive: two-component polyurethane as supplied by flooring manufacturer.

1. An epoxy adhesive for questionable substrates shall be as submitted and reviewed by the Architect.

E. Vinyl wall base, 4-inch high; or as detailed in the Drawings.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate with related Work to assure level, smooth, and clean finish surfaces to receive Work of this section.

B. Inspect concrete slab for proper tolerance and dryness.

3.02 EXAMINATION

A. Field verify dimensions, examine surfaces and other conditions, and correct deficiencies before commencing the Work of this section.

3.03 PREPARATION

A. Concrete Slabs:

1. Leveling: Check sub-floors for level, and provide floor slabs true to level and plane within a tolerance of 1/8 inch in 10 feet. Test floor areas both ways with a 10-foot straightedge and repair high and low areas exceeding allowable tolerance. Pop ups shall be hammered out and floor filled with a cementitious leveling compound. Remove high areas by power sanding, stone rubbing or grinding, chipping off and filling with leveling compound, or equivalent method. Fill low areas with leveling compound. Repair and level the surfaces having abrupt changes in plane, such as trowel marks or ridges, whether or not within the allowable tolerance. Clean areas where repairs are performed.

2. Cleaning: After leveling, if required, clean substrates of deleterious substances and foreign matter.

3. Cracks or Depressions: Fill void spaces with cementitious leveling compound of the type recommended by flooring manufacturer for the specific conditions.

4. Moisture Testing: Test new and old concrete slabs for adequate dryness. Testing shall conform to ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride, and the following minimum testing requirements of three calcium chloride tests for the first 1,000 square feet of floor area, and one for each additional 1,000 square feet or fraction thereof. Unless more stringent requirements are recommended by flooring manufacturer, maximum allowable moisture release at time of flooring installation shall be three pounds per 24 hours per 1,000 square feet. Provide report of test as specified above. For each test, perform the following steps:

a. Weigh the sealed dish of crystals immediately prior to exposure. Record starting weight, date, and time.

b. Open kit and set crystal dish on clean concrete surface. Immediately install plastic dome over the dish. Make sure the dome is gasketed to the concrete and is airtight.

c. Leave test to absorb moisture for 60 to 72 hours. Maintain room temperature above 55 degrees F for duration of test.

d. After exposure, remove and discard housing. Replace dish lid and tape shut. Weigh the sample within one hour of removal from floor.

e. Compute the vapor emission in pounds, indicate location of test and vapor emission on report.

f. Delay application of flooring until sub-floors are sufficiently dry, or perform remedial measures as recommended by flooring materials manufacturer.

5. Priming: Prime concrete floor slabs as recommended by flooring manufacturer.

3.04 INSTALLATION OF SHEET FLOORING

A. Layout:

1. Square the room or area to be installed.

2. Mark the floor off in quarters.

3. Install in straight pattern.

B. Adhesive:

1. Start in center of room.

2. Mix the two-component polyurethane adhesive and install directly to the concrete sub-floor with notched trowel per manufacturer's instructions.

3. Only install as much adhesive as can be covered in 20 minutes.

C. Flooring:

1. Start in the center and progress toward borders. Install each mat firmly into the adhesive and butt adjacent mats. Roll with 70 to 100 pound floor roller. When floor is complete, roll again. Clean and remove excess adhesive with recommended solvent.

2. Fit flooring neatly and tightly around penetrations. Scribe flooring to doorjambs. Terminate in center of doorways beneath closed doors.

D. Wall Base: Install vinyl base with recommended adhesive.

E. Installation of Trim Shapes: Provide reducer strips to cover exposed edges of resilient flooring. Provide carpet-to-tile strips at junctions with carpet.

3.05 CLEANING

A. Maintain floors in a clean condition as installation progresses.

B. Clean finished flooring and remove foreign substances.

C. Clean adjacent surfaces of adhesive or other materials. Replace damaged or defective Work.

3.06 CLEAN UP

A. Remove rubbish, debris and waste material and legally dispose of off the Project site.

3.07 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.08 INSTRUCTION

A. After the Work of this section is complete, and prior to Substantial Completion, flooring manufacture's technical representative shall provide a four hour instruction period to designated Owner staff in maintenance of installed flooring.

END OF SECTION

SECTION 09 6813

TILE CARPETING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Tile carpeting.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
3. Section 09 6513 - Rubber Base.

1.02 SUBMITTALS

A. Shop Drawings: Submit dimensioned layout of carpet tile and details for binder bars.

B. Samples:

1. Submit minimum three labeled carpet tile actual size with proper backing. Carpet style and color as selected by the Owner.
2. Trim and accessories: Submit 12-inch long Samples of each type trim proposed for the Work.

C. Product Data: Submit the following:

1. Carpet tile manufacturer's published technical data fully describing carpet materials, construction, and recommended installation directions.
2. Technical data and installation instructions for each adhesive and sealer material.
3. Carpet tile manufacturer's published instructions for maintenance, care, cleaning and repair of carpet.
4. MSDS on Manufacturers recommended adhesives and primers.

D. Certificate:

1. Submit a certificate from carpet tile manufacturer that materials supplied comply with fire hazard resistance standards specified.

2. Submit a manufacturer certification that the installer is approved by the manufacture to install the specified product.

E. Installer's Experience Qualifications: Submit list of not less than five projects with similar scope of work, extending over period of not less than five years, indicating installer's experience record.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Manufacturer's installation instructions

2. Materials shall comply with CBC Chapter 11B and ADAAG requirements.

3. Comply with current CHPS requirements for low emitting materials, www.chps.net.

4. Chemically based products such as sealers, primers, fillers, adhesives, etc. must be approved by owner's office of the Environmental Health and Safety (OEHS).

5. Carpet tile must be free of Anti-Microbial Protection.

6. Comply with ASTM F1869 for moisture testing.

B. Requirements of Regulatory Agencies: Carpet tile shall meet requirements of federal, state and local regulatory agencies for flammability, static control, or other properties as specified with testing documentation from the manufacturer by a third party laboratory.

C. Carpet Tile Installation: Comply with CRI 104 - Standard for Installation of Textile Floor Covering Materials.

D. Each color of carpet tile shall be of the same dye lot.

E. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

F. Pre-Installation and Progress meetings: Prior to start of work of this section and after approval of submittals, schedule an on site Pre-Installation and progress meetings between Contractor, Supervising Installer, OWNER and Project Inspector to review construction, drawings and installation procedures in accordance with the requirements of this specification.

1.04 DELIVERY, STORAGE AND HANDLING

A. Full cartons of carpet tile shall be packaged and identified by the flooring manufacturer. Distributor, dealer, or vendor cutting, re-packaging, and re-labeling is not permitted.

B. Store material at least 48 hours at room temperature prior to installation and in accordance to manufacturer's instructions.

C. Deliver fire-rated materials with testing agency labels and required fire classification numbers attached and legible.

1.05 JOB CONDITIONS

A. Ventilation and Temperature: Verify areas to be carpeted are ventilated to remove any off gassing from installation materials, and areas are within temperature range recommended by the various material manufacturers for Project site installation conditions. The temperature of a concrete slab must be stabilized above 65 degrees both 12 hours prior to and after the installation. The following environmental conditions inside the building are critical for proper installation. Temperature must be between 65 degrees F and 95 degrees F and the humidity between 10 percent and 65 percent for at least 72 hours before and 72 hours after installation. In addition, any adhesives and primers should be stored under these conditions for a minimum of 24 hours prior to installation.

B. Protection: Prohibit traffic on carpet for at least 12 hours after installation. Cover carpet with heavy non-staining Kraft paper in areas where the Work of other trades is to be performed and traffic and passage areas. Protect carpet from damage or soiling. Maintain protection in place until Substantial Completion.

1.06 WARRANTY

A. Contractor shall provide a two year installation warranty.

B. Manufacturer shall provide a 30 year material warranty as described below:

1. Delamination Warranty: Carpet tile will not delaminate for a minimum of 30 years from the date of installation.

2. Zippering Warranty: Carpet tile will not zipper or develop continuous pile yarn runners in the body of the carpet for a minimum of 30 years from the date of Substantial Completion.

3. Edge Ravel: Carpet tile will not have continuous pile yarn coming out at seams for a minimum of 30 years from the date of Substantial Completion.

4. Cup, Dish or Dome Warranty: The manufacturer warrants that the carpet tile will not cup, dish or dome for 30 years from the date of Substantial Completion.

5. Dimensional Stability Warranty: The manufacturer warrants that the carpet tile will not lose its dimensional stability (namely: growth or shrinkage with glue-down installations) for 30 years due to normal variations in atmosphere, temperature, or humidity

6. Wear Warranty: The manufacturer warrants that the carpet tile will lose no more than 10 percent by weight of the pile fiber during the life of the carpet from the date of Substantial Completion.

C. Manufacturer shall provide a 10 year material warranty for colorfastness and texture retention.

1. Stain and Soil Protection: 10 year stain removal written guaranty.

2. Texture Retention Warranty: The manufacturer warrants that the carpet tile will substantially maintain its physical surface texture against crushing, matting and walking out for 10 years from the date of Substantial Completion.

3. Colorfastness to light: Carpet tile will not fade for 10 years due to exposure to sunlight.

4. Colorfastness to atmospheric contaminants: Carpet tile will not fade for 10 years due to atmospheric contaminants.

1.07 MAINTENANCE

A. Extra Materials: Provide minimum three cartons of extra materials for each color, pattern, and dye lot of carpet.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Modular Carpet Tile, Heavy Commercial Traffic:

1. BOLYU Contract, Style Tempo Hip Hop TPM09

B. Adhesives and Primers: As recommended by tile carpeting manufacturer.

2.02 MATERIALS

A. Carpet tile shall meet the following minimum standards:

1. Pile: 0.195 inch maximum height level loop. No cut pile or cut and loops will be accepted.

2. Dye Method: 85 percent Solution Dyed Method. 15 percent Yarn Dyed.

3. Construction: Maximum 24-inch by 24-inch Modular Carpet Tile. Tufted level loop (no cut or cut loop accepted).

4. Pile / Yarn weight: Minimum 17 ounces per square yard.

5. Minimum Density: Not less than 6,800.

6. Moisture Impervious: Carpet tile shall be unaffected by water and moisture.

7. Static Protection: The manufacturer warrants that the carpet tile will not static discharge in excess of 3.5 KV or under when tested under the AATCC Test Method 134 for the life of the carpet.

8. Carpet tile shall be able to be installed with 5 pounds hydrostatic pressure or better per 1,000 square feet per 24 hours with written documentation from manufacturer, per CRI-104.

9. Fluorochemical Treatment: Minimum of 500 parts per million: per CRI-102; after two hot extractions (AATCC171), minimum 400 Parts per Million per CRI TM-102.

10. Traffic Classification: Class III – Extra Heavy Commercial Traffic (more than 1000-foot traffic per day).

11. GSA Certification: Carpet tiles shall meet or exceed the General Services Administration requirements.

12. Flammability:

    a. Flooring Radiant Panel: Class I- per ASTM E648

    b. NBS Smoke Density: Less than 450 per test ASTM E662; NFPA-258

    c. Flame Resistant: Shall pass Methenamine pill test ASTM E662.

    d. Materials shall meet requirements of California Proposition 65. In case of fire, no material shall be used that emit gas and is prohibited by California Proposition 65.

13. Run Resistant Strength: Not less than 25 pounds, in accordance with the Loop Pile Run Resistance test (TP 155-86), wet or dry for a minimum of 30 years.

14. Indoor Air Quality: Carpet tile and adhesion systems shall meet or exceed CRI and EPA guidelines (green label plus certified and labeled) and may not contain any VOC's such as: 4PCH (4 phenulcyclohexeneor, SBR latex (Styrene Butadiene Rubber).

15. Recycling Program: Carpet tile shall be eligible for a recycling program (the carpet tile will be recycled and no part of the reclaimed carpet enters a landfill) either through the carpet tile manufacturer or fiber manufacturer. If project scope included removal and disposal of existing carpet or carpet tile, contractor is responsible for delivery to a certified recycling center. A recycling certificate must be submitted to OAR, with its name and address of location of recycling center, date and weight of carpet recycled. Contractor is responsible for costs associated with recycling.

B. Carpet tile shall be from one dye lot.

C. Full cartons of carpet tile shall be cut, packaged, and identified by the factory. Distributors, dealers and vendor cutting, re-packaging, and re-labeling are not permitted.

D. Stair Nosing: Universal Moldings # A-544-BA 1 commercial (butt to nosing) type or equal, installed with recommended sized screws.

E. Adhesive: Water-resistant latex-based adhesive recommended by carpet tile manufacturer for re-leasable adhesive carpet tile installation. Where primers or sealers are furnished, verify their compatibility with adhesive.

F. Crack Filler and Leveling Compound: 100 percent cementitious binder type (as defined by ASTM C150), shall be approved by Owner's Office of Environmental Health and Safety (OEHS). The following manufacturers are currently listed as approved by OEHS:

1. Webcrete #95 as manufactured by Durabond

2. Ardex SD-F as manufactured by Ardex

3. Or as recommended by flooring manufacturer and approved by LAUSD's Office of Environmental Health and Safety.

4. Leveling Compound shall meet or exceed 200 pounds when tested in accordance with ASTM 1583.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Before installation is started, examine surfaces to receive carpet tile. Deficiencies shall be corrected before starting Work of this section.

B. Field verify dimensions and other conditions affecting this Work before commencing carpet tile installation.

3.02 PREPARATION

A. Provide concrete moisture vapor emission and pH testing to concrete specified to be covered with carpet tile. Includes concrete placed below, on and above grade. For replacement projects, concrete slabs not in direct contact with ground may be excluded from this requirement. Comply with requirements of ASTM F1869.

B. Testing shall take place after allowing concrete to dry for a minimum of 90 days. Testing to be scheduled no less than one or more than three weeks prior to scheduled flooring installation.

C. Quantification of Concrete Moisture Vapor Emissions

1. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75 plus or minus 10 degrees F and 50 plus or minus 10 percent relative humidity. When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.

2. The number of vapor emission test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to three in the first 1,000 square feet and one per each additional 1,000 square feet.

3. Tests sites are to be cleaned of adhesive residue, curing compounds, paints, sealers, floor coverings, etcetera 24 hours prior to the placement of test kits.

4. Weigh test dish on site prior to start of test. Scale must report weight to 0.1 grams. Record weight and start time.

5. Expose Calcium Chloride and set dish on concrete surface.

6. Install test containment dome and allow test to proceed for 72 hours.

7. Retrieve test dish by carefully cutting through containment dome. Close and reseal test dish.

8. Weigh test dish on site recording weight and stop time.

9. Calculate and report results as "pounds of emission per 1,000 square feet per 24 hours".

10. Follow manufacturer's corrective measures accordingly. Moisture vapor emission must meet manufacture's recommendation prior to installation.

D. Quantification of pH Level

1. At each vapor emission test site, after removal of test containment dome, perform pH test.

   a. Place several drops of water onto the concrete surface to form a puddle approximately 1 inch in diameter.

   b. Allow the water to set for approximately 60 seconds

   c. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading

d. Acceptable range is pH5 to pH9. Excessive alkalinity shall be neutralized prior to installation of the carpet tile.

e. Record and report results.

f. Follow manufacturer's corrective measures accordingly.

E. Preparation of Subfloors: Any leveling compound used over a vapor or moisture barrier will be warranted to be installed in a wet or moist environment without moisture limitations.

1. Delay application of flooring until sub-floors are sufficiently dry according to flooring manufacturer's recommendations, or perform remedial measures as recommended by flooring materials manufacturer.

F. Cleaning and Drying: Clean concrete floor slabs of oil, grease, waxes, curing compounds, dust, dirt, debris, paint, and other deleterious substances. Failure to remove or seal old adhesives or other floor coatings may result in installation failure. Provide a commercial vacuum cleaner to remove dust and dirt. Do not furnish oiled or chemical treated sawdust or any similar product for dust removal.

G. Leveling: Verify floor slabs true to level and plane within a tolerance of 3/16 inch in 10-feet. Test floor areas both ways with a 10-foot straightedge and repair high and low areas exceeding allowable tolerance. Pop ups shall be hammered out and floor filled with an approved cementitious leveling compound. Remove high areas by power sanding, stone rubbing or grinding, chipping off and filling with an approved cementitious leveling compound, or equivalent method. Fill low areas with an approved cementitious leveling compound. Repair and level the surfaces having abrupt changes in plane, such as trowel marks or ridges, whether or not within the allowable tolerance. Again clean areas where repairs are performed and prime floor using recommended primer by manufacture. Do not sand, stone rub grind or power chip floor adhesives that contain asbestos.

H. Wood subfloors: Clean wood subfloors of oil, grease, waxes, dust, dirt, debris, paint, and other deleterious substances. Do not furnish oiled or chemical treated sawdust or any similar product for dust removal. Sand off projecting ridges. If recommended by carpet tile manufacturer, prime floors with a recommended primer, compatible with adhesives to be installed.

I. Conditioning of Materials: Carpet tile and adhesives shall be conditioned at the Project site at not less than 65 degrees F and relative humidity between 10 percent and 65 percent for 48 hours prior to installation and in accordance to manufacturer's instructions.

J. Floors should be level and sound. Any trowel marks from old adhesives must be sanded smooth, creating a level surface prior to the application of adhesives and primers.

3.03 CARPET TILE INSTALLATION

A. General: Install carpet tile in accordance with requirements of CRI 104, except where more stringent requirements are specified herein or recommended by carpet materials manufacturers.

B. Install carpet tiles in each dye lot in the number sequence as furnished by manufacturer. Measure the area to find the best starting point that will utilize a maximum size perimeter tile. After selecting the starting point, snap a chalk line that bisects this point by at right angles. To achieve a perfect angle form a triangle by measuring 6-inch up from the center point. Then measure 8-inch out from the center point. Then, find a 10-inch angle between these two points. (See manufacturers written instructions for complete details).

C. Color Control: Install dye lot in the number sequence at locations indicated to prevent shading variations. Install only one dye lot for each area of building unless otherwise reviewed. If more than one dye lot is required, obtain prior review of color match between dye lots by Owner and its representative's written approval.

D. Carpet Tile Fit: Refer to the layout Shop Drawings. The corners of the carpet tiles should be flat to assure a proper fit. Install the carpet tiles snuggly. Be careful to not to over tighten the installation.

E. Laying and Seaming: Cut carpet tiles for seams between rows and prevent damage to loops, prevent edge ravels, and preserve uniform row alignment and spacing on both sides and across seams. Install carpet tiles with loop rows in straight lines both ways, free of offsets, waviness, distortion, or misalignment. Cut seam edges straight and square with backing. Trim carpet tiles at walls, columns, and penetrations for a compressed fit.

F. Doorways: Extend carpet tiles into doorways without piecing in and seam to the carpet on other side of door under door centerline except where metal thresholds occur; no small filler pieces of carpet tiles will be permitted at doorways.

G. Adhesive Installation: Provide proper equipment as required by manufacturer. Evenly spread adhesive free of excess or thin areas. Place and lay carpet tile within open time of adhesive.

H. Binder Bars: Provide bars at edges of carpet tiles not abutting walls or other construction, securely fastened in place by using aluminum drive nails. Precisely align splices and tightly miter angles.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion. Limit rolling traffic on carpet tiles for at least 12 hours after installation. Cover carpet tiles with heavy non-staining Kraft paper in areas where the Work of other trades is to be performed and/or traffic and passage areas. Protect carpet from damage or soiling. Maintain protection in place until Substantial Completion.

3.05 CLEANING

A. As each carpeted area is completed, clean up dirt and debris, remove spots and soiling with proper cleaner, trim off loose threads with sharp scissors, and vacuum entire area clean.

3.06 CLEAN-UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.07 INSTRUCTION

A. Before Substantial Completion of the Work, should the district request and at the districts discretion, provide a four hour Owner instruction period for proper maintenance of carpeting. Instructions shall be provided by technical representative of manufacturer.

END OF SECTION

SECTION 09 8100
ACOUSTICAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Acoustical insulation and sealants.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 07 2100 - Thermal Insulation.
3. Section 09 2216 - Non-Structural Metal Framing.

1.02 SUBMITTALS

A. Product Data:

1. Provide manufacturer's printed Product Data for each product.
2. Provide manufacturer's printed installation instructions.

1.03 QUALITY ASSURANCE

A. Fire Ratings: Comply with fire-resistance and flammability ratings specified.

B. Acoustic Performance: Acoustic Insulation shall be tested in accordance to ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method, with Type A (#4) mounting.

C. CBC 720 (CMC 506.7.3, 604 CPC 609.11)

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect insulation from physical damage and from becoming wet or soiled.

B. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

2.01 ACOUSTICAL INSULATION

A. Unfaced Mineral/Glass Fiber Blanket/Batt Acoustical Insulation: Acoustical insulation produced by combining mineral/glass fibers with thermosetting resins to comply with ASTM C665, Type I.

1. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50 when tested in accordance with ASTM E84.

2. Manufacturers: Johns Manville "Sound Control Batts", Owens Corning "Sound Attenuation Batts", or equal.

3. Thickness: 3-inch unless otherwise indicated.

2.02 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Concealed Joints: Non-drying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound:

1. Pecora Corp. "BA-98".

2. Tremco Inc. "Tremco Acoustical Sealant".

3. Hilti, Inc. “CP 506”.

4. Equal.

B. Acoustical Sealant for Exposed Joints: Non-oxidizing, skinnable, paintable, gunnable sealant recommended for sealing interior exposed joints to reduce transmission of airborne sound.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions for installation conditions.

B. Do not install insulation until building is sufficiently enclosed or protected against absorption of moisture by the insulation, and do not install insulation unless supporting framing and construction is in a thoroughly dry condition.

C. Install snugly between framing members with ends snugly fitted between units and against adjacent construction.

D. Carefully cut and fit insulation around pipes, conduit, and other obstructions and penetrations.

E. Where door and window frames occur in framing; cut additional strips of insulation and hand-pack as required to fill voids in and around such frames.

F. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C919 for use of joint sealants in acoustical applications as applicable to materials, applications and conditions indicated. Install sealants in accordance with manufacturer's instructions.

3.02 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose off of Project site.

3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 9000

PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior and exterior painting.

B. Following items shall not be painted:

1. Brass valves, chromium or nickel-plated piping and fittings.

2. Boiler control panels and control systems.

3. Fabric connections to fans.

4. Flexible conduit connections to equipment, miscellaneous name plates, stamping, and instruction labels and manufacturer's data.

5. Mechanical and electrical utility lines, piping and heating and ventilation ductwork in tunnels, under-floor excavated areas or crawl spaces, attic spaces and enclosed utility spaces.

6. Flag, floodlight, parking light poles and loudspeaker poles, metal stairs, handrails and chain-link fence with a galvanized finish, unless otherwise noted.

7. Structural and miscellaneous steel, open web steel joists and metal floor decking, which will not be exposed in final construction, shall have no finish other than one coat of shop primer.

8. Hardboard covering on tops and backs of counters and benches.

9. Brass, bronze, aluminum, lead, stainless steel and chrome or nickel-plated surfaces.

10. Non-metallic walking surfaces unless specifically shown or specified to be painted.

1.02 REGULATORY REQUIREMENTS

A. Paint materials shall comply with the Food and Drug Administration's (F.D.A.) Lead Law and the current rules and regulations of local, state and federal agencies governing the use of paint materials.

1.03 SUBMITTALS

A. List of Materials: Before submittal of samples, submit a complete list of proposed paint materials, identifying each material by distributor's name, manufacturer's name,

product name and number, including primers, thinners, and coloring agents, together with manufacturers' catalog data fully describing each material as to contents, recommended installation, and preparation methods. Identify surfaces to receive various paint materials.

B. Material Samples: Submit manufacturer's standard colors samples for each type of paint specified. Once colors have been selected, submit Samples of each color selected for each type of paint accordingly:

1. Samples of Paint and Enamel must be submitted on standard 8 ½" x 11" Leneta Opacity-Display Charts. Each display chart shall have the color in full coverage. The sample shall be prepared from the material to be installed on the Work. Identify the school on which the paint is to be installed, the batch number, the color number, the type of material, and the name of the manufacturer.

2. Elastomeric shall be submitted in duplicate samples of the texture coating. Samples will be not less than 2 ½ by 3 ½ in size and installed upon backing. Finished Work will match the reviewed Sample in texture.

3. Materials and color samples shall be reviewed before starting any painting.

C. For transparent and stained finishes, prepare samples on same species and quality of wood to be installed in the Work, with written description of system used.

1.04 QUALITY ASSURANCE

A. Certification of Materials: With every delivery of paint materials, the manufacturer shall provide written certification the materials comply with the requirements of this section.

B. Coats: The number of coats specified is the minimum number. If full coverage is not obtained with the specified number of coats, install additional coats as required to provide the required finish.

C. Install coats and undercoats for finishes in strict accordance with the recommendations of the paint manufacturer as reviewed by the Architect.

D. Paint materials shall comply with the following as a minimum requirement:

1. Materials shall be delivered to Project site in original unbroken containers bearing manufacturer's name, brand number and batch number.

2. Open and mix ingredients on premises in presence of the Project Inspector.

1.05 DELIVERY, STORAGE AND HANDLING

A. Storage and Mixing of Materials: Store materials and mix only in spaces suitable for such purposes. Maintain spaces clean and provide necessary precautions to prevent fire. Store paint containers so the manufacturer's labels are clearly displayed.

1.06 SITE CONDITIONS

A. Temperature: Do not install exterior paint in damp, rainy weather or until surface has thoroughly dried from effects of such weather. Do not install paint, interior, or exterior, when temperature is below 50 degrees F, or above 90 degrees F, or dust conditions are unfavorable for installation.

1.07 WARRANTY

A. Manufacturer shall provide a three year material warranty.

B. Installer shall provide a three year application warranty.

1.08 MAINTENANCE

A. Provide at least one gallon of each type, color and sheen of paint coating installed. Label containers with color designation indicated on Drawings.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

A. Furnish the products of only one paint manufacturer unless otherwise specified or required. Primers, intermediate and finish coats of each painting system must all be the products of the same manufacturer, including thinners and coloring agents, except for materials furnished with shop prime coat by other trades.

B. Factory mix paint materials to correct color, gloss, and consistency for installation to the maximum extent feasible.

C. Paint materials to be minimum "Architectural Grade".

D. Gloss degree standards shall be as follows:

HIGH GLOSS	70 and above	EGGSHELL	30 to 47
SEMI-GLOSS	48 to 69	SATIN	15 to 29

2.02 MANUFACTURERS

A. Acceptable manufacturers, unless otherwise noted:

1. Dunn-Edwards Corporation Paints
2. Frazee Paints and Wall coverings
3. Vista Paints
4. Sherwin Williams
5. ICI Paints
6. Equal.

B. Exterior steel:

1. Carboline

2. Equal.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine surfaces to receive paint finish. Surfaces which are not properly prepared and cleaned or which are not in condition to receive the finish specified shall be corrected before prime coat is installed.

B. New woodwork shall be thoroughly cleaned, hand sandpapered, and dusted off. Nail holes, cracks or defects in Work shall be filled. On stained woodwork, fill shall be colored to match stain. Filling shall be performed after the first coat of paint, shellac or varnish has been installed.

C. Plaster surfaces except veneer plaster shall be allowed to dry at least 3 weeks before painting. Veneer plaster shall be allowed to dry sufficiently to receive paint as determined by moisture meter tests.

D. Metal surfaces to be painted shall be thoroughly cleaned of rust, corrosion, oil, foreign materials, blisters, and loose paint.

E. Do not install painting materials to wet, damp, dusty, dirty, finger marked, rough, unfinished or defective surfaces.

F. Concrete surfaces shall be dry, cleaned of dirt and foreign materials and in proper condition to receive paint. Neutralize spots demonstrating effects of alkali.

G. Mask off areas where necessary.

3.02 APPLICATION

A. Backpainting: Immediately upon delivery to the Project site, finish lumber and millwork shall be backpainted on surfaces that will be concealed after installation. Items to be painted shall be backpainted with priming coat specified under "Priming".

B. Priming: New wood and metal surfaces specified to receive paint finish shall be primed. Surfaces of miscellaneous metal and steel not embedded in concrete, and surfaces of unprimed plain sheet metal Work shall be primed immediately upon delivery to the Project site. Galvanized metal Work and interior and exterior woodwork shall be primed immediately after installation. Priming of surfaces and priming coat shall be as follows:

1. Knots, Pitch and Sap Pockets: Shellac before priming.

2. Exterior Woodwork and Wood Doors: Prime with one coat of exterior waterborne emulsion wood primer.

3. Interior Woodwork: Where indicated to be painted, prime with one coat of waterborne wood primer.

4. Stain: Woodwork indicated to receive a stain and varnish finish shall be stained to an even color with water borne stain. On open-grained hardwood, mix stain with paste filler and completely fill pores in wood.

5. Galvanized Metal Work: Remove all soluble and insoluble contaminants and corrosion. Remove any storage stains per Section 6.2 of ASTM D6386. Chemically treat with Krud Kutter ME or Great Lakes Laboratories Clean & Etch or Equal, in accordance with manufacturer's written instructions. Ensure that all surfaces have been effectively and uniformly treated per the manufacturer's recommendation. Follow manufacturer's instructions for drying time, and then prime with one coat of Cycloaliphatic Amine Epoxy.

6. Unprimed Iron, Steel, and Other Uncoated Metals: Where specified to be painted, prime with one coat of metal primer.

7. Shop Primed Metal Items: Touch up bare and abraded areas with metal primer before installation of second and third coats.

8. Coats shall be installed evenly and with full coverage. Finished surfaces shall be free of sags, runs and other imperfections.

C. Allow at least 24 hours between coats of paint.

D. Rollers shall not be used on wood surfaces.

E. Each coat of painted woodwork and metal, except last coat, shall be sandpapered smooth when dry. Texture-coated gypsum board shall be sanded lightly to remove surface imperfections after first coat of paint has been installed.

F. Each coat of paint or enamel shall be a slightly different tint as required. Each coat of paint, enamel, stain, shellac, and varnish will be inspected by the IOR before next coat is applied. Notify the Project Inspector that such Work is ready for inspection.

1. Tinting Guideline: The first coat, primer/undercoat(s) to be untinted or tinted up to 50 percent lighter or darker (at the discretion of the installer) than the finish coat. The second coat (or third coat if a seal coat and undercoat have been specified) is to be factory tinted in the range of 10 percent to 15 percent lighter or darker (at the discretion of the installer) than the finish coat. The final coat is to be factory tinted to the required color selected. These tinting guidelines shall be provided on all surfaces receiving paint.

G. Do not "paint-out" UL labels, fusible links and identification stamps.

H. Paint Roller, brush and spray.

1. Only Paint rollers shall be used on interior plaster, drywall, masonry/plaster and plywood surfaces, nap shall not exceed one half inch in length.

2. First coat on wood overhang and ceilings shall have material applied by roller and then brushed out in a professional manner to leave surface free of imperfections. Finish coat may be sprayed.

3. Other surfaces shall have all coatings applied with brushes of proper size.

4. Spray work is permitted only on radiators, acoustic plaster, masonry and plaster.

I. Where ceilings are specified to be painted, beams, cornices, coves, ornamental features, plaster grilles, etc. shall be included.

J. Ceilings shall be white, including classrooms, storage rooms, offices, arcades, etc. Boiler room and fan room ceiling color shall match adjacent walls.

3.03 CLEANING

A. Remove rubbish, waste, and surplus material and clean woodwork, hardware, floors, and other adjacent Work.

B. Remove paint, varnish and brush marks from glazing material and, upon completion of painting Work, wash and polish glazing material both sides. Glazing material, which is damaged, shall be removed and replaced with new material.

C. Clean hardware and other unpainted metal surfaces with recommended cleaner. Do not furnish abrasives or edged tools.

3.04 SCHEDULE

A. Interior:

1. Woodwork, Painted: 3 coats.

a. First Coat: As specified in this section under Priming.

b. Second and Third Coats: Interior enamel, semi-gloss or gloss as indicated.

2. Woodwork, Stained and Varnished: 4 coats.

a. First Coat: As specified in this section under Priming.

b. Second, Third and Fourth Coats: Varnish, semi-gloss.

3. Wood Corridor doors: 4 coats.

a. First Coat: As specified in this section under Priming.

b. Second, Third, and Fourth Coats: Varnish, gloss.

4. Other Wood Doors: 4 coats.

a. Varnished or painted as indicated.

b. If varnished, same finish system as painted woodwork, with semi-gloss or gloss finish to match adjacent wall.

5. Miscellaneous Woodwork: 4 coats. Wood items including, but not limited to: stair treads and risers, handrails, rolling ladders, wood base and shoe, chair rails, counter tops and locker room benches.

   a. First Coat: As specified in this section under Priming.

   b. Second, Third and Fourth: Exterior varnish, gloss.

6. Casework: Interior surfaces of casework (except plastic laminate-faced casework) including top, edges and underside of shelving, poles, surfaces of drawers (except fronts), interior surfaces of mailbox pigeonholes, and particle board.

   a. First Coat: Waterborne stain.

   b. Second and Third Coats: Satin varnish.

7. Plaster: 4 coats.

   a. First Coats: Pigmented wall sealer.

   b. Second coat: Enamel under coater.

   c. Third and Fourth Coats – Interior enamel, semi-gloss or gloss as indicated.

8. Gypsum Board: 4 coats.

   a. First Coat: Drywall sealer.

   b. Second Coat: Enamel under coater.

   c. Third and Fourth Coats: Interior enamel, semi-gloss or gloss as indicated.

9. Concrete: 3 coats.

   a. First: Concrete sealer.

   b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.

10. Concrete Block: 3 coats.

    a. First: Concrete block filler.

    b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.

11. Metal: Shall be cleaned, pre-treated and painted with 3 coats. Items to be painted include, but are not limited to: exposed structural and miscellaneous

steel, railings and handrails, metal doors and frames, ladders, table and bench legs.

a. First Coat: Cycloaliphatic Amine Epoxy.

b. Second and Third Coats: Aliphatic Acrylic-Polyester Polyurethane.

B. Exterior:

1. Woodwork: 3 coats.

a. First Coat: As specified in this section under Priming.

b. Second and Third Coats: Exterior house and trim enamel.

2. Wood Doors: 3 coats.

a. First Coat: As specified in this section under Priming.

b. Second and Third Coats: Exterior gloss enamel.

3. Plaster and Stucco: 3 coats. Flat 100 percent acrylic.

a. Prime Coat: Alkali resistant primer/sealer.

b. Exterior 100 percent acrylic.

4. Concrete: 3 coats. Flat 100 percent acrylic.

a. First Coat: Concrete sealer.

b. Second and Third Coats: Exterior 100 percent acrylic.

5. Metal: 3 coats. Shall be cleaned and pre-treated. Items to be painted include, but are not limited to: steel columns and miscellaneous steel items, railings and handrails gravel stops, metal doors and frames, hoods and flashings.

a. First Coat: Cycloaliphatic Amine Epoxy.

b. Second and Third Coats: Aliphatic Acrylic-Polyester Polyurethane.

C. Mechanical and Electrical Work:

1. Except where interior mechanical and electrical Work to be painted is specified to receive another paint finish, Work occurring in finished rooms and spaces shall be cleaned, pre-treated, and painted with 3 coats. 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.

a. First Coat: As specified in this section under Priming.

b. Second and Third Coats: Interior enamel, semi-gloss or gloss to match adjacent wall or ceiling finish.

2. Insulation and Taping on Pipes and Ducts: 3 coats.

a. Finished Rooms:

1) First Coat: Interior waterborne primer.

2) Second and Third Coats: Interior semi-gloss or gloss enamel to match adjoining wall or ceiling finish.

b. Building Exterior:

1) First Coat: Exterior waterborne primer.

2) Second and Third Coats: Exterior gloss enamel.

3. Inside surfaces of ducts, vents, dampers and louvers as far back as visible from room in which they open shall be painted with 2 coats of flat black paint.

D. Miscellaneous:

1. Outside Storage Units (wood or metal): 3 coats.

a. First Coat: As specified in this section under Priming.

b. Second and Third Coats: Exterior gloss enamel.

2. Exterior and interior surfaces of storage bins, and potting tables shall have 3 coats of acrylic stain.

3. Wood compost bins shall be finished with 3 coats of acrylic stain.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 09 9400

SEMI-TRANSPARENT CONCRETE STAIN

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Bio-Based Decorative Concrete Stain System

1.2 RELATED SECTIONS

A. Section 03300 Cast-in-Place Concrete
B. Section 09900 Paints & Coatings

1.3 SUBMITTALS

A. Submit under provisions of Section 01 3000.
B. Product Data: Manufacturer's data sheets including;
    1. Installation Guide
    2. Product Data Sheet
    3. MSDS
C. Selection Samples: Provide (2) sets of applicable color charts or chips representing all standard colors available from the manufacturer.
D. Verification Samples: Provide verification samples of each product specified on a minimum size of 6" square showing actual products, colors, and texture.
E. Installer Qualifications: Submit list of successfully completed projects with references of same or similar scope of work.

1.4 QUALITY ASSURANCE

A. Qualifications: Successful experience with other projects of the scope and scale of the work described in this section.
B. Training: Confirmation by manufacturer that the installer has successfully completed an authorized training workshop of the flooring system(s).
C. Mock-up: Provide a mock-up demonstrating actual surface preparation methods to be used, then produce actual finishes to confirm acceptable appearance and workmanship.
D. Area to be determined by architect.
E. Approvals of each completed phase must be accepted prior to proceeding.
F. Refinish, if applicable to receive final approvals.

1.5 DELIVERY, STORAGE & HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
B. Storage & Protection: Store materials protected from exposure to harmful environmental conditions and at a minimum temperature of 40 degrees F and at a maximum temperature of 90 degrees F. Do not freeze.
C. Handling: All containers must be tightly closed when not in use to prevent accidental contamination by foreign elements.

1.6 PROJECT/SITE CONDITIONS

Maintain environmental conditions (temperature, humidity, ventilation) according to the manufacturer's instructions. Do not install an exterior project when rain is imminent within the first 24 hours.

1.7 WARRANTY
A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
B. Manufacturer's Warranty: Submit for Owners acceptance, manufacturer's standard limited warranty against manufacturer defects executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

PART 2 PRODUCTS

2.1 MANUFACTURER

Acceptable Manufacturers:

Eco Safety, Inc. d/b/a Eco Safety Products
2921 W Culver Street, #4B, Phoenix, AZ. 85009
Telephone: 602.305.9397 Fax: 602.305.6431
Email: info@buildwithesp.com Website: www.buildwithesp.com

2.2 Or Equal – provide itemized comparison of products showing proposed product meets or exceeds the specified product.

2.3 ETCHING & CLEANING COMPOUND
A. Product: Eco Etch Pro (EE3-8000)
B. Description: An organic biodegradable cleaning and etching compound used to prepare existing cementitious substrates for optimum results when staining and coating concrete substrates. May be used in conjunction with mechanical diamond grinders to enhance uniform profiling and reduce wear. It is an effective muriatic and phosphoric acid replacement that will not corrode metals or burn skin.
C. Surface Preparation: Remove all bond breakers that may prevent desired chemical reaction with the lime content in cement-based substrates such as paint, sealers, oil, grease, dirt, etc.

2.4 BIO-BASED PENETRATING CONCRETE STAIN

A. Product: SoyCrete Architectural Concrete Stain (S1-1000)
B. Description: A high performance semi-transparent interior/exterior bio-based architectural concrete stain. The soy dispersion technology replicates the permanent absorption characteristics similar to motor oil, but with an unlimited array of natural variegated color effects. Intended to be non film forming to eliminate peeling, chipping or flaking. Available in 35 standard colors with optional fade resistant I.R. pigments and custom colors available.
C. Surface Preparation: Remove all bond breakers and prepare substrate for optimum penetration and integral bonding by mechanical grinding and/or chemical etching and cleaning. Use Eco-Etch Pro Etch & Clean Concentrate (EE3-8000). Achieve a surface profile of CSP-1.

2.5 BIO-BASED PENETRATING CLEAR SEALER

A. Product: Acri-Soy Penetrating Clear Sealer (A1-3000)
B. Description: A high performance interior/exterior clear penetrating sealer. A non film forming natural satin protective finish to provide outstanding moisture and stain resistance.
C. Surface Preparation: Remove all bond breakers including but limited to stain residue, oils, dirt, etc.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Comply with the instructions and recommendations of the flooring surface manufacturer.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify that substrate conditions are suitable for installation of the flooring surface system.
B. Do not proceed with installation until unsuitable conditions are corrected.

3.3 SURFACE PREPARATION

A. Protect adjacent surfaces to prevent accidental application to surfaces not indicated to receive stain; remove accidental applications from surfaces immediately, following manufacturer's instructions.

B. Preparation of existing surfaces:
1. Remove loose or deteriorated materials, including, but not limited to, scale, spalling, paint, sealers, curing compounds or other coatings.

2. Clean and etch concrete with Eco Etch Pro to achieve optimum porosity and deep cleaning for a properly prepared substrate suitable for decorative staining.
3. If preparing concrete by mechanical abrasion be sure to test for porosity when complete as some very dense concrete may remain less porous than desirable.

3.4 INSTALLATION

A. Apply stain in accordance with manufacturer's instructions for indicated project conditions; for multi-coat applications, allow specified curing time between subsequent coats.

B. Apply SoyCrete Stain on the following properly prepared compatible horizontal surfaces:
   1. Cast-in-place concrete surfaces.

C. Application of finish sealer is required as recommended by manufacturer.

3.5 PROTECTION

Protect the installed surface from damage resulting from subsequent construction activity on the site.

3.6 STORAGE AND REPAIR

A. To store partially used cans, seal can well (airtight) and place in cool, dry place. The contents should be useable for at least 12 months.
B. The evaporation of the water within the product will cause the product to cure. If some water content has evaporated, reconstitution with clean water may restore product viability if the curing process within the can is not too advanced.

3.7 MAINTENANCE

A. Most general neutral pH floor cleaners have been tested and will work well. We recommend Soy-It Degreaser Concentrate.
B. Use a wet/dry microfiber mop for daily maintenance cleaning.
C. Surfaces can also be cleaned with the use of automatic scrubbers. These are machines which, in one pass, put down the washing solution, scrub the floor with a light pad, and vacuum up the dirty water. It should be pointed out that the pad pressure used in the scrubber must be light and need only be sufficient for the pad to make light contact with the floor.
D. Heavy scrubbing will negatively affect the coated surface over time.

END OF SECTION

SECTION 10 1100

VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wall mounted marker boards.

2. Tack boards.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 09 9000 - Painting and Coating.

1.02 SUBMITTALS

A. Shop Drawings: Shop Drawings to indicate gages, profiles, sections of materials, details of construction, hardware, methods of attachment and/or anchoring, as applicable for specified materials.

B. Samples: Submit the following:

1. Three- inch by 5-inch marker board Samples, provide manufacturer's full range of colors.

2. Three- inch by 5-inch sliding tack board Samples, provide manufacturer's full range of colors and patterns.

3. Three- inch by 5-inch sliding bulletin board Samples, provide manufacturer's full range of colors.

C. Product Data: Submit manufacturer's technical data, product specifications, installation instructions, and other pertinent information as applicable for each product or material specified.

D. Test Reports: Submit certified laboratory test reports as applicable to indicate compliance with specified requirements.

1.03 QUALITY ASSURANCE

A. Manufacturer shall have been regularly engaged in the business of manufacturing markerboards for at least five years.

B. Comply with requirements and recommendations of applicable portions of Porcelain Enamel Institute - PEI 2.

1.04 PRODUCT HANDLING

A. Deliver materials to the Project site with manufacturer's labels intact and legible.

B. Protect marker boards before, during and after installation.

1.05 JOB CONDITIONS

A. Sequencing, Scheduling:

1. Coordinate with related Work of other sections including gypsum board and tackboards.

2. Do not install markerboards until paint is installed to surfaces concealed behind them.

1.06 SPECIAL PROJECT WARRANTY

A. Manufacturer shall provide a 50 year material warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. W.E. Neal Slate Co.

B. ABC School Equipment.

C. Claridge Inc.

D. Equal.

2.02 SYSTEM PERFORMANCE

A. System shall be comprised of factory assembled markerboards, in configurations and sizes indicated on the Drawings or as specified herein.

B. Laminations of panel components shall be by face sheet manufacturer.

2.03 MATERIALS

A. Wall-Mounted Marker boards

1. Dry marker boards shall be porcelain enamel steel manufactured to exceed the performance specifications for porcelain enamel S104 of the Porcelain Institute. Markerboards shall be capable of supporting papers by means of magnets. The writing surface shall resist wear and damage from shock and abrasion and shall not dent, shatter or crack. The surfaces shall retain original color, writing, and erasing qualities and shall not become glossy or shiny in normal use. The gloss variation of a surface shall not exceed three units when measured by a 45 degree gloss meter in accordance with the Porcelain Enamel Institute Bulletin 1-18 Gloss Test for Porcelain Enamels and ASTM C346.

2. Steel: Base metal shall be high quality enameling iron or steel of low metalloid and copper content, especially manufactured and processed for temperatures

over 1,400 degrees F. used in coating porcelain on steel units for Architectural purposes; minimum 24 gage.

3. Facing Surfaces:

   a. Board surfaces shall consist of the following:

      1) Primer coat, 0.0025 inch minimum thickness.

      2) Vitreous-porcelain writing surface coating of 0.0025 inch minimum thickness.

      3) The reverse side of the steel base sheet shall receive a ground coat of 0.0005 inch thickness and a spray coat of silicon.

      4) The panel edges at butt joints shall be porcelain enamel.

      5) Fuse cover and ground coats to the steel at the manufacturer's standard firing temperature, but at least 1,250 degrees F.

4. The dry marker board surfaced steel shall be factory laminated to 7/16 inch thick fiberboard core. A moisture blocking backing sheet shall be provided.

   a. Fiberboard Core shall be #45 pound particle board.

   b. Moisture Barrier Backer Sheet shall be minimum .015 aluminum or 28 gauge galvanized steel. Backer sheet shall be factory laminated to the core under pressure.

5. Lamination: The surface facing and the backing shall be bonded to the core material by means of a special flexible adhesive developed for this purpose with no unbonded area. The face and back shall not be removable without rupturing the core material. Panels shall not delaminate under normal use.

6. Joints: Where vertical joints occur, a 14 gage continuous concealed steel spline shall be fitted tightly into grooves in the core material. Factory rabbet to produce a smooth butt joint. Do not furnish exposed trim.

7. Edge Trim:

   a) Alloy 6063-T5, extruded, anodized satin finish aluminum.

8. Chalktray: Furnish manufacturer's standard continuous flat-ribbed or box-type aluminum chalktray with stained front and cast plastic end closures for each chalkboard and markerboad.

   a. Extend chalk tray to end of both vertical edges of the board.

   b. On flat-rib tray, provide 3/4 inch radius on corners and polish at ends.

9. Map Rail: Furnish map rail at the top of each unit, complete with the following accessories:

a. Display rail: Provide continuous cork display rail 2-inch wide, as indicated, integral with the map rail. Extend display rail to end of both vertical edges.

b. End stops: Provide one end stop at each end of the map rail.

c. Map hooks: Provide two map hooks with flexible paper holder clips for each 8 feet of map rail or fraction thereof.

d. Roller Map Bracket: Provide two for each 8 feet of map rail or fraction thereof.

D. Tack boards:

1. Tackwall panels shall consist of single-face layer of cloth-backed vinyl film, factory-bonded to 1/2 inch wood fiberboard backing; weight of vinyl film to be 20 ounces per lineal yard. Panel edges shall be beveled and wrapped; ends shall be square and unwrapped. Color as selected by Architect.

a. Vinyl film shall comply with FS CCC-W-408 A, Type 1; backing shall comply with FS LLL-1-535B, Class A. Finished panel shall have a Fire Hazard Classification of Class II in accordance with ASTM E84 tunnel test, as administered by California State Fire Marshal approved testing laboratory.

2. Adhesive shall be as recommended by manufacturer.

E. Flagpole Holder: Provide one per classroom where marker boards are provided.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install markerboard, trim, map rail and marker tray in accordance with manufacturer's directions. Fasteners for assembly of trim and frame units shall be truss head aluminum or stainless steel self-tapping screws with double cadmium-plated finish.

B. Install panels after finish painting of wall surfaces has been completed and paint is cured. Install panels level, plumb and neatly assembled. Before Substantial Completion, trim shall be cleaned of dirt, finger-marks, and other foreign material.

C. Install panel guides, spacers, and panels at media wall cabinets.

3.02 CLEANUP

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 10 1400
SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior and exterior accessibility, identification, directional and informational signs.

2. Parking signs.

B. Related Requirements:

1. Division 01: General Requirements.

2. Section 08 1113: Hollow Metal Doors, Windows and Frames.

3. Section 08 1416: Wood Doors.

4. Division 09: Finishes.

5. Section 14 2400: Hydraulic Elevator

6. Section 32 1313 - Site Concrete Work.

1.02 REFERENCES

A. ASTM International:

1. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

3. ASTM D4802 - Standard Specification for Poly (Methyl Methacrylate) Acrylic Plastic Sheet.

1.03 SUBMITTALS

A. Product Data: Submit material descriptions, finishes and color charts for each type of sign.

B. Shop Drawings: Submit Shop Drawings indicating sign style, lettering, overall dimensions and quantities. Submit floor plans showing locations for each sign.

C. Material Samples: Submit three samples illustrating full size sample sign, of type, style and color specified.

D. Manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

A. Pre-Installation Conference: Notify ARCHITECT when signs are ready for installation. Arrange for conference at site. Do not proceed with installation until ARCHITECT'S approval of specific locations and methods of attachment has been obtained.

B. Provide signs from one manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site and protect from damage. Store until immediately prior to installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products of following manufacturers are acceptable and are the basis for intended design and quality.

1. H. Toji and Company.
2. Karman Ltd., Architectural Signs.
3. Vomar Products Inc.
4. ASI-Modulex, Inc.
5. Mohawk Sign Systems, Inc.
6. Accent Signage Systems.
7. The Gruenke Company.
8. Ada Sign Products.
9. AccuBraille.
10. Equal.

2.02 MATERIALS AND FABRICATION

A. Interior Sign Materials:

1. Substrate Panel: 1/8 inch minimum thick, integrally colored or clear acrylic plastic, or laminated acrylic. Conforming to ASTM D4802; non-glare (matte), UV stable, suitable for interior and exterior use.

   a. Corners shall be square.

   b. Edges shall be square and eased.

   c. Colors as selected by ARCHITECT from manufacturer's custom color range.

2. Fasteners:

   a. Stainless steel tamper-proof screws and plastic anchors.

   b. Signs mounted on fire-rated doors shall be secured with adhesive.

   c. Adhesives and sealants shall comply with the limits for VOC content.

B. Exterior Sign Materials:

1. Sign: ASTM B209 aluminum sheet, 0.080 inch thick with rounded corners of at least 1/8 inch radius and eased edges. White figure on a blue background; non-glare, high contrast signs. The blue shall be equal to color number 15090 in Federal Standard 595B.

2. Post: 2 by 2 inch galvanized steel tubing, weighing minimum of 4.31 pounds per foot and conforming to ASTM A500, Grade B, 3/16 inch thick wall thickness.

3. Concrete Post Footings: Refer to Section 32 1313, Site Concrete Work.

4. Fasteners: Stainless steel carriage bolts with tamper resistant nuts.

C. Characters and Symbols: Shall be fabricated by one of the processes described below:

1. Computer cut raised characters and graphics shall be cut from 1/16 inch integrally colored acrylic. Raised characters and graphics shall be inlaid 1/32 inch minimum into first surface of sign background, secured with adhesive so it cannot be removed without the use of tools. Raised characters and graphics shall have beveled, eased or rounded edges. Non-tactile text and graphics shall be applied to the second surface, and background color shall be applied to the second surface and protected with film or an additional backplate. Pictograms and other symbols including the International Symbol of Accessibility, which are included on signs with raised characters and Braille, are not required to be raised.

2. Raised characters and graphics including braille shall be integral to sign face and shall be formed into sign face by high pressure thermoforming using a negative mold. No applied, glued, welded tactile elements are acceptable. Raised characters and graphics shall have beveled, eased or rounded edges. No sharp, square edges are acceptable. Non-tactile text and graphics shall be applied to the second surface, and background color shall be applied to the second surface and protected with vinyl film. Pictograms and other symbols including the

International Symbol of Accessibility, which are included on signs with raised characters and Braille, or other signs are not required to be raised.

2.03 COMMUNICATION ELEMENTS AND FEATURES

A. Raised Characters Raised characters shall comply with CBC 11B-703.2.

1. Character Type: Characters on signs shall be raised 1/32 inch minimum above their background and shall be sans serif uppercase characters duplicated in Braille. Characters and Braille shall be in a horizontal format.

2. Character Height: Character height measured vertically from the baseline of the character shall be 5/8 inch minimum and 2 inch maximum based on the height of the uppercase letter "I".

3. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the letter "I".

4. Stroke Thickness: Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character.

5. Character and Line Spacing shall be in conformance to CBC 11B-703.2.7 and 11B-703.2.8.

6. Character Placement: Shall be placed in accordance to Paragraph 2.03, C below.

B. Visual Characters: Visual characters shall comply with CBC Section 11B-703.5. Characters shall be conventional in form, and shall be uppercase or lowercase or a combination of both, as indicated on the drawings. Characters shall not be italic, oblique, highly decorative, or of other unusual forms.

1. Finish and Contrast: Characters and their backgrounds shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or a dark characters on a light background.

2. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase of the letter "I".

3. Character Height: Minimum character height shall comply with CBC Table 11B-703.5.5.

4. Height from Finish Floor or Ground: Visual characters shall be a 40 inches minimum above the finish floor or ground

5. Stroke Thickness: Uppercase letter "I" shall be 10 percent minimum and 20 percent maximum of the height of the character.

6. Character and Line Spacing: Shall be in accordance to CBC 11B-703.5.8 and 11B-703.5.9.

C. Braille: Contracted Grade 2 Braille, conforming to CBC 11B-703.3. Braille characters shall be inlaid optically correct acrylic Raster beads into computer drilled holes in the panel surface.

1. Dimensions and Capitalization: Braille dots shall have a domed or rounded shape and shall comply with CBC Table 11B-703.3.1.The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.

2. Position: Braille shall be positioned below the corresponding text in a horizontal format, flush left or centered. If text is multi-lined, Braille shall be placed below the entire line of text. Braille shall be separated 3/8 inch minimum and 1/2 maximum from any other tactile characters and 3/8 inch minimum from raised borders and decorative elements.

D. Pictograms: In conformance to CBC 11B-703.6. Pictograms shall have a field height of 6 inches minimum. Characters and Braille shall not be located in the pictogram field.

1. Finish and Contrast: Pictograms and their field shall have a non-glare finish. Pictograms shall contrast with their field with either a light pictogram on a dark field or a dark pictogram on a light field.

2. Text Descriptors: Pictograms shall have text descriptors located directly below the pictogram field, and shall comply with CBC 11B-703.2, 11B-703.3 and 11B-703.4.

E. International Symbol of Accessibility (ISA): Shall comply with CBC 11B-703.7 and CBC Figure 11B-703.7.2.1. The ISA shall consist of a white figure on a blue background. The blue color shall be approximate to FS. 15090 in Federal Standard 595C.

F. Mounting Locations and Height: Signs with tactile characters shall be as indicated on the drawings and in conformance to CBC 11B-703.4.

1. Mounting Locations:

a. Identification signs for rooms and spaces shall be located on the wall adjacent to the latch side of the door, as one enters the room or space.

b. Signs that identify exits shall be located at the exit door when approached in the direction of egress travel.

c. Signs containing tactile characters shall be located so that a clear floor space 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

d. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.

e. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located at the inactive leaf.

f. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door.

g. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall.

2. Mounting height above finish floor or ground: Tactile characters on signs shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest Braille cells and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the highest line of raised characters.

2.04 ROOM IDENTIFICATION SIGNS

A. Room Identification Sign Types:

A. 1. Room Identification Sign with Changeable Insert: 7 inches high by 9 inches wide, minimum, with 4 inches high by 9 inches wide window for name and title removable insert. Locate room name immediately below window, and centered above room number. Room name shall be raised characters 3/4 inches high minimum, and room number 1 inch minimum; and shall be accompanied with Braille indicators.

B. Room Identification Sign Requirements:

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Raised Characters and Proportions: Refer to paragraph 2.03.A.

3. Braille: Refer to paragraph 2.03.C.

4. Mounting Location and Height: Refer to paragraph 2.03.F.

2.05 RESTROOM SIGNAGE

A. Multiple-Occupancy restrooms shall be provided with geometric symbols and wall mounted pictograms with text descriptors.

B. Geometric Symbols:

1. Doorways leading to toilet rooms shall be identified by a geometric symbol complying with CBC Section 11B-703.7.2.6.

2. Male Restroom Door Symbol: 1/4 inch thick equilateral triangle with edges 12 inches long, with vertex pointing upward, the triangle symbol shall contrast with the door, either light on a dark background or dark on a light background. A male silhouette shall appear within the equilateral triangle in contrasting color to it.

3. Female Restroom Door Sign: 1/4 inch thick circle 12-inch diameter, the circle symbol shall contrast with the door, either light on a dark background or dark on a light background. A female silhouette shall appear within the circle in contrasting color to it.

4. "All Gender" Restroom Door Sign (Single occupancy restrooms): 1/4 inch thick circle, 12-inch diameter with a 1/4 inch thick equilateral triangle with the vertex pointing upward superimposed on the circle and within the 12-inch diameter. Triangle and circle shall be of contrasting colors; the circle symbol shall contrast with the door. A female and male silhouettes shall appear within the equilateral triangle in contrasting color to it, and the word "restroom" shall appear on the bottom part of the circle in contrasting color to it.

5. Edges and Vertices on Geometric Symbols: Shall be eased or rounded at 1/16 inch minimum, or chamfered at 1/8 inch maximum. Vertices shall be radiused between 1/8 minimum and ¼ inch maximum.

6. Location and Mounting Height: Symbols shall be mounted at 58 inches minimum and 60 inches maximum above the finish floor or ground surface measured from the centerline of the symbol. Where a door is provided the symbol shall be mounted within one inch of the vertical centerline of the door.

C. Room Identification for Multiple-Occupancy Restrooms: Provide a 16 inch long by 6 inch tall room identification sign, including a pictogram of the International Symbol of Accessibility on a side. Restroom names shall be "Women" and "Men" . Characters, Braille, pictograms and mounting locations and height shall be in conformance to Article 2.03.

D. Room Identification for Single-Occupancy Restrooms: Provide a 16 inch long by 6 inch tall room identification sign, including a pictogram of the International Symbol of Accessibility on a side. Text descriptor shall be "All Gender Restroom". Characters, Braille, pictograms and mounting locations and height shall be in conformance to Article 2.03.

2.06 RAISED CHARACTER AND BRAILLE EXIT SIGNS

A. Tactile Exit Sign Types:

1. "EXIT".

2. "EXIT STAIR DOWN".

3. "EXIT RAMP DOWN".

4. "EXIT ROUTE".

5. "TO EXIT".

B. Sign Requirements:

B. 1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Raised Characters and Proportions: Refer to paragraph 2.03.A.

3. Braille: Refer to paragraph 2.03.C.

4. Mounting Location and Height: Refer to paragraph 2.03.F.

2.07 ASSISTIVE LISTENING DEVICE SIGN

A. Include International Symbol of Access for Hearing Loss, CBC Figure 11B-703.7.2.4, with text "Assistive-Listening System Available". Use upper and lower case characters. Sign shall comply with the following requirements:

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Character Height and Proportions: Refer to paragraph 2.03.B.

3. Symbol of Accessibility: Refer to paragraph 2.03.E.

2.08 ACCESSIBILITY ENTRANCE SIGNS AND PATH OF TRAVEL DIRECTIONAL SIGNS

A. Entrance Sign: Provide at each building entrance an International Symbol of Accessibility sign. Signs shall be visible to persons along approaching pedestrian ways.

B. Directional Signs: Provide where indicated on the drawings with arrow indicators and International Symbol of Accessibility.

C. Signs shall be mounted on wall with lower edge between 48 inches and 60 inches above ground surface or finish floor. Pole mounted, overhead and projecting signs shall have the lower edge at least 80 inches from the ground surface or finish floor.

D. Sign shall comply with the following requirements.

1. Directional Signs: Refer to paragraph 2.03.B.

2. Symbol of Accessibility: Refer to paragraph 2.03.E.

E. No Smoking Sign: Provide at each building entrance. Reverse cut white vinyl sign with 4 1/2-inch high no smoking symbol, mounted on glass entry doors. Under No Smoking symbol, place words "No Smoking", ½ inch high minimum, San Serif upper and lower case characters.

2.09 PARKING SIGNS

A. Tow-Away Sign: 18 inches by 24 inches with rounded corners. Black graphics on white background, with lettering not less than 1 inch high. Sign to read: "UNAUTHORIZED VEHICLES PARKED IN DESIGNATED ACCESSIBLE SPACES NOT DISPLAYING DISTINGUISHING PLACARDS OR SPECIAL LICENSE PLATES ISSUED FOR PERSONS WITH DISABILITIES WILL BE TOWED AWAY AT THE OWNER'S EXPENSE. TOWED VEHICLES MAY BE RECLAIMED AT DAVE'S

TOWING, 890 W. LOS ANGELES AVE. SIMI VALLEY OR BY TELEPHONING (805) 526-4221".

B. Parking Space Identification Sign: 12-inch by 18-inch with rounded corners. White reflectorized graphic on dark blue background, and shall display an 8-inch high International Symbol of Accessibility per paragraph 2.03.E.

1. Additional language or an additional sign below the International Symbol of Accessibility shall state I "Minimum Fine $250".

2. Signs identifying van accessible parking spaces shall contain additional language or an additional sign with the designation "Van Accessible".

C. Signs shall be mounted on posts at head of each accessible parking with lower edge 80 inches minimum above ground surface, or mounted on walls at a minimum height of 60 inches from ground surface.

2.10 OCCUPANT LOAD SIGNS

A. Provide maximum occupancy load signs. Post in a conspicuous place near the main exit or exit access doorway from the room or space of rooms and areas indicated in the drawings.

B. Minimum size: 4 inches high by 8 inches wide, 7/8 inch high letters, 1 inch high numerals.

C. Sign to read: "MAXIMUM OCCUPANCY LOAD XXX". Indicate occupant load shown on drawings.

2.11 EMERGENCY GAS SHUT OFF SIGN

A. Exterior Signs: Painted aluminum, suitable for outdoor use, with pre-drilled mounting holes.

1. Sign Size: Minimum 4 inches high by 8 inches wide.

2. Color: Subsurface white text, red background.

3. Character Height: One inch high.

4. Text:

a. Building gas shut-off valve(s): "BUILDING EMERGENCY GAS SHUT-OFF VALVE."

2.12 FIRE SPRINKLER RISER ROOM SIGN

A. Locate one sign at each fire sprinkler riser room door as indicated in drawings.

B. Text: Sign to read "Fire Sprinkler Riser Inside", white characters, 1 inch high on red background.

C. Sign Requirements:

1. Raised Characters and Proportions: Refer to paragraph 2.03.B.

2. Braille: Refer to paragraph 2.03.C.

3. Mounting Location and Height: Mounted on the door, refer to paragraph 2.03.F.

2.13 ELEVATOR SIGNS

A. Elevator hoistways shall be identified on both jambs by a 2-inch high raised character identifying level of floor, accompanied by Grade 2 Braille in compliance with CBC. 11B-407.2.3.1. A raised, 5-pointed star placed to the left of the floor designation shall be provided on both jambs at the main entry level. The outside diameter of the star shall be two inches and all points shall be of equal length. Raised characters including the star, shall be white on a black background. The Braille translation for the star shall be "MAIN". Applied plates shall be permanently fixed to the jambs.

1. Raised Characters: Refer to Paragraph 2.03.A.

2. Mounting Height: Refer to Paragraph 2.03.F.

3. Braille Characters: Refer to Paragraph 2.03.C.

B. Emergency Signs: Pictorial sign shall be posted adjacent to each elevator call station on all floors instructing occupants to use the exit stairways and not to use the elevator in case of fire. Sign shall read: "IN CASE OF FIRE, ELEVATORS ARE OUT OF SERVICE. USE EXIT STAIRS." Letters shall be not less than 1/2 inch, on a contrasting background.

C. Floor numbers: Elevator hoistway shall have a floor number not less than 4 inches in height, placed on the walls and/or doors of the hoistway at intervals such that a person in a stalled elevator, upon opening the car door, can determine the floor position.

D. Machine Room: A sign shall be permanently displayed in the elevator machine room, elevator machinery space, elevator control space, or elevator control room in a conspicuous location with a minimum 1-1/2 inch letters on a contrasting background, stating:

NO COMBUSTIBLE STORAGE
PERMITTED IN THIS ROOM
By Order of the Fire Marshal

2.14 EVACUATION PLANS

A. 1/8 inch thick acrylic sign consisting of a floor plan depicting the building layout. The words "EVACUATION PLAN" shall be included at the top of the plan in minimum 3/4 inch high characters. Interior spaces shall be indicated by shading and corridor shall be prominent and displayed in white. Sign shall provide emergency procedures information and instructions to be followed in the event of an emergency, and shall be printed with a minimum of 3/16-inch high non-decorative lettering providing a sharp contrast to the background. Emergency procedures information shall include, but not be limited to the following:

1. Viewer location symbol, "YOU ARE HERE" in the plan. Plan shall be oriented in each sign as required to correspond with the users view.

2. Location of exits with arrows leading to them.

3. Location of fire extinguishers.

4. Fire department emergency telephone number 911.

B. Mount signs so that bottom edge is no more than 48 inches from the finish floor, and within close proximity to the building, stair or elevator entrance. The reader must be able to approach the sign without encountering any obstacle.

C. Evacuation Plans Requirements:

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Character Height and Proportions: Refer to paragraph 2.03.B.

2.15 CAST ALUMINUM LETTERS

A. Sign, indicating building name, shall be furnished with cast aluminum letters as manufactured by Andco Industries Corp., or equal.

B. Style: Helvetica Medium or Arial as selected.

C. Material: 0.064 inch aluminum construction, unless indicated otherwise.

D. Letter Size: Name shall be 12 inches high unless indicated otherwise.

E. Letter Copy and Design: As indicated on Drawings.

F. Finish: Finish shall be type H anodic clear or dark bronze, as selected by ARCHITECT.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.02 METHODS OF INSTALLATION

A. Interior Identification Signs and Interior Directional Signs:

1. Fasten to wall with four tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.

2. When concealed installation is specified, install backplate to wall as above. Fasten sign to backplate with very high-bond double-faced tape.

3. For installation on glass, fasten sign to glass with very high bond double faced tape. On opposite side of glass, anchor matching backplate to glass with very high-bond double-faced tape.

B. Geometric Signs: Geometric toilet room signs shall be fastened to doors with three tamper-proof oval-head counter-sunk screws.

C. Exterior Post Mounted Directional Signs: Size of required footing shall be as indicated on the drawings. Fasten sign with tamperproof stainless steel bolts.

D. Exterior Wall Mounted Identification Signs and Directional Signs:

1. Aluminum signs: Fasten to wall with 4 tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.

a. Cement Plaster, Brick, or Masonry: Provide plastic anchors. For signs greater than 640 square inches use Leadwood Screw Anchors, concrete fasteners 1WSA 10112, or equal.

b. Chain Link Fence: Fasten with 9 gage hog rings, King Hughes Fasteners 5150DG50, or equal, with 11/16 inch opening at each corner of sign.

c. Wrought Iron Fence: Install at each corner with 3/16 inch stainless steel rivets.

2. Acrylic signs: Install backplate to wall as indicated above. Fasten sign to backplate with high-bond double-faced tape and silicone.

E. Cast Aluminum Letter Sign:

1. Each letter shall be furnished with a minimum of three cast mounting lugs on backside, drilled and tapped to receive installation bolts.

2. Letters shall be installed as detailed. Letters shall be installed 1/2 inch away from wall surface, by an aluminum sleeve spacer.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.04 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 10 1446

VINYL WALL GRAPHICS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior vinyl wall graphics.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 09 9013 – Painting of Existing Facilities.

1.02 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. ANSI/NFPA 255 – Standard Method of Test of Surface Burning Characteristics of Building Materials.

2. ANSI/UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

3. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

B. Qualifications:

1. Vinyl Film and Ink Manufacturers: Minimum of ten years manufacturing vinyl films and inks.

2. Graphic Manufacturer: Minimum five years experience in successfully fabricating and installing interior and exterior vinyl graphics.

C. Certifications: Film manufacturer shall certify the following:

1. Graphic and overlay films and inks to be used are compatible.

2. Graphic and overlay films are rated for installation using high heat tools.

D. Regulatory Requirements: Use only sealants, primers, adhesives, paints and cleaning agents approved by the Owner's Office of Environmental Health and Safety (OEHS).

1.03 SUBMITTALS

A. Shop Drawings: Submit the following:

1. Floor plans indicating location of each graphic.

2. Elevations of each graphic showing mounting heights, graphic dimensions and locating distances. Show all existing and new wall-mounted items such as fire hose and fire hydrant cabinets, plaques and signage, electrical outlets and switches, access panels, etc. Indicate the items that will temporarily be removed and reinstalled after application of graphic. Callout the items that will remain in place and indicate how the graphic will be placed around them.

3. Provide isometric drawings for graphics designed over two or more adjacent surfaces.

B. Graphic:

1. Color corrected graphics utilizing Photoshop or similar program, and incorporating any changes required from site verification. Prints shall be a minimum of 11"X17" high quality proofing paper capable of accurately representing the final color print. Prints shall include actual pantone numbers and colors of each color indicated next to the graphic.

3. Upon final approval of the graphics, submit one copy of each file on a CD. Files shall be submitted in .eps, ai, pdf, or jpeg. Include the original wet signed color corrected 11x17 print proof.

C. Product Data:

1. Product data for vinyl film, overlay film and inks.

2. Installation and maintenance instructions, including removal of graffiti.

3. Submit MSDS sheets for adhesives, sealants, adhesives, primers, paints and cleaning agents used on the application of the films.

D. Certifications: Submit certification attesting graphic and overlay films are certified as class A per ASTM E84, ANSI/UL 723, or ANSI/NFPA 255.

E. Samples: Submit a three feet by three feet sample illustrating colors of graphic, and materials used.

F. Installation instructions: Manufacturer's installation instructions and instructions for care and removal of graffiti.

G. Documentation: Submit documentation stating compliance to the qualifications and certifications indicated on Article 1.02, Quality Assurance.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site, protect from damage and handle in accordance with manufacturer's instructions.

B. Product shall not be stored at the site. Product shall be delivered immediately prior to installation.

1.05 WARRANTY

A. Film manufacturer shall provide a five year warranty against manufacturing defects, premature failure, excessive dimensional change and loss of adhesion for interior applications and a three year warranty for exterior applications.

B. Graphic Fabricator and Installer shall provide a five year fabrication and installation warranty against product failure, adhesion and fading for interior applications and a three year warranty for exterior applications.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Products of following manufacturers form basis for design and quality intended.

1. Graphic Film: For interior and exterior applications and for smooth and rough surfaces:

a. 3M Commercial Graphics, Scotchcal IJ 8624.

b. Avery Dennison SF MPI 6121.

c. MACtac.

d. Equal.

2. Overlay Film: For interior and exterior applications and for smooth and rough surfaces:

a. 3M Commercial Graphics, Scotchcal IJ 8524.

b. Avery Dennison.

c. MACtac.

d. Equal.

3. Inks:

a. HP-LX881 latex ink.

b. Equal.

B. Graphic Fabricators and Installers:

1. CR&A Custom.

2. AAA Flag & Banner Manufacturing Co.

3. Equal.

2.02 VINYL PRODUCTS

A. Graphic Film:

1. Soft white gloss, 2mil thick minimum without adhesive, highly conformable vinyl film designed for solvent based ink jet printer. Graphic film shall be coated on one side with an opaque acrylic or gray pigmented pressure sensitive adhesive, supplied with a release liner.

2. Graphic film shall be designed for direct application onto moderately textured exterior and interior walls, including concrete block, brick, plaster, tile and drywall.

B. Overlaminating Film:

1. High Performance, UV resistant, anti-graffiti highly conformable overlaminate film, 2 mil thick minimum. Overlaminating film shall be coated on one side with a clear permanent pressure sensitive adhesive, supplied with a release liner.

C. General:

1. Product shall be of recent production runs, no older than two months. Store and handle, before and after printing per manufacturer's recommendations.

2. Product shall meet Class A I flame spread rating requirement of 0-25, smoke 0-400, based upon ASTM E-84, ANSI/UL 723, or ANSI/NFPA 255.

3. Product shall use the highest quality, UV and chemical resistant inks in the manufacture of the graphics. Inks shall be Original Equipment Manufacturer (OEM) products and completely compatible with the type and manufacture of the vinyl product, and shall conform to manufacturer's requirements.

4. Product shall adhere permanently (versus repositionable) to substrates to which they are to be applied such as, but not limited to: stucco, uneven, curved or molded surfaces, plaster, masonry, wood, concrete, etc.

2.03 FABRICATION

A. Owner will provide artwork for graphics in .eps or .ai format. In the event that artwork is not available in eps or .ai format, allow for retracing of graphics.

B. Make any corrections required for color and image fit to existing conditions.

C. Prior to fabrication, confirm text, font, size, etc. with OWNER and make required corrections or changes.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Perform site verification and measure locations for the graphics. Make any adjustments required for proper installation.

B. Examine substrates for compliance with requirements for non-porous, smooth surface and other conditions affecting the performance of work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Proceeding with installation means installer acceptance that existing substrate and conditions are prepared and ready for product installation.

3.02 WALL PREPARATION

A. Comply with Manufacturer's requirements for surface preparation.

B. Repair wall damages, such as holes, loose joints, chipped or peeling paint, remove nails and staples, etc. and return wall to acceptable surface condition to receive graphic.

C. Clean substrate of substances that can impair the product bond, such as oil, grease, dirt, dust, etc., utilizing OEHS approved cleaning products.

D. Prime and paint wall per Section 09 9013, Painting of Existing Facilities Paint the wall with a semi gloss top coat. Do not use matte paint or paint with silicone, graffiti resistant or texturizing additives. Allow the final coat of paint to dry for at least five days prior to installing the graphic.

E. Perform adhesion test at each wall location to which a graphic will be applied.

F. Temporarily remove wall applied items for the installation of wall graphic. Reinstall removed items after wall graphic has been applied.

3.03 APPLICATION

A. General:

1. Notify OAR when graphics are ready for installation. Arrange for conference at site. Do not proceed with installation until Architect's approval of specific locations and methods of attachment has been obtained.

2. Conform to Manufacturer's recommended installation requirements.

3. If specifications conflict with Manufacturer's recommended installation requirements, the more stringent requirement shall prevail. Specifications shall not cause void to any warranty or guarantee of product or installation.

4. Install substrates with no gaps or overlaps. Installation shall be smooth, wrinkle, bubble, and/or crease free.

5. Confirm surfaces are cleaned within 24 hours prior to applying graphic.

6. Use a DRY application method only.

7. Perform adhesion testing recommended by film manufacturer on the wall of each location in which a graphic will be applied.

B. Smooth Indoor Walls:

1. Lay the graphic image side down on a flat clean surface. If graphic orientation is vertical, pull back about six inches of the liner from the top of graphic. If graphic is orientation is horizontal, pull back about six inches of the liner along one side. Crease the liner.

2. Follow manufacturer's positioning and application technique recommended by manufacturer.

3. Apply the graphic using a stiff nylon brush, moving the brush in a straight line (non-arcing), with firm, overlapping brush strokes. Re-brush all edges after applying the graphic with small circular movements to ensure good adhesion.

C. Textured Walls:

1. Wash the wall with cleaning solution recommended by installer. Avoid soaps or preparations that contain waxes and oils since they impair graphic adhesion. Dry thoroughly.

2. Concrete block walls: Power wash or hand wash with a stiff brush and a detergent cleaner followed by clean water rinse to remove grease. Allow wall to dry thoroughly before applying the graphic. Clean loose mortar with a stiff bristled brush. Brush the substrate lightly immediately prior to graphic application.

3. Follow manufacturer's positioning and application technique recommended by manufacturer.

4. Remove part of the liner and lightly tack the film to the substrate and use roller to roll on the film without heat. Always work toward and open edge through which the trapper air can escape.

5. Direct the heat gun toward the top corner of the graphic, heat a two inch wide band until warm. With the roller closely following the heat gun, move continuously and completely past the outer open edge of the graphic. Overlap the previous roller pass by about 70 percent. Continue working down the graphic.

6. Remove air bubbles by use of an air release tool, do not use knifes. Poke a hole near one end and push out the air. Rework the area with the heat gun and roller to conform the film to the texture.

D. To avoid an exposed edge, which are prone to picking and other damage, trim graphic 1/4 inch maximum from inner or outer wall corners.

E. Finish the graphic by working the brush or manufacturer's approved application tools around the entire outer three inches of the graphic.

F. Graphic installation shall smoothly conform to surface applied, including any curved, mitered, detailed or angled surfaces. Verify cutout locations where wall items were removed, so the flanges of the wall items will cover the film.

G. Use only heat activated vinyl products. Product shall conform to substrate upon application of heat, without compromising final image, and shall have heat activated adhesive substrate. Utilize manufacturer's approved application methods and recommended tools for applying vinyl and overlays.

H. Upon completion of wall graphic application, reinstall wall items that were temporarily removed.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.05 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 10 2113

PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Solid phenolic toilet compartments, urinal screens, and vision screens.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 4100 - Structural Metal Stud Framing.
3. Section 06 1000 - Rough Carpentry.
4. Section 10 2813 - Toilet Accessories.
5. Section 10 2815 – Hand and Hair Dryers.

1.02 DESIGN REQUIREMENTS

A. Design and fabrication shall conform to requirements of ADAAG and CBC Chapter 11B.

B. Toilet Compartments: Floor supported overhead braced type units consisting of solid phenolic pilasters, panels and doors; plated steel leveling devices with stainless steel covers; and stainless steel fittings, hardware and fastenings.

C. Urinal Screens: Floor supported and wall hung type consisting of solid phenolic screen panels and plated steel leveling devices with stainless steel covers, stainless steel fittings and fastening.

D. Vision Panels: Floor- and wall-mounted solid phenolic type.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating complete layout, elevations of partitions, thickness of solid phenolic panels, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, hardware, fittings, mountings, method of assembly, other related items, and installation details.

B. Product Data: Submit manufacturer's technical data for materials, fabrication, finishing, fastenings, hardware, and installation details.

C. Material Samples:

1. Submit full range of Samples of phenolic chips for initial color selection. Chips shall be at least 2-inch by 3-inch.

2. Submit Samples of hardware and fasteners.

D. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. ASTM A167: Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

2. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.

3. Chemical Resistance: Panels to meet or exceed Scientific Equipment Furniture Association's (S.E.F.A.) list of 49 standard chemicals.

4. Consistency:

a. Panels to have uniform thickness (+0.03 inch).

b. Panels to have uniform flatness (maximum difference of 0.03 inch) for a 10-foot span.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site with manufacturer's labels intact and legible, in sealed containers. Materials shall be kept dry.

B. Protect compartments and screens.

1.06 COORDINATION

A. Field Measurements: Secure field measurements before preparation of Shop Drawings and fabrication where possible, for proper and adequate fabrication and installation of the Work of this section.

B. Furnish inserts and anchorage built into other construction for installation of toilet compartments, urinal screens and vision panels.

1.07 WARRANTY

A. Manufacturer shall provide a 10 year material warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Solid Phenolic Panels:

1. Formica Solid Phenolic panels with -42 sparkle finish, Formica Corporation.

2. Trespa Athlon DSQ panels, Trespa North America Ltd.

3. Pionite Phenolic Panels.

4. Equal.

B. Hardware:

1. Galaxy Hardware, Series 8033.

2. Glen Products.

3. Jacknob Corporation.

4. Equal.

2.02 MATERIALS

A. Toilet compartments panels, doors and pilasters; urinal screens and visual screens.

1. Core: Phenolic impregnated Kraft papers. Panel shall be at least 93 pounds per cubic foot to ensure full saturation of Kraft core.

2. Face Sheet: Separate sheet of clear melamine over decorative papers impregnated with melamine resin and integrally compression molded with the core. Face color and pattern shall be as selected by Architect from manufacturer's full custom range of colors and patterns.

3. Fire Resistance: The panels shall have the following surface burning characteristics and smoke generation values in accordance with UL classification and labeling in accordance with ASTM E84 tests and shall be self-extinguishing.

a. Flame spread: Maximum 30 for ¾ inch thick panels; 30 for ½ inch thick panels.

b. Smoke developed: Maximum 70 for ¾ inch thick panels; 85 for ½ inch thick panels.

4. Panels shall be UL registered and labeled.

5. Panel shall be resistant to cleaning solvents and uric acid.

6. Product/Material Specification:

a. Modulus of Elasticity: 1.5 million psi minimum.

b. Shear Strength: 2,000 psi minimum.

c. Compressive strength: 24,000 psi minimum.

d. Water Absorption: 3 percent maximum.

e. Use Temperature: 350 degrees F maximum.

f. Surface and Edges: Non-porous.

g. Material Resistance: Will not support fungus or bacteria.

h. Uniform Load Deflection: ¼ inch maximum per Table A:

Table A: Uniform Load (lbs) which causes ¼ inch deflection at Center (Shelves not fixed at either end, static load on E modulus of 2.0 by 106)*

Uniform Load in pounds

Thickness	12 by 24-inch	12 by 36-inch	12 by 48-inch	24 by 36-inch
½ inch	370	110	45	220
¼ inch	1,400	400	170	800

* Loads can be affected by temperature, humidity, time, and other environmental factors. Users should test shelves in appropriate environment. It is assumed that deflection grater than ¼ inch is undesirable aesthetically, even though rupture has not occurred.

B. Stainless Steel: ASTM A167, Type 304.

C. Concealed Fasteners and Leveling Devices:

1. Concealed Fasteners: Stainless steel.

2. Leveling Devices: Zinc or cadmium coated steel, or stainless steel.

2.03 CHARACTERISTICS

A. Doors shall be minimum ¾ inch thick, panels minimum ½ inch thick, pilasters minimum 3/4 inch thick and screens minimum ½ inch thick. Edges shall be machined to a radius of 0625 inch; exposed surfaces shall be free of fabrication marks.

2.04 FABRICATION

A. Pilasters and Doors: Flush, formed of ¾ inch thick solid phenolic panels.

1. Door Dimensions: Unless otherwise indicated, furnish 24-inch wide in-swinging doors for standard toilet compartments, 36-inch wide clear opening out-swinging doors when located at the end, and 36-inch wide clear opening out-swinging doors when located at the side for stalls equipped for use by the physically disabled

2. Anchorage: Provide stainless steel anchorage, complete and threaded rods, washers, and leveling adjustment nuts at pilasters, to permit connection to floor slab. Furnish devices, which are designed to support pilasters from structure without transmitting load to floor fill.

3. Overhead Bracing: Provide anti-grip, decorative, heavy duty, extruded aluminum head rail with clear anodized finish.

B. Panels and Urinal Screens: Flush, formed of ½ inch thick solid phenolic panels. Height and width as indicated in drawings.

2.05 HARDWARE

A. Door hardware shall be cast Type 304 stainless steel, as follows:

1. Hinges: 11 gage Cast Stainless Steel Hinge. Hinge shall be cast of type 304 stainless steel and shall have a Satin finish. Hinge shall be gravity type for self-closing action and shall be fully adjustable up to 360 degrees. Pivot pin shall be made of type 304 stainless steel. Only stainless steel components shall be used in the construction of the Hinge. Plastic inserts are unacceptable. Hinges shall provide emergency access by lifting the door. Hinges shall be pre-drilled for mounting to door and pilaster with Stainless Steel through-bolts. Stamped stainless steel is not acceptable.

2. Strike and Keeper with Emergency Access: Heavy duty cast stainless steel with a Satin finish. The strike and keeper shall be 2.50 inch high, with the mounting holes at 1.50 inch on center, and the wall thickness shall be a minimum of .125 inch. The strike and keeper shall have an integral rubber bumper door stop. The stock number shall be molded into the back of the strike and keeper for ease in identification. Furnish one per door. Stamped stainless steel is not acceptable.

3. Slide Latch: Heavy Duty Cast Stainless steel with a Satin finish. The slide latch shall be surface mounted. The slide bar shall be .150 inch thick, 1.020 inch wide and 3.720 inch long. Latch shall have an internal stainless steel buffering spring to prevent damage when door is inadvertently slammed against the latch. Mounting holes are to be spaced at 3.50 inch on center. Latch knob is to be riveted to the slide bar and then welded to insure that the knob will not come off. The stock number shall be molded into the back of the slide latch for ease identification. Furnish one per door. Stamped stainless steel is not acceptable.

4. Coat Hook: Heavy Duty Cast Stainless Steel with a Satin finish. Coat Hook and bumper shall be 2.340 inch high, 1.230 inch wide and shall protrude out from the door 3.05 inch. The hook portion shall have a finished diameter of .250 inch thick. The stock number shall be molded into the back of the Coat Hook and Bumper for ease in identification. Furnish one per door. Stamped stainless steel is not acceptable. Mount at 48 inches maximum above finished floor in accessible toilet compartments.

5. Door Stop: Heavy Duty Cast Stainless Steel with a satin finish. Plated Zarnac Door stops are unacceptable. Door Stop shall have a 2.125 inch base diameter and shall protrude 1.80 inch from the Wall. The bumper at the end of the Door

Stop shall be .250 inch thick. The diameter of the shaft shall be .6875 inch. The stock number shall be molded into the back of the Door Stop for ease in identification. Furnish one for each Disabled Accessible door. Stamped stainless steel is not acceptable.

6. Pull Handle: Heavy Duty Cast Stainless Steel with a Satin finish. Plated Zamac Door pulls are unacceptable. Pull Handle shall protrude from the face of the door .940 inch and shall be 4.735 inch long. The Pull Handle shall have mounting holes drilled and tapped for 10/24 threads at 3.50 inch on center. The Pull Handle shall be .655 inch wide and shall be mounted back to back with the Slide Latch. The stock number shall be molded into the back of the Pull Handle for ease in identification. Stamped stainless steel is not acceptable. Provide u-pull shape handle on each side of accessible toilet compartment doors.

B. Pilaster Shoes: ASTM A167, Type 302/304 Stainless Steel, minimum 3-inch high, 18 gauge, finish with #3 Directional polish, attached with Stainless Steel Through Bolts.

C. Brackets: One piece double ear bracket or single ear bracket (at end partition) extending within 3 inches of top and bottom panel edges. Extruded 6063-T5 Aluminum with a satin anodized finish. The minimum weight shall be 1.685 pounds per lineal foot. Inside opening of Bracket shall be .50 inch for panels, .75 inch for pilasters. Holes for mounting to wall and panel/pilaster shall be pre-drilled. Holes are to be spaced at 9 inches on center along the full length of the bracket for a total of twelve holes (double ear) for mounting to the wall and six holes (single ear) for mounting to the panel/pilaster. Each bracket is to have a minimum wall thickness of .125 inch.

D. Overhead Bracing (Headrail): Continuous heavy duty extruded 6063-T5 Aluminum Headrail with anti-grip profile. Head rail shall have integral reinforcing channel and curtain track. Head rail shall have Satin Anodized finish. Provide headrail corner brackets, wall brackets, and headrail end caps as required. The headrail and headrail brackets shall have a minimum wall height of 2 inch. The minimum wall thickness of the headrail and head ail brackets shall be .125 inch.

E. Chrome-plated, non-ferrous cast alloy material shall not be furnished for hinges, brackets, locks, latches and other fittings and accessories.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Before covering wall framing with finish materials, examine framing to ensure that backing plates and structural framing have been installed in such position as to receive all attachment screws.

B. Verify spacing of plumbing fixtures to ensure compatibility with installation of compartments.

C. Do not start the Work of this section until all deficiencies have been corrected.

3.02 INSTALLATION

A. Install partitions and screens as shown in the Shop Drawings and in accordance with manufacturer's instructions and as specified. Install straight, level and plumb.

B. No evidence of drilling, cutting or patching shall be visible in finished Work.

C. Fasten panel brackets securely to walls and ceilings with recommended anchoring devices.

D. Fasten panels and pilasters to brackets with through bolts and nuts.

E. Fasten urinal screen panels to walls with two panel brackets, minimum.

F. Provide ½ inch spaces between wall surface and panels or pilasters.

G. Provide for adjustment of floor variations with non-breakable plastic shoes on pilasters. Conceal floor fastenings in pilaster shoes.

H. Furnish each toilet compartment door with top and bottom hinges, and door latch.

I. Install door strike keeper on each pilaster in alignment with door latch.

J. Furnish each toilet compartment door with one coat hook and bumper.

3.03 TOLERANCES OF INSTALLED WORK

A. Maximum Variation from Plumb or Level: 1/8 inch.

B. Maximum Misplacement from Intended Position: 1/8 inch.

3.04 ADJUSTING AND CLEANING

A. Hardware Adjustment: After installation, adjust hardware for proper operation. Install hinges on in-swinging doors to hold open approximately 30 degrees from the closed position when unlatched. Install hinges on out-swinging doors to return to the fully closed position. Adjust doors so that bottoms of doors are level with the bottoms of the pilasters when the doors are in the closed position.

B. Adjust and align door hardware to uniform clearance at vertical edges of doors. Clearance space shall not exceed ¼ inch.

C. Cleaning: Clean compartments, hardware, and doors before Substantial Completion and leave free from imperfections. Remove protective coverings.

3.04 CLEANUP

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 10 2813

TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Toilet accessories.

B. Related Requirements:

1. Division 01 - General Requirements.

3. Section 05 4100 - Structural Metal Stud Framing.

4. Section 10 2113 - Plastic Toilet Compartments.

5. Section 10 2815 – Hand and Hair Dryers.

1.02 REGULATORY REQUIREMENTS

A. Comply with CBC Chapter 11B requirements and ADAAG recommendations for accessibility.

1.03 SUBMITTALS

A. Shop Drawings: Submit a schedule of accessories and Shop Drawings indicating installation methods and fasteners.

1.04 QUALITY ASSURANCE

A. Coordinate related Work as required to ensure proper and adequate provision in framing of backing and wall finish for installation of accessories.

B. Coordinate requirements of Section 10 2113 - Plastic Toilet Compartments to ensure that correct openings are provided in partitions for toilet accessories where required.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect accessories from damage.

PART 2 - PRODUCTS

2.01 GENERAL

A. Accessories shall be provided with necessary anchoring devices and fasteners appropriate for surfaces on which items are to be fastened.

2.02 MATERIALS

A. Liquid Soap Dispenser: 20 gage stainless steel, 40-ounce. capacity, tamper-proof cap and concealed vandal-proof mounting. Continental V 444SS, ASI 0347, Bobrick B-2111, or equal.

B. Toilet Paper Boxes:

2. All Restrooms:

a. Non-accessible toilet compartments: ASI 0264-1A2, Bobrick B-27460 (double roll tissue holder), Bradley, or equal.

b. Accessible toilet rooms or compartments: semi-recessed Bobrick B4388 or 3888, ASI 0031, Bradley 5412 (double roll tissue holder without paper roll spindle stops), or equal

D. Grab Bars: 1-1/4 inches diameter by 18 gage stainless steel tubing, of size and configuration indicated. Ends shall be screwed to 11 gage stainless steel wall plate, with snaplock cover flanges. Grab bars over 36 inches in length shall be furnished with stainless steel support at mid point. Exposed stainless steel to be 180 grit satin finish. ASI 3700 series, Tubular Specialties Manufacturing, Inc. series Q-CS-1, Bobrick, or equal.

E. Shower Seat: Folding shower seat with frames and supports constructed entirely of stainless steel tubing. Slats shall be phenolic. Mounting hardware shall consist of stainless steel screws with plastic plugs. Tubular Specialties Manufacturing Inc., Model No. 731-PH, ASI, Bobrick, or equal.

F. Mirrors: Framed mirror, with one piece roll-formed 3/4 inch by 3/4 inch Type 304 stainless steel angle frame, with satin finish. Corners shall be heliarc welded, ground and polished smooth. Glass shall be No. 1 quality 1/4 inch float glass, electrolytically copper-plated. Frame shall be furnished with a continuous integral stiffener on sides. Back of mirror shall be protected by 1/8 inch thick, waterproof, shock-absorbing polyethylene padding and 20 gage galvanized steel back attached to frame with concealed screws. Mirror shall be provided with a 20 gage wall hanger. ASI 0600, Bobrick B-290 series, Bradley, or equal. Size as indicated on Drawings.

I. Toilet Seat Cover Dispensers: Surface-mounted, Type 304 stainless steel, satin finish. ASI 0477SM, Bobrick B-221, Bradley, or equal.

J. Sanitary Napkin Vendors and Disposals

1. Vendors: Surface mounted, Type 304 stainless steel, satin finish, tumbler lock, single 25 cent coin operation. ASI 0864, Bobrick B-2800, Bradley, napkin/tampon dispenser, or equal.

2. Disposals in non-accessible toilet compartments Surface-mounted, Type 304 stainless steel, satin finish, ASI 0473-A, Bobrick B-270, Bradley, or equal.

3. Disposals in accessible toilet rooms or compartments: recessed, semi-recessed or 3-inch maximum projection from wall surface; Bobrick B 353 (recessed), ASI 0473 (recessed), Bradley, or equal.

L. Shower Curtain Rod: Surface-mounted, Type 304 stainless steel, satin finish. ASI 1214, Bobrick B-6107, Bradley, or equal.

M. Shower Curtain: White opaque vinyl. ASI 1200–V 72, Bobrick 204-3, Bradley, or equal.

N. Shower Curtain Hooks: Type 304 stainless steel. ASI 1200-SHU, Bobrick 204-1, Bradley, or equal.

O. Mop and Broom Holder Rack: Provide two 24-inch long minimum, stainless steel mop and broom holder racks at each janitor room. ASI 8215-3, Bobrick B223 by 24, Bradley, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Check openings in substrates to receive accessories. Verify openings are correctly located and sized to receive accessories, and that locations will comply with disability access requirements. Confirm that blocking, backing or support is properly located and adequate for the accessory installation.

B. Verify spacing of plumbing fixtures and toilet partitions. Confirm spacing and locations are compatible with proposed accessory locations and will allow compliance with disability access requirements.

3.02 INSTALLATION

A. Install toilet accessories in accordance with manufacturer's written recommendations and accessibility requirements. Fasten components firmly in place.

B. Drill holes to correct size and application that is concealed by item with ¼ inch tolerance.

C. Install recessed accessories into wall openings with sheet metal screws into metal frames.

D. Install surface-mounted accessories to backing plates with machine screws, plumb, and aligned.

E. Grab Bars:

1. Fasten to toilet partition with 3-inch diameter stainless steel back plates with studs, couplings, and stainless steel machine screws.

2. At wood stud walls, fasten wood blocking with threaded stainless steel wood screws of sufficient length to penetrate blocking 1 ¼-inch minimum.

3. At metal stud walls, provide 1/8 inch cold-rolled steel plate, drilled and tapped for machine screws, or 16 gage cold-rolled steel plate complete with threaded sleeves for stainless steel machine screws. Weld plates to studs.

4. At concrete or masonry walls, install bars with sheet metal screws and expansion anchors.

5. At plaster or gypsum board walls, provide spacers of same thickness as wall material to prevent crushing of wall material.

F. Mirrors: Install mirror on manufacturer supplied concealed wall hanger and fasten with two theft-resistant locking screws.

G. Stainless Steel Medicine Cabinet: Fasten cabinet to wall.

H. Before Substantial Completion, deliver keys and maintenance instructions and product data to OAR.

3.03 ADJUSTING AND CLEANUP

A. Adjust accessories for proper operation.

B. Remove rubbish, debris, and waste material 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 10 4413

FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fire Extinguishers and Cabinets.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 04 2200 - Concrete Unit Masonry.
3. Section 06 1000 - Rough Carpentry.
4. Section 09 2900 - Gypsum Board.

1.02 SUBMITTALS

A. Shop Drawings: Indicate materials, sizes, anchorage, and installation details.

B. Product Data: Submit manufacturer's product literature, indicating product characteristics.

C. Material Samples: Submit manufacturer's standard cabinet color Samples for selection by Architect.

1.03 QUALITY ASSURANCE

A. Installer shall be manufacturer trained and certified to install the Work of this section.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's wrapping to protect items.

B. Store items in a dry, enclosed area.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHERS AND CABINETS

A. Location: Fire extinguisher cabinets and fire extinguishers shall be installed where indicated on Drawings or as required by authorities having jurisdiction.

B. Manufacturer: Fire extinguishers and cabinets shall be manufactured by one of the following:

1. Potter-Roemer.

2. J. L. Industries.

3. Larsen's Manufacturing.

4. Modern Metal Products.

5. Waltrous.

6. Amerex (fire extinguishers).

7. Equal.

C. Fire Extinguisher Type: Provide a legally appropriate rechargeable fire extinguisher for every fire extinguisher cabinet and as otherwise indicated.

1. Classrooms, Corridors and Offices, Cabinet mounted:

a. Type ABC multi-purpose dry chemical with UL rating 2A:10B:C, 5 pound size, also with red glossy polyester coated steel cylinder, pressure gage, hose and horn. Maximum Height: 15 ¼-inch. Maximum Cylinder Diameter: 4 ½-inch.

4. LAN Rooms, Bracket mounted:

a. Type Halotron 1, EPA approved "Clean Agent" with UL rating 5B:C, 5 pounds size, with red glossy polyester coated steel cylinder, discharge nozzle and bracket. Maximum Height: 15 ¼-inch. Maximum Cylinder Diameter: 6-inch. Provide 16 gage steel bracket by same manufacturer as extinguisher.

5. Electrical, Boiler, Fan, Heating Rooms, bracket mount:

a. Type CO_2, carbon dioxide gas, with UL rating 5B:C. 10B:C, (5 pounds with red glossy polyester coated aluminum cylinder, hose and horn. Maximum Height, (not exceed): 17 ¾-inch. Maximum Cylinder Diameter, (not to exceed): 5 ¼-inch.

D. Fire Extinguisher Requirements:

1. Design Specification:

a. Finish: Corrosion and impact resistant red epoxy.

b. Valve Stem Assembly: Metal, reusable, connects to cylinder by threaded pipefitting, aluminum or steel siphon tube, and shatter resistant plastic face gage.

c. Gage (if applicable) to Indicate: "Recharge," "fully charged (195 PSI)," and "over charge."

d. Pull Pin: Metal, reusable and securely fastened to unit with metal, aluminum chain or very heavy plastic line approximately 4 ½-inch long.

e. Mechanical Operation: Pistol grip, heavy duty metal handle (plastic not permitted), and shall be operated by a grip and squeeze lever.

2. Manufacturer Identification/Information: Manufacturer's name, date manufactured, model number, U.L. approval seal and number, contents operating instructions, Fire Marshall approval, etcetera shall be identified on the Fire Extinguisher.

3. Warning and First Aid Label: Fire extinguisher must indicate all standard warnings concerning breathing, eyes, skin and ingestion. Provide emergency and first aid procedures.

4. Repair Parts: The manufacturer and/or their representative shall maintain within the Los Angeles Metropolitan Area an adequate stock of replacement parts, available for immediate delivery.

5. Warranty:

a. Manufacturer shall provide a five year material warranty.

b. Installer shall provide a five year installation warranty.

6. Material Safety Data Sheet: Provide an MSDS sheet with every shipment.

E. Fire Extinguisher Cabinet: Potter-Roemer cabinets are listed as the standard of quality, products by other listed manufacturers are acceptable.

1. Semi-recessed cabinet: Provide semi-recessed, square trim edge cabinet with 1 1/4 inch to 2-inch projection:

a. Potter-Roemer Fire Extinguisher Cabinet 7022:

1) Door Style: either DVL (Duo Vertical Panel with lock) or E (Center Break Glass with lock), glass to be clear tempered safety glass.

2) Cabinet Door and Frame: Cold rolled steel with electrostatically applied, thermally fused polyester coating with recoatable white finish.

3) Identification Lettering: Cabinet door to be furnished with die cut lettering indicating "FIRE EXTINGUISHERS" in contrasting color to cabinet finish, and either vertical or horizontal lettering depending upon door style.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in accordance with manufacturer's recommendations.

B. Cabinets shall be installed plumb and level, where indicated on Drawings, at heights required by authorities having jurisdiction.

3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 10 51 26
PLASTIC LOCKERS AND BENCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Solid plastic lockers and locker room benches.

1.2 RELATED SECTIONS

A. Division 06 Section "Rough Carpentry" for locker anchorage.

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
2. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. US Federal Government:

1. U.S. Architectural & Transportation Barriers Compliance Board. Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG).

C. GREENGUARD Environmental Institute (GREENGUARD):

1. GREENGUARD certified low emitting products.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets for each type of product indicated include fabrication details, description of materials and finishes.

1. Product Test Reports: When requested by Architect, provide documentation indicating compliance of products with requirements, from a qualified independent testing agency.

B. Shop Drawings: Include overall locker dimensions, floor plan, elevations, sections, details, and attachments to other work. Include choice of options with details.

C. Samples for Selection: Furnish samples of manufacturer's full range of colors for initial selection.

D. Samples for Approval: Furnish a physical sample of the material in the selected color.

1. Size: 6 by 6 inch (102 by 102 mm) in type of finish specified.

1.5 INFORMATIONAL SUBMITTALS

A. Installation instructions.

B. Warranty: Sample of special warranty.

1.6 MAINTENANCE SUBMITTALS

A. Operation and Maintenance Data.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in the manufacture of plastic lockers. Manufacturers seeking approval must submit the following in accordance with Instructions to Bidders and Division 01 requirements:

1. Product data, including test data from qualified independent testing agency indicating compliance with requirements.
2. Samples of each component of product specified.
3. List of successful installations of similar products available for evaluation by Architect.
4. Submit substitution request not less than 15 days prior to bid date.

B. Installers Qualifications: An experienced Installer regularly engaged in the installation of lockers for a minimum of 3 years.

C. Source Limitations: Obtain plastic lockers and trim accessories from single manufacturer.

D. Accessibility Requirements: Comply with requirements of ADA/ABA and with requirements of authorities having jurisdiction.

E. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 100 or less.

2. Smoke-Developed Index: 450 or less.

F. Indoor Environmental Quality Certification: Provide certificate indicated that products have been certified under the following programs, or a comparable certification acceptable to Owner:

1. GREENGUARD Indoor Air Quality Certified.
2. GREENGUARD Certified for Children and Schools.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver plastic lockers to the site until the building is enclosed and HVAC systems are in operation. Deliver plastic lockers in manufacturer's original packaging. Store in an upright condition. Protect plastic lockers from exposure to direct sunlight.

B. Ship plastic lockers fully assembled.

C. Lift and handle plastic lockers from the base not the sides.

1.9 WARRANTY

A. Special Manufacturer's Warranty: 20 year against rust, delamination or breakage of plastic parts under normal use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of Bradley Corporation, Menomonee Falls, WI 53051, (800)272-3539, fax (262)251-5817; Email info@BradleyCorp.com; Website www.bradleycorp.com.

1. Provide basis of design products or comparable products of one of the following approved manufacturers:

a. [Specifier: Insert name of manufacturer of comparable product.]
b. Submit requests for substitution in accordance with Instructions to Bidders and Division 01 General Requirements.

B. MATERIALS

1. High Density Polyethylene (HDPE): 30 percent pre-consumer recycled content polyethylene thermoplastic formed under high pressure into solid plastic components.
2. High Density Polyethylene (HDPE): 100 percent pre-consumer or post-consumer recycled content polyethylene thermoplastic formed under high pressure into solid plastic components.
3. Stainless-Steel Sheet: ASTM A 666, Type 304.
4. Fasteners: Tamper-Resistant Fasteners: Stainless steel torx-head screws.

a. Locker Connectors: No. 10-24 sex bolts.
b. Anchors: Type and size required for secure anchorage.
c. Drilled-in-place Masonry Anchors: Minimum 1/4 by 1-3/4 inch (6 by 44 mm) screws.

2.2 STANDARD PLASTIC LOCKERS

A. Basis-of-Design Product: **Bradley LENOXLOCKER.**

B. Locker Configuration: One Tier.

C. Locker Dimensions

1. Height, Nominal: 72 inch (1829 mm).
2. Width: 18 inch (305 mm).
3. Depth: 18 inch (457 mm).

D. Material: HDPE plastic, 30 percent recycled material.

E. Sides, Tops, Bottoms, Dividers, and Shelves: 3/8 inch (10 mm) thick HDPE plastic with smooth finish.

F. Locker Shelves: 3/8 inch (10 mm) HDPE plastic, mortised into sides and back.

G. Locker Tops: Flat top.

H. Doors: Fabricate from a single piece 1/2 inch (13 mm) HDPE plastic.

1. Doors and Frame: 1/2 inch (13 mm) thick HDPE plastic with matte texture finish with cross-hatch mesh pattern.

2. Logo on Door: Indicate accessible lockers.
3. Handle: ADA/ABA Compliant handle fabricated from injection molded plastic.
4. Locks: Standard hasp.

5. Hinges: Continuous piano hinges, .05 inch/18 gauge (1.27 mm) thick type 304 stainless steel fabricated to wrap around edges of door and frame and attached with stainless steel tamper-resistant screws.

a. Finish: Powder coated to match color of locker.

6. Latch Bar: Full-height latch bar constructed of 1/2 inch (13 mm) HDPE plastic secured to locker with stainless steel tamper-resistant screws.

I. Color: As selected by Architect from manufacturer's full range.

J. Accessories:

1. Coat Hooks: Black polycarbonate double hook.
2. End Panels: 1/2 inch (13mm) thick, with color and finish matching locker body.
3. Filler Panels: 1/2 inch (13 mm) HDPE filler panel, with color and finish matching locker body, attached with 3/8 inch (10 mm) thick HDPE solid plastic angle bracket.
4. Wall Hooks: Black powder coated, cast zinc hook two per locker.
5. Number Plate: White acrylic with black film coating, laser etched with number specified. Provide one per locker.
6. Locker Base: 1 inch (26 mm) solid HDPE plastic, with black or finish matching locker body, 4 inch high.
7. Coat Rod: Schedule 40 PVC with plastic pole sockets and stainless steel tamper-resistant screws.

2.3 GEAR LOCKER

A. Basis-of-Design Product: **Bradley LENOXGEAR**.

1. Upper Door, Frame, Sides, Tops, Bottoms, Dividers, and Shelves: 1/2 inch (13mm) thick HDPE plastic with matte textured finish.
2. End Panels: 3/8 inch (10 mm) thick HDPE plastic with matte texture finish.

B. Locker Configurations: Single, full height.

C. Gear Locker Dimensions

1. Height: 72 inch (1829 mm).
2. Width: 24 inch (609 mm).
3. Depth: 18 inch (457 mm).

D. Material: HDPE plastic, 30 percent recycled material.

1. Upper Door, Frame, Sides, Tops, Bottoms, Dividers, and Shelves: 1/2 inch (13mm) thick HDPE plastic with matte textured finish.

E. Locker Top: Flat top.

F. Upper Door: Fabricated from one piece 1/2 inch (13 mm) HDPE plastic.

1. Handle: ADA/ABA-compliant, fabricated from injection molded plastic.
2. Locks: Standard hasp
3. Hinge: Continuous piano hinge made of .05 inch/18 gauge (1.27 mm) thick, type 304 stainless steel attached to door and frame with stainless steel tamper-resistant screws and fabricated to wrap around edges of door and frame.

a. Finish: Powder coated to match color of locker.

4. Latch Bar: Full-height latch bar constructed of 1/2 inch (13 mm) HDPE plastic secured to locker with stainless steel tamper-resistant screws.

G. Foot Locker

1. Hinged Bench Seat: Fabricated from 1 inch (26 mm) thick HDPE plastic.

a. Hinge: Full length piano hinge made of .05 inch/18 gauge (1.27 mm) thick, type 304 stainless steel attached to bench seat and frame with stainless steel tamper-resistant screws and fabricated to wrap around edges of bench seat and frame.
b. Safe Closing Device: Soft-Down Stay closing device.

2. Front: 1/2 inch (13 mm) thick HDPE plastic with ventilation slots
3. Lock: Standard hasp.

H. Color(s): As selected by Architect from manufacturer's full range.

I. Accessories:

1. Coat Hooks: Black polycarbonate double hook.
2. Wall Hooks: Black powder coated, cast zinc hook two per locker.
3. Number Plate: White acrylic with black film coating, laser etched with number specified. Provide one per locker.
4. Coat Rod: Stainless steel rod, 1 inch (26 mm) diameter, with stainless steel flanges and stainless steel tamper-resistant screws.

2.4 PEDESTAL BENCH

A. Basis-of-Design Product: **Bradley LENOXPEDESTAL.**

B. Pedestal Bench Dimensions

1. Length: as shown on drawings.
2. Width: 12 inch (305 mm) and 24 inch (610 mm).
3. Height: 18-1/2 inch (470 mm).

C. Materials:

1. Bench Top: 1-1/2 inch (39 mm) thick HDPE plastic, 30 percent recycled material, with matte texture finish.
2. Pedestal: Black anodized aluminum with welded aluminum flanges top and bottom.

D. Color: As selected by Architect from manufacturer's full range.

2.5 LOCKER FABRICATION

A. Fabricate locker box from a single sheet of HDPE solid plastic with corners fused together. Weld frames and shelves to box assembly. Provide all welded construction of locker parts without dovetail slots or metal fasteners. Add welded gussets in single tier full height lockers.

B. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

C. Hardware Attachment: All hinges, handles, hasps, hooks, latch bars, and locks attached with tamper-resistant screws.

D. Provide ventilated panels where indicated.

E. Continuous Base: Set toe clearance 3 inch (76 mm) from locker front. Notch end caps for ease of installation.

F. Continuous Sloping Tops: Fabricated in lengths indicated, without visible fasteners at splice locations; and finished to match lockers.

G. Filler Panels: Fabricated in unequal leg angle shape; finished to match lockers.

H. Finished End Panels: Fabricated with 1/2 inch (13 mm) wide edge dimension, configured to conceal fasteners and holes at exposed ends of plastic lockers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lockers in climate controlled environment, shielded from direct sunlight.

B. General: Install on floor or other firm support. Install level, plumb, and true.

1. Position locker base per approved shop drawing. Using fasteners provided by manufacturer, anchor base sections to the floor.
2. Attach filler pieces to lockers with male-female sex bolts.
3. Position first locker according to submittal layout. Square and plumb the locker using concealed shims. Secure the locker to the wall at the top and bottom of the locker. Position second locker next to first, square and plumb to align the tops and bottoms; and

temporarily clamp lockers together. Drill four holes through the sides of the lockers and connect lockers using sex bolts provided by manufacturer.

C. Accessories: Fit exposed connections of trim, fillers, and closures together to form tight, hairline joints, with concealed fasteners and splice plates furnished by locker manufacturer. Install as indicated on approved shop drawings.

1. Coat Hooks: Attach with at least two fasteners.
2. Coat Rods: Attach at height indicated.
3. Identification Plates: Identify plastic lockers with approved identification numbers. Attach plates to each locker door.
4. Filler Panels: Attach with concealed fasteners.
5. Sloping Tops: Attach sloping-tops to plastic lockers, with closures at exposed ends.
6. Finished End Panels: Attach at ends indicated.

D. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, spaced as indicated. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

3.2 FINAL CLEANING

A. Clean locker interior and exterior surfaces.

B. Remove packaging and construction debris and legally dispose of off-site.

END OF SECTION

SECTION 10 5626

MOBILE STORAGE SHELVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. High-density mechanically assisted mobile shelving system for athletic equipment storage.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 3000 - Cast-in-Place Concrete.

1.02 PROJECT REQUIRMENTS

A. Mechanically assisted high-density movable shelving system with four-post 7-shelf equipment shelving units mounted on track-guided wheeled carriages called ranges to form a compact storage system.

B. System design permits access to any single aisle by manually moving units until the desired aisle is opened. Shelving on carriages is double-faced, 24-inch deep, with matching single-faced, 12-inch deep, fixed shelving units at either or both ends of movable shelving.

C. Rails are embedded in the concrete floor to provide a smooth and uninterrupted surface between shelves and with the adjoining room space.

D. The system is provided with necessary mechanisms to insure safety to users. Assembly must be designed and anchored to meet seismic requirements of the CBC.

1.03 SUBMITTALS

A. Drawings: Provide detailed plans, sections, elevations and details of the proposed system.

B. Calculations: Complete structural calculations by the structural engineer showing compliance with the California Building Code, including provisions for loading, overturning, and anchorage to the building structure. Seismic calculations shall consider entire book stack, including columns, bases, connections and anchorages. The system shall be capable of resisting a lateral seismic force in any direction, acting simultaneously with a vertical seismic force as determined by CBC. The equipment stack shall be considered as "cabinets". Allowable stresses and other design criteria shall be permitted. Weight is defined as the total weight of the shelving system plus the weight of the materials stored. Stresses and deflections shall be investigated for

shelves fully loaded in combination with seismic forces, and loaded one side only in combination with seismic forces.

C. Product Data: Manufacturer's data, catalog information, fabrication details and specifications, and any special construction required.

D. Material Samples:

1. Samples of manufacturer's complete color charts for exposed materials for initial selection.

2. Samples for final verification of actual materials with colors and finishes selected.

E. Operating and Maintenance Information: Manufacturer's operating and maintenance manual and customized instructions.

1.04 QUALITY ASSURANCE

A. Qualifications: Shelving shall be manufactured and installed by firms having not less than five years experience in providing products and installations of comparable scope and complexity, and the capability of documenting such experience.

B. Prior to delivering materials to the site, the installer shall inspect the areas to receive mobile shelving to verify actual dimensions and field conditions affecting Work, and to assure that floors and troughs are smooth and level within tolerances required for smooth, trouble-free operation.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver products only after exterior openings are closed up; wet Work is complete, and proper facilities are available for handling, storing, and protecting items.

B. Deliver components in sealed containers, with manufacturer's labels intact.

C. Discharge materials carefully and store on clean surfaces or raised platforms in a safe, dry area fully protected from weather. Keep materials clean and dry.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. **DSA Approval is required Prior to Bid Opening: agency approvals must be obtained no later than 5 working days prior to bid opening. DSA will not accept Deferred Approval submission for this work. It is the responsibility of the bidder to pay for and obtain DSA approval for the proposed product. Refer to paragraph 1.03 SUBMITTALS for requirements.**

B. Applicable products of Spacesaver Corporation have been approved by the Division of the State Architect for this project. Other acceptable manufacturers pursuant to paragraph A above are:

C. Burroughs Corporations.

D. Richard Wilcox.

E. Montel Mobilex.

2.02 MOVABLE SYSTEM COMPONENTS

A. Carriages: The carriage consists of a rectangular welded steel frame with reinforcing cross members on which the drive system and shelving units are mounted. The carriage is designed to support 1000 pounds minimum per linear foot. Provide carriages for movable and fixed ranges.

B. Bumpers: Shall be furnished for each side of each carriage and be of Durometer hardness of 70, not less than 2 inches long.

C. Wheels: Load and drive wheels are 5-inch overall diameter, cast iron, double flanged, and precision machined for minimum friction and for smooth and trouble-free operation. Wheels are mounted on ball bearings, self-aligning, hermetically sealed and lifetime lubricated. Wheel assemblies are designed to support 3,220 pounds static load minimum. Complete drive shaft and wheel assemblies shall be constructed to insure no play or looseness over the entire length of any range.

D. Track (RAILS): The number of rails, two or more, and their spacing shall be defined by the dimensions of the range module and by its storage capacity, but in no cases no greater than 84 inches on center. Rails are fabricated of cold rolled steel and designed to allow no movement or deflection during operation of the mobile ranges. Rails shall be designed to accommodate the adjoining floor finish material. Parallelism between rails shall be assured by the use of a specially designed jig, and levelness by the use of closely spaced anchor screws that can be adjusted to level measured by a surveyor's transit. Non-shrink grout, rated at 7,000 psi, shall be installed under the rail to assure stability. The track is laid in a trough provided in the cast-in-place concrete floor with gaps on each side no greater than 3/8 inch. Levelness of the rail after installation shall not vary more than 1/32 inch in 10 feet of rail length, along any rail.

E. Seismic Anti-Tip Device: Provide a floor-level anti-tip system consisting of a steel channel bolted to the underside of the carriage along its full width that slides into each track to prevent tipping of the range while minimizing the effort of moving the range. There is positively no contact between the two parts. This anti-tip mechanism will prevent a range from leaning any more than 2 inches at the top. Design shall be as required to meet the California Building Code.

F. Operation: Provide a triple-arm operating wheel with rotating hand knobs on the accessible (drive) ends of each shelf range, centered on the end panel and 40 inches above the base of the unit, that when turned in the direction of travel will move each unit. One pound of effort on the handle shall move a minimum of 4,000 pounds of carriage load. Turning the handle transfers power through a chain drive to the drive-

wheel axle on the carriage, so that wheels on one side of the carriage function as drive wheels.

G. Safety Mechanism: Provide a pin-lock safety mechanism consisting of a locking device located on the operating wheel which can be manually locked on either end of the range, locking the range in place. When unlocked, the device will permit the carriage to be moved in either direction to create a new access aisle, where it can then be manually relocked

H. Finished Steel End Panels: Provide steel end panels at exposed range ends. Steel end panels shall be three piece 20 gage commercial prime quality patterned sheet steel and contain no joints or seams, flush, full height and width of range with flanged and turned top, bottom edges. End panels are attached with concealed machine screws to carriage and uprights. End panels shall completely cover width and depth of shelving including carriage.

I. Fixed Shelving Units: Fixed shelving units at one or both ends of shelving range area shall exactly match in appearance and be of the same construction and heights as the movable units, and be anchored to the rails to assure continuity of alignment and appearance.

2.03 FOUR-POST SHELVING SYSTEM

A. Upright Frame: Each frame shall be made of two U-shaped upright posts with two or more cross members welded in between. Two frames with shelving comprise a section. Components are made of 18 gage steel. The posts are 1 ¼-inch wide by 2-inch deep with one row of slots on each side. Slots are spaced at 1-inch increments allowing full adjustability of the shelves. Guide-perforations are located every 6-inches to facilitate shelf placement and leveling. Uprights shall be 85-inch high by 12-inch deep. "L" and "T" shelving shall not be permitted.

B. Shelves: Shelves shall be made of 18 gage steel with front and rear faces formed one inch high and box-formed with no less than three 90 degree bends (i.e. down 1-inch, return 5/8 inch and return 3/8 inch). They shall present a smooth, closed appearance on both faces with sharp edges eliminated. Shelves shall carry the required loads without deflection in excess of 3/16 inch. A hat shaped reinforcement channel may be welded underneath the shelf if required to increase the shelf capacity. The nominal depth of bookshelves is the same as the actual depth from front to back of shelf. The shelves must be reversible, front to back, for maximum shelf life. Each section shall have seven shelves, 12-inch deep by 36 or 48-inch wide.

C. Hooks: Each shelf shall be supported by four aluminum hooks, each capable of supporting 260 pounds.

D. Steel Canopy Tops: The canopy top shall be constructed in the same manner as the adjustable shelf. The canopy top shall be screwed to the upright frame for more strength. Canopy tops shall be provided for sections, one for single-faced sections and two for double-faced sections, in order that any rearrangement of sections at a later date may be accomplished without accumulating extra parts or requiring new parts.

E. End Panel Card Holder: Polished aluminum designed to accept 5-inch by 3-inch cards. Provide two for double faced end panel and one for single faced end panel.

F. Back Panels And Sway Bracing: Provide 20 gage steel back panels on the freestanding single faced units. On other sections provide diagonal sway braces.

2.04 FINISHES

A. Epoxy coating: Provide the manufacturer's standard epoxy finish to exposed steel surfaces: Prepare components for painting by a multi-stage smoothing, cleaning and phosphatizing process to assure a smooth, clean surface with no trace of foreign material that would interfere with the adhesion of the epoxy powder. Finish shall be medium gloss, 1.2-mil minimum dry-film thickness, smooth, free of streaks, drops, sags, pinholes, checks, cracks, peeling, blisters, and foreign material, and capable of withstanding severe hammer and bending tests without flaking.

B. Color: Shall be selected by the Architect from the manufacturer's standard range of colors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the areas to receive mobile shelving to verify that floors are level and other conditions meet the requirements for a satisfactory installation.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install mobile shelving system in accordance with the manufacturer's written instructions and approved DSA Approval Drawings.

B. Ensure that anchors are installed in accordance with the anchor manufacturer's instructions, receive full embedment, and develop their full design strength.

C. Survey the Work to ensure that tracks are correctly leveled and aligned. Support tracks and fill gaps with non-shrink grout as specified.

D. Upon completion, touch-up any minor scratches or damaged finish with paint, matching color and texture of finish.

3.03 CLEAN UP AND PROTECTION

A. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

B. Leave area clean and ready for use.

C. Protect the Work of this section until Substantial Completion.

3.02 DEMONSTRATION AND TRAINING

A. A factory-authorized service representative shall provide start-up services, test and adjust controls and safety devices, and assure system is in full and safe operable condition.

B. Prior to Substantial Completion, provide a two hour training session to Owner operating and maintenance personal in the operation and proper care of the system, including trouble-shooting, servicing, and preventive maintenance.

END OF SECTION

SECTION 11 5213

PROJECTION SCREENS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Manually operated projection screens.
2. Electrically operated projection screens.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 09 2216 - Non-Structural Metal Framing.
3. Section 09 2900 - Gypsum Board.
4. Section 09 5113 – Acoustical Panel Ceilings.
5. Electrical: Division 26.

1.02 SUBMITTALS

A. Shop Drawings: Submit details for installation, attachment, and electrical requirements.

B. Product Data: Submit manufacturer data indicating model and size of units.

C. Installation Instructions: Submit manufacturer's installation instructions.

D. Certification: Submit GREENGUARD certification for conformance to UL 2818.

1.03 QUALITY ASSURANCE

A. Coordinate installation of ceiling mounted recessed screens with ceiling installation.

B. Conduct a pre-installation meeting on Project site to review procedures, details and interfacing with adjacent materials and finishes.

C. Screen fabric shall be GREENGUARD certified for Chemical Emissions for Building Materials, Finishes and Furnishings in conformance to UL 2818.

D. References:

1. UL 2818 - Standard for Chemical Emissions for Building Materials, Finishes and Furnishings.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened undamaged packaging with identification labels intact.

B. Store protected from exposure to harmful weather and in dry, ventilated conditions at temperature less than 80 degrees F.

C. Handle projection screens with care in order to prevent damage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Da-Lite Screen Co., specified as basis of design.

B. Draper Inc.

C. Elite Screens Inc.

D. Stewart Filmscreen Corp.

E. Equal.

2.02 MANUALLY OPERATED PROJECTION SCREENS

A. Heavy duty, manually operated retractable projection screen mounted on ball bearing rigid steel spring roller.

B. Screen Case: Steel or aluminum case sized to suit projection screen and furnished with end caps concealing roller ends. Steel case shall be powder coated painted, white or black, as selected by ARCHITECT.

C. Screen:

1. Nominal Diagonal / Aspect Ratio: 109 inches, 16:10.

2. Approximate Viewing Area Dimensions: 57-1/2 inches high by 92 inches wide.

3. Surface: Matte white, flame retardant, mildew resistant, washable fiberglass fabric with black borders.

D. Accessories:

1. Installation Hardware:

a. Surface Mounted: Manufacturer's mounting brackets and fasteners for attachment to framing through wall or ceiling.

b. Recessed: Manufacturer's hanger rods, angles, brackets and fasteners for attachment to underside of structure.

2. Recessed Projection Screens Trim Kit: Integral trim or manufacturer's ceiling trim flange surrounding the perimeter of the screen case.

3. Pull Rod: One manufacturer's standard pull rod for each projection screen.

E. Products:

1. Ceiling or Wall Mounted: Da-Lite Screen Co., Model C, or equal.

2. Recessed: Da-Lite Screen Co., Advantage manual with CSR with integral ceiling trim.

2.03 ELECTRICALLY OPERATED PROJECTION SCREENS

A. Electrically operated UL listed retractable, with rigid metal roller. Motor, 3-wire type, with automatic thermal overload protection, integral interlocking gears, capacitator, electric brake, and preset adjustable limit switches for the up and down positions. Projection screens shall bear UL label.

1. Voltage and Frequency: 115 V, 60 Hz.

2. Electric Controls: Wall mounted switch with integral junction box incorporated into screen housing.

B. Screen Case:

1. Steel or aluminum case sized to suit projection screen and furnished with end caps concealing roller ends. Steel case shall be powder coated painted, white or black, as selected by ARCHITECT.

2. Bottom of case shall be furnished with piano type hinges and connected to drive mechanism so that it opens and closes automatically with lowering and raising of screen.

C. Screen:

1. Nominal Diagonal / Aspect Ratio: 109 inches, 16:10.

2. Approximate Viewing Area Dimensions: 57-1/2 inches high by 92 inches wide.

3. Surface: Matte white, flame retardant, mildew resistant, washable fiberglass fabric with black borders.

D. Accessories:

1. Installation Hardware: Manufacturer's mounting brackets and fasteners for attachment to wall or ceiling.

a. Surface Mounted: Manufacturer's mounting brackets and fasteners for attachment to framing through wall or ceiling.

b. Recessed: Manufacturer's hanger rods, angles, brackets and fasteners for attachment to underside of structure.

2. Recessed Projection Screens Trim: Manufacturer's integral trim or manufacturer's ceiling trim flange surrounding the perimeter of the screen case.

E. Products:

1. Ceiling or Wall Mounted: Da-Lite Screen Co., Cosmopolitan, or equal.

2. Recessed: Da-Lite Screen Co., Cosmopolitan with recess kit, or Equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install screens according to manufacturer's installation instructions and Shop Drawings.

B. The finished installation shall be free from damage, blemishes or other defects impacting appearance or operation, with operating panels in alignment with adjacent ceiling, and be uniform in plane and appearance.

3.02 CLEANUP

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 11 5215

VIDEO / MULTIMEDIA PROJECTOR MOUNTING PLATES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Provide and install video/multimedia mounting plates for OFOI projector. Coordinate with related Work for proper location of projector mounts and distance to screen based on the projector used.

B. Related Requirements:

1. Division 01 - General Requirements
2. Section 09 2900 – Gypsum Board.
3. Section 09 5113 – Acoustical Panel Ceilings.
4. Section 11 5213 – Projection Screens.
5. Division 26 – Electrical.
6. Division 27 – Communications.

1.02 SUBMITTALS

A. Submit Shop Drawings indicating locations, dimensions, and anchoring details.

B. Submit Product data and installation instructions.

1.03 QUALITY ASSURANCE

A. Coordinate installation of mounting plates with ceiling, electrical and data work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Project site in original sealed packages.

B. Handle in a manner to prevent damage during storage and installation.

1.05 WARRANTY

A. Manufacturer shall provide a 5 year material warranty.

B. Installer shall provide a two year installation warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Video/Multimedia Projector Ceiling Mount Plate with all associated hardware as manufactured by Peerless Industries, Bretford, Chief, or equal.

1. Suspended Ceiling Attachment Plate: Peerless Model CMJ 455 Variable Position Suspended Ceiling Plate.

2. Hard Lid Ceiling Attachment Plate: Peerless Model ACC 570 Round Structural / Finished Ceiling Plate.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install per manufacturer's installation instructions.

B. Place ceiling tray and filler tray into ceiling opening. Attach ceiling tray to filler tray with four bolts. Hook turnbuckles into ceiling tray.

C. Mounting plates shall be suspended from structural members by wires, at an angle of 15 degrees. If needed, angle may be increased up to 45 degrees. Use eye-bolts for connections to wood joists, expansion anchors for concrete and tie-wires to open web metal joists. Wires shall be fastened with at least six turns as tightly as possible.

D. Connect wires to turnbuckles with at least six tight turns. Tension the wires by adjusting the turnbuckles.

3.02 ADJUSTING

A. Adjust turnbuckles as needed so projector mounting plates are set flush with ceiling.

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 11 6500

ATHLETIC EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Protective Wall Padding.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Division 26 – Electrical.

1.02 SEQUENCING AND SCHEDULING

A. Coordinate with related Work of other Sections.

B. Furnish items to be embedded in concrete or wood floors and templates for setting as required to respective trades in ample time for proper positioning as Work progresses.

1.03 SUBMITTALS

A. Provide in accordance with Division 01.

B. Shop Drawings: Submit Shop Drawings for Work.

C. Product Data:

1. Copies of manufacturer's standard printed brochure illustrating standard components and features of each system specified.

D. Material Samples:

1. Manufacturer's standard color range.

1.05 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Source Limitations: Provide secondary materials including adhesives, anchoring materials, filler, sealant material, and repair materials of type and from source recommended by manufacturer of primary playground surface system material.

B. Qualifications:

1. Installer: Minimum five years experience in successfully installing the same or similar playground equipment and shall be certified in writing by the playground materials manufacturer to install the playground equipment.

1.06 WARRANTY

A. Manufacturer shall provide their standard warranty for components specified in this section.

PART 2 - PRODUCTS

2.01 PROTECTIVE WALL PADDING

A. Manufacturer/Product:

1. Resilite Sports Products, Inc.

2. Equal.

B. Provide #00345 certified fire-retardant wall padding wainscot panels. The entire pad, vinyl covering, foam padding and backing board, shall be certified (Athletic Equipment – Division 11 Equipment, Category #11710, Listing #15559-1 to meet the NFPA 101 Life Safety Code requirement 10.2.3.2 and 10.2.4.1.2, class A rating of 0-25 flame spread and 0-450 smoke development for use on interior wall and ceiling finishes. Wall padding shall also meet the CBC Chapter on Interior Finish and Trim. Laboratory certification test results must be furnished to verify that the wall pad assembly (vinyl cover, foam interior and wood backing) meets or exceeds the ASTM E84 standard test method for surface burning characteristics of building materials (test also published as NFPA-255, UL-723, UBC 8-1 (42-1), and ANSI 2.5). Each panel shall have a certification label attached to backside. Wall pad panels not meeting proof of certification and test requirements are not permitted.

C. Wall pad panels shall be 2-foot wide by 6-foot high with a slot-back keyhole top and bottom for securing panels to the wall. Panels shall be constructed with flame retardant, 2-inch thick open cell neoprene foam filler with a density of 5.5 pound-feet and an Indentation Force Deflection (IFD) of 25 to 45 lbs. Interior foam shall be bonded to a 7/16 inch oriented strand wood board to minimize warping. Entire face of panel shall be upholstered in a heavy (14 ounce) fire-retardant vinyl laminated, high tensile, polyester

base fabric material with a leather-like embossed finish. Provide cutouts in panels as required for outlets and switches to fit related Work. The installer shall be responsible for proper inspection and installation of panels. Installation shall be in accordance with current factory suggested procedures.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Equipment shall be installed by factory trained craftsmen skilled in their trade.

B. Install and assemble equipment furnished in accordance with manufacturer's instructions and reviewed Shop Drawings.

3.02 CLEANUP

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 12 2113

WINDOW BLINDS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Window vertical blinds and accessories.

B. Related Requirements:

1. Division 01 - General Requirements.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings including plans, elevations, and fastening details.

B. Product Data: Submit manufacturer's data and catalog cuts.

C. Material Samples: Submit manufacturers color Samples and catalog cuts.

1.03 QUALITY ASSURANCE

A. Qualifications of Manufacturer: Manufacturer shall have been regularly engaged in the business of manufacturing vertical blinds for five years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Century Blinds Inc. Contract

B. Hunter Douglas Contract.

C. Levolor Contract.

D. Equal

2.02 VERTICAL BLINDS

A. Materials:

1. Headrails shall be 6063-T5 aluminum alloy. Headrail shall have a high quality ivory baked enamel finish or clear anodized finish.

2. Carriers shall be a 7/16" polyacetal plastic body and shall traverse on rolling self-lubricating plastic wheels aligned in channel runway. Carriers shall have a self- aligning mechanism designed to prevent damage to the vanes or carriers when over-rotated. Carrier stems shall be molded clear non-yellowing polycarbonate. Carriers shall be attached to each other with a nylon strap. Stem

of carriers shall be centered allowing headrail to be reversed. Spacing of vanes shall be 3 1/8" (for 3 1/2" vanes).

3. Rotation System shall be wand operated and use a lead carrier control unit. Traverse shall be controlled by a fiberglass wand attached to the lead control unit (also used for rotation).

4. Pinion (tilt rod) shall be four pronged 6063 T5 aluminum alloy.

5. Vanes shall be made of 100% PVC with UV inhibiters. Vane material shall meet NFPA-701 federal fire rating. 3 ½" vanes shall be 22 gage.

6. Valance shall consist of a curved vane fitted into valance channel with square corners and continuous dust cover. Valance shall be attached to headrail using acetyl plastic clips.

7. Installation brackets shall be made of zinc plated steel. Headrail mounting clips shall be made of spring steel. Installation hardware shall facilitate easy installation and removal of headrail. Provide extension brackets where required by field conditions.

8. Blinds shall be manufactured in full compliance of ANSI/WCMA Standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive Work.

B. Ensure that structural blocking and supports are installed and suitable for attachment and support of Work.

3.02 INSTALLATION

A. Install blinds as detailed in locations indicated. Furnish and install necessary parts and perform adjustments required to provide a complete, rigid and properly operating installation. Corners and surfaces shall be free from burrs and sharp edges.

B. Unless otherwise indicated, blinds shall be top-suspended, installed singly over each sash and between jambs or mullions, heads set flush with wall or trim, and shall not interfere with operation of sash or sash hardware. Where recessed installation is not indicated, blinds shall be installed over the casing, overlapping casings not less than 1 3/8-inch at sill, 1 ¾-inch at jambs and one inch at top.

C. Brackets shall securely fasten head rails and shall provide for easy removal of head rails. Blinds shall be securely fastened by sheet metal screws through back into head rails at side channels.

D. Brackets shall be fastened with galvanized or cadmium-plated pan-head all-purpose screws, oval-head wood screws, toggle bolts or appropriate fasteners.

3.03 INSTALLATION TOLERANCES

A. Maximum Variation of Gap at Perimeter: 1/4 inch.

B. Maximum Offset from Level: 1/8 inch.

3.04 ADJUSTMENT AND CLEANUP

A. Adjust for smooth operation.

B. Before Substantial Completion, clean the blinds in accordance with manufacturer's recommendations.

C. 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 13 4610
IMAGEWALL PANEL SYSTEM

Part 1 General

1.1 General Requirement

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

B. Reference standards: Work shall comply with published recommendations of the following unless otherwise stated below:

1. ZAHNER "Architectural Metals – A guide to Selection, Specification and Performance"; John Wiley & Sons 1995: ISBN 0-471-04506-3.
2. ZAHNER "Architectural Metal surfaces" John Wiley and Sons 2005: ISBN 0-47126335-4.
3. ZAHNER US Patent 7,212,688: A method for converting an image to machine control data. The patent describes and claims several methods and procedures for applying images to metal panels and other building coverings.

1.2 Section Includes

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the custom metal panels incorporating images and or lettering as shown on the drawings including but not limited to the following:

1. IMAGEWALL custom architectural metal panels, imaging and associated trimless edges and panel work.
2. IMAGEWALL is the basis of design.

1.3 Related Sections

A. 05 1200 – Structural Steel

B. 05 5000 – Metal Fabrications

1.4 Quality Assurance

A. Qualifications of Installers:

1. Use a single source installer with a minimum of five years of experience with artwork, custom architectural metal work or similar high quality finish products which is thoroughly trained and experienced in the skills required and completely familiar with the material science of sheet metal as well as the requirements established for this work.
2. For panel installation, allow only competent and skilled workers vetted by or in the employ of the installer. The crews must be completely familiar with the products and the manufacturer's currently recommended methods of installation.

B. Electronic Files
    1. Electronic imaging files will be provided by the Architect. The General Contractor is responsible for providing field verified dimensions and reference points as the basis for the files. The density of the perforation will be determined by the manufacturer of the panels and submitted to the Architect for review and approval.
    2. The General Contractor shall be responsible for the coordination of all electronic files provided by the Architect. File compatibility with the fabrication software is the sole responsibility of the Architect.

1.5 Performance Criteria
A. Structural Design: Panel system shall be capable of resisting typical interior positive and negative forces.

1.6 Submittals
A. Manufacturer's Data: Submit for information only, metal manufacturer's specifications, installation instructions, operations and maintenance instructions and general recommendations.. Include manufacturer's certification or other data substantiating that the materials comply with the requirements. Indicate by copy of transmittal that the Installer has received a copy of the manufacturer's instructions and recommendations.
B. Samples: Submit samples at least 6" square of each specified metal and gauge to be used. Samples will be reviewed by the Architect for compliance with the Architect's control samples relative to thickness, texture and finish requirements. Compliance with all other requirements is the exclusive responsibility of the Contractor.
C. Shop Drawings: Submit 3D electronic model or shop drawings of the metal panel system including all installation layouts and all details necessary to inform the installation process.
D. Shop drawings should be coordinated and show surrounding work, and should be promptly updated throughout the project as architectural drawings and shop drawings from other trades are updated.
E. Structural calculations should be signed and sealed by a licensed Professional Engineer.

1.7 Product Handling
A. Deliver materials and products in unopened factory labeled packages. Protect packages from all possible damage including tarping to protect from exposure to weather.
B. Store and handle in strict compliance with manufacturer's instructions and recommendations.
    1. Stack materials inside on platforms or pallets, covered with tarps or other suitable weathertight but ventilated covering allowing for fee airflow around covered material. Protect from exposure to site airborne debris.

2. Require all personnel to wear clean white cotton gloves when handling and installing architectural metal panels.
3. Do not store panels in contact with other materials that might cause staining, denting or other surface damage.

C. Protection: the General Contractor is responsible to use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

D. Replacements: In the event of damage, immediately make all repairs and replacements necessary at the sole cost of the responsible party.

1.8 Guarantee

A. Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Architect a written guarantee signed by the Panel Installation Contractor guaranteeing that the work was installed per the drawings and the manufacturer's instructions and that the installed panels will remain intact for a period of at least five years.

B. Manufacturer to provide a separate guarantee that the panels were fabricated to meet the drawings requirements and if properly maintained will not crack, peel, delaminate or fail structurally for a period of at least five years.

Part 2 Products

2.1 Materials

A. IMAGEWALL Panel System:
1. IMAGEWALL, 1400 E. Ninth Street, Kansas City, MO, 64106. (816) 423-8326.
2. Custom architectural metal panel system with perforation pattern as required.

B. Panel Materials to consist of :
1. Aluminum: 1/8 inch thick, clear anodized finish.

C. Hardware System:
1. Screen system: Steel frame, mullions, drop locks.

D. If there is a protective film, the temporary film must be removed immediately upon installation.

E. All panels to be designed, engineered and fabricated in the panel manufacturer's plant and finishes applied by patina craftspeople experienced in the handling of custom metal sheets.

F. All panel surfaces must be fully inspected and cleaned upon arrival at the panel manufacturer's plant to fully prepare the surfaces and edges for a multi-step fabrication process.

G. Face panels and attachments to be designed (in electronic models) and manufactured at manufacturer's plant. All components to be sequenced and numbered without visible notes on the surface to guide a seamless sequence of installation process.

H. Fasteners, including rivets, screws and bolts, shall be as recommended by the single source manufacturer.

2.2 Miscellaneous Materials

A. All other materials not specifically described but required for a complete and proper installation of complete custom panel system to be provided by the installer.

2.3 Dissimilar Metals Protections

A. Where possible, contact between dissimilar metal surfaces shall be avoided. Where contact occurs, notify the Manufacturer who shall advise the Customer how best to isolate the surfaces, as follows:
   1. Taping or gasketing with a non-absorptive material.

Part 3 Executions

3.1 Panel Fabrication

A. General: Custom fabricate sheet metal panels to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, geometry, metal thickness and other characteristics of the installation indicated. Fabricate sheet metal panels and accessories at the shop to the greatest extent possible.

B. Fabricate sheet metal wall panels to allow for expansion in running work sufficient to prevent buckling, damage and deterioration of the Work. Form exposed sheet metal work to fit over substructure without excessive oil-canning, buckling or tool marks.

3.2 Inspection

A. Examine the areas and conditions where the custom metal cladding is to be installed and correct any conditions detrimental to the proper and timely completion of the work. The substrate must be plum and true and capable of supporting the custom panel system without deflection or deformation. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

B. Verify field dimensions before fabrication. Notify Manufacturer of any discrepancy between field measurements and dimensions in the model.

3.3 Installation

A. General: Comply with panel manufacturer's instructions for assembly, installation and erection of custom metal panels.

B. Damaged Material: Remove and replace panels and component parts of the work which have been damaged (including finish) as directed by the Architect.

3.4 Cleaning and Protection

A. Remove protective film or interleave from exposed surfaces of metal panels promptly upon installation and in accordance with Manufacturer's recommendations and with care to avoid damage to finish.

B. Clean exposed surfaces of custom metal panel work promptly after completion of installation. Comply with recommendations of panel manufacturer.

C. Maintain installed custom panels in a clean condition throughout construction and ensure that cleaning by other trades in proximity to the

custom panels does not impart dust or debris on panels. Avoid spilling, dripping or splattering of cleaning solutions onto custom panels.

END OF SECTION

SECTION 14 2400
HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the furnishing and installation of one hydraulic passenger elevator.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 1200 - Structural Steel.
3. Section 05 4100 - Structural Metal Stud Framing.
4. Section 07 1326 – Self-Adhering Sheet Waterproofing.
5. Section 07 8116 – Cementitious Fireproofing.
6. Section 07 8413 – Penetration Firestopping.
7. Section 09 2900 – Gypsum Board Assemblies.

C. LEGAL HOISTWAY AND PIT ENCLOSURES - Pertinent sections including:

1. Clear plumb hoistway with variations not to exceed 1/4" at any point.
2. Bevel cants (15 degrees from vertical) over any rear or side walls ledges that project 12" or more into the hoistway.
3. Guide rail supports.
4. Install guide rail bracket supports. Verify adequacy with elevator manufacturer.
5. Cut and patch walls and floors, if necessary.
6. Blockouts for pushbutton stations, hall lanterns and position indicators.
7. Erect front hoistway wall after elevator contractor has installed hoistway entrances. Grout between walls and frames, if necessary.

8. Grout sills after installation.
9. Vent hoistways.
10. Pit ladders, buffer and rail load supports.
11. Smoke and Heat detectors required
12. Protect open hoistways and entrances during construction per OSHA regulations.
13. Protect cabs, entrances and special metal finished from damage after installation.
14. Pit support framing for jack cylinder and buffer loads.
15. Opening in hoistway wall for hydraulic piping; trench and backfill underground piping.
16. Hoistway shall be oversized and framed such as to permit a future rear opening at Owners discretion.

D. LEGAL MACHINE ROOMS:

1. Reinforced concrete machine room floor slab.
2. Lockable, self-closing machine room access doors.
3. Machine room ventilation and heating, if required by manufacturer or Code.
4. Adequate Lighting, Switch and GFI Receptacle.
5. Wall Mounted Class A-B-C Fire Extinguisher.
6. Smoke and Heat Detectors.

E. ELECTRICAL SERVICES:

1. Pit and machine room lighting and convenience outlets.
2. Three-phase mainline power feeders to terminals of each elevator controller unit, including protected lockable "off" disconnect switch (Copper conductors to terminals). Mainline disconnect switch to be located in sight of car controller.
3. Single-phase power feeders for car lighting, including individual disconnect at location shown on elevator shop drawings.
4. Dedicated telephone line to elevator controller.
5. Smoke and Heat Detectors.
6. Shunt trip device, mounted outside machine room, designed to interrupt power to the elevator machine room prior to application of water via sprinklers.

1.03 DEFINITIONS

A. In all cases where a device or a part of the equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many such devices as are required to complete the installation.

B. All equipment and installation practices shall be done in accordance with CCR, Title 8, Elevator Safety Orders, Group lV (Adopted May 2008).

1.04 DESCRIPTION

A. The work of this Section includes the complete and operational systems for one hole less hydraulic passenger elevator with motor and pump at bottom landing, adjacent to hoist way as indicated on architect's drawings.

TYPE:	Hole Less hydraulic passenger elevator
CAPACITY:	3500 Pounds
SPEED:	100 feet per minute
MOTOR CONTROL:	Solid-state
POWER CHARACTERISTICS:	3 phase, 60 hertz
STOPS:	2 stops in line
FLOORS SERVED:	1 - 2
TRAVEL:	13'- 0" (approx.)
HOISTWAY SIZE:	8'- 8" wide X 7'-0" front to back
PLATFORM SIZE:	7''-0" wide x 6'- 2" front to back
ENTRANCE SIZE:	3'- 6" x 7'- 0"
ENTRANCE TYPE:	Single Speed, Side Opening
DOOR OPERATION:	G.A.L. - MOVFR, master door operation (minimum opening speed 1-1/2 fps)
DOOR PROTECTION:	Infrared proximity with nudging
MACHINE:	Self contained submersible.
GUIDE RAILS:	Planed steel T's, sides and back
BUFFERS:	*Spring*
CAR ENCLOSURE:	As specified below
ENTRANCES:	Finished in # 4 Stainless Steel
SIGNALS:	Integrated plates with the following:
	Registration Lights: Car & Corridor
	Position Indicators: Digital in Car Station
	Lanterns: Car traveling type
	Communications: Hands-free telephone
	Finish: #4 Stainless Steel

ADDITIONAL FEATURES: Pit Ladder
Infrared Door Protection
Reduced Voltage Starting (Solid-state).

Non-proprietary Controls
3 months Free Service
California Fire Service
Independent Service Feature
Digital Car Position Indicator in C.O.P.

1.05 QUALITY ASSURANCE

A. Manufacturer - Company specializing in the manufacturer of elevator equipment with ten years minimum experience.

B. Installer - Company specifically authorized by manufacturer for installation of its products. Company must have minimum five years experience including documentation of past installations of similar design.

1.06 SUBMITTALS

A. Shop Drawings: Submit complete Shop Drawings, indicating controls, power, lighting, telephone, and piping diagrams. Include dimensioned plans of car, machine beams, guide rails, buffers and other components in hoistway, machine room with location of components arranged to clear passage through doors and access doors, and full height section through hoistway. Include details of elevator pit ladder, guide rail brackets, fire alarm detector enclosure and fixture drawings. Submit scaled drawings indicating elevation views of car operating panel and hall fixtures including position and directional indicators, hall-call key switch, hoistway access key switch, and emergency recall key switch. Elevation view of car operating panel shall identify each device on panel, indicating its function, manufacturer and model number of each component. Shop drawing shall indicate motor(s), hydraulic pumps, valves, controller, selector, and other component locations. Indicate rail bracket spacing and maximum loads imposed on guide rails requiring transfer to structure, individual weight of principal components and load reactions at points of support, loads on hoisted beams, clearances and over travel. In addition, indicate expected heat dissipation of elevator equipment in machine room.

B. Approval by Division of the State Architect:
   1. Submit to the Owner a complete set of guiderail drawings, calculations, signed and sealed by a structural engineer currently licensed in the State of California, and specifications for approval by the Division of the State Architect (DSA). Drawings must include attachment of the guiderails to

the structure.

2. Allow six months in the schedule for DSA review.
3. Respond to DSA comments and resubmit until final approval is received.

C. Fire Department approval of material and assembly submittal: Provide Class A fire rating submittal package for cab materials as required by code.

D. Product Data: Submit a complete materials list of items proposed to be provided under this section. Provide materials list together with Product Data for manufactured items.

E. Installation Instructions: Submit manufacturer's printed installation instructions.

F. Samples: Submit Samples indicating full range of colors and textures of finish materials specified, including 2-inch by 3-inch Sample of light-diffusing plastic ceiling panels.

G. Project Record Drawings: Submit 11-inch by 17-inch sheets.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Republic Elevator Company equipment **has been approved by DSA** for this project. Subject to compliance with requirements, other manufacturers offering products may be substituted with Architect approval one week prior to bid opening. If substitution is proposed CONTRACTOR shall be responsible for costs and time impacts of said substitution including the time of the ARCHITECT and any plan check costs.

2.02 MATERIALS AND COMPONENTS

A. General Requirement: Provide manufacturer's standard elevator systems that will comply with or fulfill the requirements of elevator schedule sheets at end of this Section or, at manufacturer's option, provide custom manufactured elevator systems that will fulfill requirements. Where components are not otherwise indicated provide standard components published by manufacturer as included in standard elevator systems and as required for a complete system.

B. Hole Less Hydraulic Jack Unit:

1. Plungers and Cylinders shall be accurately ground and polished steel.
2. Plungers shall be fitted with a heavy steel disk welded in place and provided with a suitable extended edge designed to prevent plunger from leaving the cylinder.
3. Cylinders shall be constructed of steel pipe of sufficient thickness and suitable for the operating pressure.
4. Each plunger and cylinder shall be installed plumb and shall operate freely with minimum friction.
5. Piping and Oil: Provide piping from power unit to cylinders, complete with necessary threaded or Victaulic fittings. Initial supply of proper grade hydraulic oil.
6. Rails: 15 lb. - T-section suitable for weight and travel.
7. Hydraulic Pump Unit: Submersible unit specifically designed for elevator use. Includes the following:

C. Tank - Integrated tank unit capable of holding required components and oil with 15 gallon reserve. Isolation pads.
1. Motor - Submersible, industrial quality - 3450 rpm, 3 phase.
2. Pump - Submersible screw type
3. Valve - Unit oil control valve/manual lowering.
4. Muffler - A blowout proof muffler to be installed in pipeline.
5. Seismic "Rupture" Valve shall be installed per Code.

2.03 ELEVATOR OPERATION: Simplex selective/collective.

A. Provide controller of programmable microprocessor type. All available options or parameters shall be field programmable. Programs to be non-proprietary and any programmers required shall be property of owner. Enclose in cabinet with hinged or removable door. Provide Solid-State starter.

2.04 SIGNALS

A. Illuminated hall button at each floor.

B. Car station with integrated phone speaker pattern.

C. Digital Position Indicator in cab.

D. All A.D.A. accommodations including Integrated hands-free telephone.

2.05 DOOR OPERATION

A. Doors on the car and at the hoistway entrances shall be power operated by means of a medium speed operator mounted on top of the car. The motor shall have positive control over door movement for smooth operation. Each car door shall be provided with an infrared proximity safety device to cause instant re-opening should any contact be made with an obstruction during the closing cycle.

B. Door operation shall be automatic at each landing with door opening being initiated as the car arrives at the landing and closing taking place after expiration of a time interval. A car door electric contact shall prevent starting the elevator away from the landing unless the car door is in the closed position.

C. Door close shall be arranged to start after a minimum time consistent with Handicapped Requirements from notification that a car is answering a hall call.

D. Doors shall be arranged to remain open for a time period sufficient to meet Handicapped Requirements.

E. The time interval for which the elevator doors remain open when a car stops at a landing shall be independently adjustable for response to car calls and response to hall calls.

F. An approved positive interlock shall be provided for each hoistway entrance which shall prevent operation of the elevator unless all doors for that elevator are closed and shall maintain the doors in their closed position while the elevator is away from the landing. Emergency access to the hoistway as required by governing codes shall be provided.

2.06 DOOR SAFETY DEVICE

A. A proximity-type door reversal device shall be furnished. Operation to be as follows:

1. The doors shall be prevented from closing from their full open position if a person comes within the zone of detection. The detection zone shall move with the doors and if a person or object enters the zone as the doors are closing, the doors shall reverse and re-open. The doors shall re-close after a minimal time interval. A passenger entering or leaving the cars shall not cause the doors to stop and reverse unless the doors reach a pre-determined proximity to the passenger.
2. After a stop is made, the doors shall remain open for a time interval to permit passenger transfer, after which the doors shall close automatically. This interval shall be less for a

car call stop that for a hall call stop or a coincidental car/hall car stop.

3. If the doors are prevented from closing for a fixed time period, the door protective device shall be rendered inoperative, a buzzer shall sound on the car and the doors shall close at approximately half speed. Normal operation shall resume at the next landing reached by the car.

2.07 HOISTWAY ENTRANCES (smoke containment-system compliant: ICC ESA C77

Size -	3'-6" x 7'-0".
Type -	Single Speed, Side Opening type.
Frames -	#4 Stainless Steel finish, 1 ½ hour UL "B" Rated.
Doors -	1 ½ hour UL Label – #4 Stainless Steel finish.
Sills -	Extruded aluminum.

2.08 CAR ENCLOSURE:

Front walls and transoms:	#4 Stainless Steel.
Car door:	#4 Stainless Steel on interior face.
Rear & Side walls:	Raised panels with plastic laminate finish.
Ceiling:	Aluminum frame with translucent panels at 7'-6".
Handrail:	2" cylindrical type, #4 Stainless Steel on back wall.

PART 3 EXECUTION

3.01 PREPARATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations for work required during installation.

B. Excavation for Jack: Drill excavation in elevator pit to accommodate installation of casing and plunger-cylinder unit.

C. Install PVC casing with waterproof seals at pit floor, and with waterproof, high-pressure seal at bottom of casings.

D. Install plunger units plumb and coordinated in alignment with shafts and hoistway entrances. Anchor securely in place at pit floor level, and permanently seal to prevent in-flow of ground water.

E. Coordination: Install hoistway entrances for elevator plumb with each other and aligned properly with hoistway. Install guide rails for uniform, close tolerance of car door with hoistway entrances. Install sills after car installation, and align with car sill.

F. Install piping without underground, where possible; where not possible, cover underground piping and joint with permanent protective wrapping before back-filling.

G. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

H. Lubricate operating parts of systems, including ropes, if any, as recommended by manufacturer.

I. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails, for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

J. Leveling Tolerance: 1/4", up or down, regardless of load and direction of travel.

K. Coordinate the grouting of sills with non-staining, non-shrink grout and the setting of units accurately aligned with and slightly above finish floor landings.

3.03 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon nominal completion of each elevator installation, and before permitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by Code and by governing regulations or agencies.

B. Notify Contractor, Project Inspector, Owner and Architect, in advance of dates and times tests are to be performed on elevators.

3.04 INSTRUCTION AND MAINTENANCE

A. Instruct Owner's personnel in proper use, operations and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.

B. Make a final check of each elevator operation, with Owner's personnel present and just prior to date of substantial completion. Determine that control systems and operating devices are functioning properly.

C. Maintenance Period: Provide 3 months of completed maintenance, starting from the date of final acceptance.

D. Continuing Maintenance: Provide a continuing maintenance proposal to Owner, in the form of a standard maintenance agreement, starting on date construction contract maintenance requirements is concluded. State services, obligations, conditions and terms for agreement period, and for renewal options.

END OF SECTION 14 2400

SECTION 21 1313

FIRE PROTECTION SPRINKLER SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:

1. Design, furnish and install fire sprinkler system for protection of buildings.

C. Related Sections: The requirements of this Section, NFPA 13 shall take precedence over requirements found in the following Related Sections:

1. Section 31 2333: Trenching and Backfilling.

2. Section 07 8413: Penetration Firestopping.

3. Section 07 9200: Joint Sealants.

4. Section 22 0500: Common Work results for Plumbing.

5. Section 26 4721: Fire Alarm System.

6. Section 33 1000 Water Utilities.

1.02 APPROVAL SUBMITTAL –Adhere to CBC 107.2.2, CFC 105.4.2.1, 901.2.

A. Approval Submittal Procedure:

1. Provide Deferred Approval Submittal including Drawings, Product Data and Hydraulic Calculations of complete automatic wet pipe fire sprinkler system, in compliance with Ventura County Fire Dept. requirements of the "Fire and Life-Safety Plan Review Submittal Guideline for Automatic Fire Sprinkler Systems (AFSS)". Drawings and Hydraulic Calculations shall be stamped and signed by a Mechanical Engineer or Fire Protection Engineer currently licensed in the State of California.

a. Submit to the Architect for review:

1). One (1) CD containing electronic files of Drawings, Hydraulic Calculations and Product Data.

2) Three (3) sets of Drawings, Product Data and Hydraulic Calculations.

b. Submittal and any required resubmittal to the Architect shall be in accordance to Section 013300, Submittals procedures.

c. Once the Architect marks the submittal "reviewed", the Architect shall submit the Drawings, Product Data and Hydraulic Calculations to the DSA.. for approval.

d. If required make necessary corrections to meet Ventura County Fire Dept. approval and resubmit to Architect.

B. Manufacturer's Data:

1. Submit complete and detailed equipment and material list of items to be furnished and installed under this section.

2. Submit manufacturer's specifications and other data required to demonstrate compliance with specified requirements.

C. Drawings and Hydraulic Calculations:

1. Design wet pipe fire protection sprinkler system in accordance to NFPA 13, 2016 CBC/CFC Standard for the Installation of Sprinkler Systems, by hydraulic calculations for uniform distribution of water over design area.

2. Drawings shall fully comply with the most stringent provisions of this specification, applicable codes and standards.

3. Drawings shall be same size as the Contract Drawings and shall be produced using AutoCAD.

D. Regulatory Requirements:

1. Installation of fire sprinkler system shall not start until Approval Drawings have been stamped approved by the DSA.

E. Closeout Submittals: Submit in accordance to Division 1, Closeout requirements as specified herein:

1. Record Drawings:

a. Record drawings of installed Work shall be maintained current on the Project site, available for Fire Inspector and the IOR to review.

b. At completion of installation submit to the Architect Record Drawings signed by installing Contractor and Record Drawings in AutoCad format, including:

2. Record Specifications.

3. Record Product Data: Include specific model, type and size for all equipment and material installed.

4. Record Samples.

5. Maintenance Manuals.

1.03 QUALITY ASSURANCE INSPECTION / INSTALLATION CBC / CFC

A. Comply with all applicable national or local codes and standards.

B. Except where exceeded by the requirements of these specifications, the following are made part of this section: approved prints and details, and all provisions of the NFPA 13 Standard for Installation of Sprinkler Systems.

C. Qualifications of Manufacturer: Products used in work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a 5 year history of successful production that is acceptable to the Architect.

D. Qualifications of Installer: Installer shall have a current C-16 license in the State of California in the installation of fire sprinkler systems.

1.04 FIRE SERVICE WATER CONNECTION

Section 331000 Site Water Distribution System.

A. The Owner shall pay fees and provide for the fire main POC (point of connection), consisting of the installation of a single detector check valve (if one is required) and meter shut off valve inside a meter vault.

B. All Fire Service Mains shall be provided with approved Meter Service Backflow protection. An approved Reduced Pressure Principle Backflow Prevention Assembly (RP) to meet minimum backflow protection requirements for meter service protection (MSP) shall be provided on the fire main, according to the California and Uniform Plumbing Code (CPC and UPC) 603.4.16 and according to the CFC 912.6, CBC 903.3.5 & current City of Los Angeles Water and Power Service. (See section 202.D. for approved backflow assemblies.) Double Check Assemblies shall only be used with the written approval of the Water Purveyor.

-Existing to include Annual Test Report.

1.05 PRODUCT HANDLING

A. Comply with the provisions specified in Sections 220500 and 220513.

1.06 COORDINATION

A. Coordinate activities in accordance with provisions of Section 220500.

1.07 JOB CONDITIONS

A. Unscheduled utility flow interruptions are not permitted. Schedule all service interruptions in advance, with the owner.

1.08 EXTRA MATERIALS FOR MAINTENANCE

A. Provide spare sprinkler heads in quantity equal to 2% of total number of each type of sprinkler head installed. There shall be no less than 2 heads of each type and temperature rating provided, and in no case less than 6 spare sprinkler heads per building. There shall be no fewer than 6 spare sprinkler heads for up to 300 sprinkler heads installed; no less than 12 spare sprinkler heads for up to 1,000 sprinkler heads installed; and no less than 24 spare sprinkler heads for the sites with more than 1,000 sprinkler heads installed. Spare sprinkler heads shall be kept inside of spare sprinkler head box(s). A spare sprinkler wrench for each type of sprinkler head shall also be provided inside of each spare sprinkler head box, at each building. Locations of spare sprinkler boxes shall be located at:

1. Fire Sprinkler Riser, when enclosed and secure.

PART 2 - PRODUCTS

2.01 FIRE PROTECTION SYSTEM DESCRIPTION

A. General: Provide systems complete including, but not limited to:

1. Provide underground and above ground sprinkler piping including trenching and backfilling. All materials and equipment shall be UL/FM listed and/or approved as required by NFPA for their application. All required signage shall be provided and installed as required by NFPA 13, Chapter 10, NFPA 24.

2. Provide overhead sprinkler system with sprinklers installed as required according to type, location and temperature rating.

B. Sprinkler Heads:

1. Provide chrome pendant spray type sprinkler heads with matching escutcheons in areas with finished ceilings. Exterior escutcheons shall be poly-coated or concealed type to prevent rusting and oxidation.

2. Provide upright sprinklers in areas with exposed piping.

3. Provide poly-coated glass bulb type sprinklers (for corrosion resistance) in areas exposed to a corrosive environment such as parking garages and coastal air.

4. Sprinklers shall be glass bulb type, with hex-shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation,

5. Sprinklers in concealed spaces, exterior locations, and any other areas which will experience over 100 degrees F ambient temperature shall be furnished with 200 to 225 degree rated sprinklers. Sprinkler heads in boiler rooms, furnace rooms, or heater rooms shall be furnished with sprinklers rated at 250 to 290 degrees F. If a sprinkler is directly affected by a spotlight, steam, or other heat source, a 350 degree F or higher sprinkler head shall be furnished. Sprinkler heads in all other locations, unless otherwise noted, shall be 155 to 165 degrees F rated.

6. Automatic fire sprinkler head type shall be as follows:

7. Sprinkler heads in light hazard occupancies are required to be Quick Response sprinklers as required in NFPA 13. Sprinkler heads shall be of the same manufacturer throughout the building/site as indicated. Sprinklers shall typically be ½ inches NPT, standard orifice, minimum 5.6 nominal K factor, UL listed for 175 psi, and listed for light and ordinary hazard occupancies.

8. Other specialized sprinkler heads such as walk-in refrigerator or freezer heads, side wall, ¾ inches sprinklers above 5.6 K factor, and those sprinklers with a K factor below 5.6, shall only be used where required by project condition. Large drop sprinkler heads and extended coverage sprinkler heads shall not be installed.

9. Sprinkler head location shall be designed and installed in an aesthetically pleasing manner and should generally be located in center of 24"x24" ceiling tiles and in center of 24"x48" ceiling tiles in the 24" direction and no closer than 12" from the edge in the 48" direction.

10. UL/FM listed Sprinkler head guards shall be provided on Sprinkler heads installed at 7'- 6" above floor or lower in exposed locations, or that are deemed subject to damage. Sprinkler head guards shall securely fasten with bolt-on feature to the base of the sprinkler or be a factory installed guard. Guards shall also be provided on upright and sidewall heads where sprinklers are installed at 7'-6" heights or lower.

C. Fire Sprinkler System:

1. Underground piping: Comply with the requirements of Section 33 1000, Water Utilities.

2. Provide an underground UL/FM listed PVC or Ductile iron supply line connected to detector check meter or water main as indicated. Install site water mains no closer than 10'- 0" parallel to the building foundations. Underground fire water lines shall be installed 36 inches below grade. Tracer wire shall be installed in accordance with Section 331000: Site Water Distribution Systems.

3. Fire Department Connection (FDC) with check valve (wafer type) shall be provided after the backflow preventor, and before the building fire sprinkler riser(s), located where the FDC will be accessible to the fire department from the street or sidewalk without obstructions. No shut off valve shall be allowed on the FDC line as per NFPA 13. FDCs shall have a height between 2'- 0" and 4'- 0" above the ground. Fire Department Connection shall be installed in accordance with the NFPA standard applicable to the system design and shall comply with Section 912.2 through 912.7.

4. PIVs shall be electrically supervised regardless the number of fire sprinkler served (CBC 903.4), and set at a height of 3'- 0" to the top and have the handle locked in place with a break-a-way lock. (Not Applicable).

5. Provide a UL listed, FM approved FDC, approved RP type backflow assembly, check valves, shut-off valves, drain valves, ITV, and flow indicator at the locations required. (Test-and-drain combination valves are prohibited.)

6. Flow indicator shall activate the fire alarm system between 45 and 90 seconds, and activate a local alarm on the outside of the building continuously with water flow. Connection of this switch is a part of the Work of Division 26. All shut-off including valves on the fire main backflow preventor shall be electrically supervised according to CBC 903.4,, NFPA 13 and Section 26 4721 – "Fire Alarm System".

7. Pipe through ceilings at head locations shall be furnished with a two piece, or fully concealed escutcheon. Unless otherwise designated, escutcheons shall be identical and match the other escutcheons of the same type throughout the building or site. Piping through walls and ceilings shall have a split ring chrome escutcheon.

   a. Flexible stainless steel sprinkler head drop system may be used. Flexible drops shall be UL listed, FM approved, and shall be compatible with ceiling systems. Flexible drop length shall be included in the Hydraulic Calculations. The drop system shall include the required support bracing.

8. Furnish and install all required signs, spare heads, special wrenches, and spare sprinkler head boxes as required to satisfy NFPA 13, and this specification.

9. Sprinkler system piping shall be provided with complete drainage as required by NFPA. Inspector's test valve discharge shall be piped away from planters to asphalt areas. Furnish protection of piping against accidental or malicious damage.

10. Upon completion of the Work of this section, and before Substantial Completion, subject system, including underground supply connection, to tests required. A minimum hydrostatic test shall be two hundred pounds (200 psi) or fifty pounds (50 psi) in excess of the maximum system working pressure, whichever is greater, for two hours with no leaks or loss of pressure per NFPA 13. The inspector shall be furnished with a NFPA 13 test certification.

11. Local fire sprinkler alarm requirements shall be accomplished with a vane or paddle type (Potter Roemer VSR-F) water flow detector switch and an electrically powered fire sprinkler horn located on the street side of the building and connected to the fire alarm control panel with 24/110V secondary power provided from the fire alarm batteries. Time delay shall be set at 45 to 60 seconds.

12. Seismic separation assemblies shall be located between the buildings if space allows accessibility. Otherwise they shall be located inside the building providing the most space. Swing joints may be fabricated on site using flexible groove couplings and 6 (six) grooved (Victaulic) 90 degree elbows in a teepee formation (see NFPA 13, figure A.9.3.3). Seismic separation assemblies can also be made utilizing a manufactured, UL/FM listed swing joint assembly rated at a minimum 175 psi.

13. Hanging, bracing and support shall utilize only UL/FM listed approved products, and comply with NFPA 13, Chapter 9

requirements for rod and bolt sizes except for the following: 4 and 6 inch pipe shall be supported by a minimum ½ inch hanger rod, 8 inch pipe shall be supported by a minimum 5/8 inch hanger rod, 10 and 12 inch pipe shall be supported by a minimum ¾ inch hanger rod. Hanger rods in exterior locations and in parking structures shall have Electrodeposited Zinc Coating per ASTM B633 to prevent rusting.

14. Building Fire Sprinkler riser assemblies shall be provided as follows. Every building shall be provided with an accessible and electrically supervised riser shut off valve at a height not to exceed 5'- 0" above the floor. Every building riser assembly shall be equipped with a check valve followed by a main drain valve and then the flow indicating switch and pressure gauge immediately after the shut-off valve. In cases where a riser assembly is provided for each floor in the building, a check valve, main drain and flow switch shall be provided for each floor; the main building shut-off shall not be required. An electrically supervised Post Indicator Valve located outside the building may serve as the building riser shut-off valve.

2.02 MATERIALS

A. Access Panel:

FAP-1 Square, steel, prime-coated, with vandal-proof door lock operated by Allen wrench:

Smith	Josam	Elmdor
4760		DW – AKL

B. Globe or Angle Valves: UL/FM listed.

AV-1 Bronze angle valve: 2 inches and smaller, screwed-in bonnet, threaded ends, rising stem:

Nibco	Kennedy	Fairbanks	United
T-301	98 SD	0210	126T

C. Automatic Fire Sprinkler Head, UL/FM listed:

AFSH-1 Brass upright type for areas with exposed ceiling:

Victaulic	Tyco	Viking	Reliable
V27	TY3131	VK300	F1FR300

AFSH-2 Fully concealed type sprinklers; for areas with suspended ceiling: chrome cover:

Victaulic	Tyco	Viking	Reliable
V38	TY3531	VK462	F4FR
		VK404	G4A

D. Backflow Prevention Assemblies:

BPV-1 Approved Reduced Pressure Principle Backflow Prevention Assembly (RP) type for meter service protection (MSP) requirements:

Ames	Febco	Watts	Wilkins
4000SS	860 OS&Y	909 RP	975 RP
C400	880 OS&Y	957 RP	375 RP
M400		994 RP	375 DA

BPV-2 Approved Reduced Pressure Principle Detector Assembly (RPDA) for MSP requirements:

Ames	Febco	Watts	Wilkins
5000SS	860 DA	909 RPDA	950 DA
C500	880 DA	957 RPDA	350 DA
M500		994 RPDA	

E. Gear Operated Butterfly Valves: (Not Applicable).

GOBFV-1 Grooved end Gear Operated Butterfly Valve, 300 psi, for fire protection sprinkler risers. UL listed, FM approved, with weatherproof gearbox and double pole/double throw monitor switch, double seal design for bubble tight shut off at 175 psi. Corrosion-resistant, fusion-bonded nylon II body coating, easy to read position indicator:

Kennedy	Nibco Tyco	Victaulic	
Figure 82M	GD-4765-8N, 580	705W	
	300 psi 300 psi	300	psi

GOBFV-2 Wafer Type Gear Operated. Butterfly Valve, same requirements as GOBFV-1:

Kennedy	Nibco	UL/FM or Equal
Figure 82W	WD-3510, 300 psi	

F. Check Valves:

CV-1 Bronze check valves: 2 inches and smaller, 200 psi WOG, bronze disc, swing type, conforming to MSS-SP-80-97, threaded ends:

Crane	Nibco	Stockham
	United	
37	T-433-Y	B-319
	62T	

CV-2 Iron check valves: 2-1/2 inches and larger, class 175, composition disc, swing type, bolted cap, UL listed, FM approved flanged ends:

Stockham	Kennedy	Tyco
	Clow	
G-940	126	Model G
	F5380	

CV-3 Wafer Type Check Valve:

United Wafer Check #90 Nibco KW-900-W Mueller A-2102

CV-4 Grooved Check valve 2 ½ inch and larger:

United	Gruvlock	Reliable	Victaulic
Tyco			
67	7800	Mode "G"	Series 717
590F			

G. Escutcheons

ES-1 Chrome plated, or white poly-coated, 2-piece canopy (escutcheon), 2.25 to 3.5 inches in extended position:

FPPI	Tyco	Reliable
01 - 401	No. 401	HBC (chrome)
Chrome or	Chrome or	HBW (white)
White	White	

ES-2 Chrome plated or white poly coated, 2-piece recessed:

FPPI	Tyco	Reliable (semi recessed)
01 - 400	410	GF2-C (chrome)
01 - 402	420	GF2-W (white)

H. Fire Department Connections:

FDC-1 UL listed, FM approved, type, 4 inch x 2-1/2 inches x 2-1/2 inches bronze body fire department hose connection (FDC):

Crocker	Potter-Roemer Powhaten	Tyco	
6405 or 201 or 6420 133	5710 or 5730	86	21- 31-

I. Flow Indicators:

FIA-1 Listed by State Fire Marshal, with double pole, double-throw switch, one normally open and one normally closed, UL listed and FM approved:

Potter-Roemer VSRF Series	Notifier WFR Series	or Equal

J. Outside Stem and Yoke Gate Valves: (Not Applicable).

OS&Y-1 Bronze Gate Valves: 2 inches and smaller, class 175, solid bronze wedge disc, OS&Y, copper silicon alloy stem, UL/FM listed, threaded ends:

Stockham	Crane	Nibco	United
B-133	459	T-14	18

OS&Y-2 Iron gate valves: 2-1/2 inches and larger, class 175, IBBM, OS&Y, solid wedge disc, Teflon-impregnated packing, UL/FM listed, flanged ends:

Stockham	Crane Victaulic	Kennedy	Mueller	
G-634	467	68	A-2073	771

OS&Y-3 2 ½ inch and larger, epoxy coated, resilient wedge, 175 lbs. gate valve (for riser valves, P.I.V., and shut off:

Clow	Nibco	Kennedy	Mueller
F-6136	617-0	KV-4068	A-2360

K. Gate Valves:

GV-1 Bronze gate valves: 2 inches and smaller, class 175, solid bronze wedge disc, rising stem copper silicon alloy stem, UL/FM listed, threaded ends:

Stockham	Crane	GrinnellUnited
B-133	459	Fig. 66 14

GV-2 Iron gate valves: 2-1/2 inches and larger, class 175, IBBM, solid wedge disc, Teflon impregnated packing, UL/FM listed, flanged ends:

Stockham	Crane	Kennedy	Mueller	
	Victaulic			
G-634	467	68	A-2052	772

L Gear Operated Ball Valves:

GOBV-1 Threaded ball valve for sizes 2" (two inches) and smaller:

Nibco KT-505W-4 Victaulic 728 UL/FM listed or Equal

M. Seismic Swing Joints:

SJ-1 UL/FM Approved flexible seismic connector with grooved, or threaded ends for seismic separation requirements.

SJ-2 Fabricated swing joint as per NFPA 13 using six groove 90 degree elbows and flexible groove couplers such as Victaulic style 75.

N. Post Indicator Valves:

PIV-1 Vertical Indicator Posts: Furnished for underground valves, post must provide a means of knowing if the valve is open or shut, UL/FM listed. (Where a backflow assembly is provided, the shutoff valves on the backflow preventer satisfy the requirement for a post indicator valve to control the fire main and FD Connection):

Stockham	Kennedy	Grinnell
G-951	2945	F-750

Clow	Mueller	Victaulic
F-576	2945	774

PIV-2 Posts Indicator valve: Furnished for underground valves. Ductile iron

fusion bonded epoxy coated resilient wedge gate valves: 4 inches and larger, class 175 lb, non-rising stem, mounting plate for indicator post, UL/FM listed, flanged or mechanical ends (in accordance with NSF 61).

Stockham G-635	Kennedy 71X	Clow F-6100
Mueller 2360	Victaulic 772	

O. Sprinkler Guards:

SPG-1 Sprinklers installed at 7'- 6" above floor or lower in exposed locations, or that are deemed subject to damage shall be equipped with a UL/FM listed, head guard. Guards shall be listed, supplied and approved for use with the sprinkler by the sprinkler manufacturer. Sprinkler head guards shall securely fasten with bolt-on feature to the base of the sprinkler or be a factory installed guard. Guards shall also be provided on upright and sidewall heads where sprinklers are installed at 7'-6" heights or lower.

Reliable Viking Tyco FPPI Victaulic

P. Sprinkler Horn:

SPH-1 UL/FM approved, surface-mounted, weatherproof and red finished:

Horn: equal HRK System Sensor 24 V-DC Weatherproof with BBS-2 back-box for surface mount	Bell: SSM-24-10 System Sensor 24 V-DC Weatherproof with WBB box for surface mount installation	Wheelock

Q. Hangers, Supports, Bracing:

HSB-1 Tolco products or UL listed and FM approved equal.

R. Threaded fittings:

TF-1 Ductile iron, 300 psi rated, UL listed, FM approved and/or NFPA approved

TF-2 Cast iron fittings, 175 psi rated, UL listed, FM approved and/or NFPA approved:

Anvil Ward Equal

TF-3 Mallable Iron, 300 psi rated, UL, Listed, FM approved and/or NFPA approved

TF-4 Galvanized, 175 psi rated, UL Listed, FM approved, and/or NFPA approved

S. Fire Sprinkler Pipes:

FSP-1 Fire sprinkler pipe – 1" thru 8" Schedule 40 black steel pipe, /or galvanized steel meeting ASTM Standards A53, A135, and/or A795. Pipe Corrosion Resistance Ratio (CRR) shall be 1.00 or greater. Pipe may be threaded or grooved.

a. Piping 2 inches and smaller shall have threaded joints and fittings in all concealed, non-accessible locations. Groove coupler connections (Victaulic or equal) on pipe sizes 1 inch through 2 inches are acceptable in all accessible areas with all required seismic bracing provided. Plain end connections such as "Plainlock" and "FIT" are prohibited.

b. For pipe sizes 2 ½ inches and larger, grooved type (Victaulic or equal), welded, threaded and flanged connections may be used. Any connection that does not utilize a threaded, welded or grooved connection is prohibited, except for mechanical tee bolt-on branch outlet fittings sizes 2 inches and smaller (Victaulic 920 and the 920N).

c. Submit Verification from manufacturer stating that piping material furnished meets above criteria; (i.e.: threadable pipe has a UL assigned CRR of 1.00

minimum, that it meets ASTM A53, A135 or A795, and it is UL listed, FM approved, and/or NFPA approved.)

FSP-2 Dyna-Thread, Eddythread, or Super 40, commonly referred to as Schedule 30 threadable, meeting ASTM A135, A795, and/or A53, may be used for pipe sizes 2" and smaller. Pipes shall provide a CRR of 1.00 or greater per UL Listing. Pipes 2" and smaller shall be by only one manufacturer. (Not Applicable).

FSP-3 Ductile iron pipe, AWWA C151 (for pipes below grade). Gasketed self retaining joints per ASME/ANSI B16.4.

FSP-4 Plastic, PVC, thickwall (cast iron OD sized), DR 14 (200 PSI). UL listed for fire main service (underground). Gasketed self retaining joints - Johns Manville Blue Brute AWWA C900, or equal.

FSP-5 Fire Sprinkler Pipe – 1" Thru 3" Copper meeting NFPA 13 Standards. Pipe may be grooved.

FSP-6 Flexible Fire Sprinkler Head Connectors – 1" pipe size flexible stainless steel fire sprinkler head connectors "Flex Head Industries" Models 2024, 2036, 2048, 2060 and 2072.

2.03 ACCESSORIES AND APPURTENANCES

A. Escutcheons: Polished chrome plated split-ring type for exposed piping at every penetration inside finished rooms.

B. Guards: Provide sprinklers with guards as required in 7'- 6" ceilings and where required by the Architect.

C. Miscellaneous: Provide all other accessories and appurtenances required for a complete system.

2.04 FIRE PUMP (Not Applicable).

A. Schedules:

Pump Model:	Product type:	Capacity:	Head:	Horsepower:	Temp.
Peerless B-1500	Vertical fire pump	250-5000 Gpm	92 to 1,176 Ft.	Up to 600 HP	Up to 115 F.

Pump Model:	Product type:	Capacity:	Head:	Horsepower:	Temp.
Peerless B-1500	In-Line fire pump	50 – 500 Gpm	Up to 406 Ft.	Up to 75 Hp	Ambient within limits

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which Work of this section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove all burrs. Bevel or groove all plain end ferrous pipe ends.

B. Remove scale and foreign matter, from inside and outside of pipes, before assembly.

C. Provide piping connections to equipment with flanged or grooved connections.

3.03 INSTALLATION

A. Install underground supply line connected to detector check or water main indicated. Braced or clamped bends shall be in accordance with requirements of NFPA 24. Provide vertical clamp rods at flange and spigot piece of risers, long enough to pass through riser's base flange where required. Furnish concrete thrust blocks where required. Tracer wire shall be installed as per Section 15075: Mechanical Identification on all PVC underground piping.

B. Pipe through floors, wall, and ceilings, at head locations, shall be furnished with required sleeves, and escutcheons and fire caulking where indicated and/or required by code. Escutcheons shall be polished chrome plated unless other finish is selected by the Architect.

C. Sprinkler system shall be provided with complete drainage facilities in accordance with CBC standards. Drain discharge may discharge into a sewer, storm drain, sump pit or street gutter. Fire sprinkler drains shall not discharge onto a playground or across a sidewalk. Discharge to any plumbing fixture is

prohibited due to the inability of a plumbing fixture to receive a full flow of water from a fire sprinkler drain valve under working pressure.

H. Upon completion of the Work of this section, and before Substantial Completion, subject the entire system, including underground supply connections, to tests as required by CFC 901.2.1 Statement of comply required for Final Testing Request NFPA 13, and CBC standards and furnish the Owner with a certificate of compliance as required.

I. Close nipples are prohibited. Threaded unions are prohibited. Where a threaded union or coupling is needed, a groove type fitting (Victaulic or equal) shall be used instead. If a groove style coupling is used in a concealed area, an access panel allowing full access to that connection shall be provided.

J. Fire sprinkler systems piping hangers, seismic bracing, anchors and supports shall conform to all NFPA 13, CBC and all other applicable codes and the requirements of this specification.

K. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer.

L. Tee branch outlets on fire sprinkler mains shall be by the use of a threaded ductile iron tee fitting, a groove type tee fitting, (Victaulic or equal), or by the use of a thread-a-let welded on by a certified welder as required by NFPA. Mechanical tee bolted branch outlet fittings are prohibited except for branch outlet sizes 2 inches and smaller.

M. Sprinkler lines within the building shall be concealed within the structure. Risers shall be installed in utility, supply rooms or similar service areas whenever possible, and shall not obstruct access, or maintenance of other equipment within the space. Mains and risers shall be located within the area protected by the sprinkler system unless otherwise approved by fire authorities having jurisdiction.

N. Sprinklers that have been dropped, damaged, have cracked bulbs, or show a visible loss of fluid shall not be installed.

O. Sprinkler bulb protectors shall be removed by hand after sprinkler installation. Tools or any other device to remove the protector that could damage the bulb in any way shall not be used.

P. Routing of piping in non-concealed exposed areas shall be subject to the Architect's approval in the final shop drawings.

D. Underground piping shall have a minimum of 36 inches of cover to grade. Underground pipe shall be installed on a flat undisturbed sand bed. After required pressure-leak test, pipe shall be covered with sand not less than 6 inches thick, before backfilling. Comply with all NFPA Standards.

E. Provide approved backflow prevention assemblies as required. Installations of backflow prevention assemblies shall be tested and certified by a certified Ventura County backflow prevention device tester prior to Substantial Completion. Tests shall be performed in the presence of the IOR. Test reports shall be turned over to the IOR for mailing to proper agency. (Not Applicable).

F. Provide shunt trip when sprinklers are installed in the elevator machine rooms and elevator hoist way unless the sprinklers are located 2 feet or less from the hoist way pit floor.

G. Inspectors test valve (ITV) shall be located at the opposite end of the sprinkler system from the supply. Test-and-drain type combination valves are prohibited. ITV discharge and main drain lines shall be piped to a sump pit or to the outside of the building to within a foot from the ground where it will drain away from the building to an exterior storm drain.

H. Each building with a sprinkler riser shall be furnished with an accessible shut off riser valve installed no higher than five feet from the finish floor. Each floor shall have a separate shut off valve with flow switch, and shall be securely enclosed or secured with a chain and break-a-way lock. Also see section 2.01- C-12 of this specification.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.05 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose at off-project site.

- Certificate of Completion per NFPA 13, 24, 72.

- Coordinate Commissioning Systems.

END OF SECTION

SECTION 22 0500

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic Mechanical Requirements specifically applicable to Division 22 Sections, in addition to the general requirements.

B. Plumbing work includes the following: furnish and install all piping and plumbing fixtures shown on the plumbing, mechanical, architectural, and civil engineering drawings and described in these specifications. In connection with this work, contractor shall also furnish and install all necessary work, devices, hardware and systems required to make said systems properly and safely operable, including, but not limited to, mounting hardware, framing, insulation, valves, flashing, cleanouts, cutting, concrete coring and cutting, patching, and fixture insulation.

1.2 WORK SEQUENCE

A. Install work in phases to accommodate District's construction requirements. Refer to Architectural, Structural, Civil, 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. During the construction period, coordinate mechanical schedule and operations with General Contractor and any other related subcontractor.

1.3 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the District's option. Accepted Alternates will be identified in District-Contractor Agreement.

B. Coordinate related work and modify surrounding work as required.

1.4 SUBMITTALS

A. Submit the following:

B. Proposed Products List: Include Products specified in the following Sections:

1. Division 22 - Plumbing.
2. Division 23 - Mechanical.
3. Project Drawings.

C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

D. Equipment and materials shall be ordered only after satisfactory review by District and Engineer.

E. The following statement applies to all items reviewed: "Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for dimensions which shall be confirmed at the job site; fabrication processes and techniques of construction; coordination of his work with that of other trades; and the satisfactory performance of his work."

F. California Division of State Architect (DSA) Interpretation of Regulations.

G. Contractor shall clearly mark the submittal sheet as to which model number, size, color, etc. when there is more than one choice available.

H. Maintain a complete set of the most current reviewed submittal and shop drawings on site during construction.

I. Submittals shall have Table of Contents organized by specification section and shall clearly identify electrical characteristics, options provided, color, model number and equipment tag as indicated on the drawings.

J. College Standards for materials and equipment are available from Moorpark College Facilities Department. Materials listed as District Standards have been chosen in order to match other products already in use within the district as required for maintaining serviceability and spare parts in compliance with the California Public Contract Code.

1.5 REGULATORY REQUIREMENTS

A. Conform to 2016 California Building Code.

B. Fire Protection: Conform to 2016 California Fire Code, and California State Fire Marshall Regulations, Title 19, Public Safety.

C. Plumbing: Conform to 2016 California Plumbing Code.

D. Mechanical: Conform to 2016 California Mechanical Code.

E. Electrical: Conform to 2016 California Electrical Code.

F. Obtain approved inspections from authority having jurisdiction.

G. Conflicts: Where conflict or variation exists amongst Codes, the most stringent shall govern.

1.6 PROJECT / SITE CONDITIONS

A. Install work in locations shown on drawings, unless prevented by project conditions.

B. Prepare coordination drawings showing proposed arrangement of work to meet project conditions, including changes to work specified in other Sections. Coordinate with all other trades and existing structure.

C. Piping Locations: Piping locations shown are diagrammatic only. Contractor shall verify locations of all lateral stubs, vent locations offsets, etc. required in the field. The actual locations of piping, cleanouts and connections may vary to avoid conflicts, or a more efficient route is determined provided that complete systems are installed in compliance with applicable codes.

D. Construction Observation: In addition to the requirement for obtaining inspections by DSA and the local jurisdiction, Contractor shall notify Engineer at appropriate times during the construction process so that Engineer can visit site to become generally familiar with the progress and quality of Contractor's work and to determine if the work is proceeding in general accordance with the contract documents.

E. Scaling of Drawings: In no case shall working dimensions be scaled from plans, sections, or details from the working drawings. If no dimension is shown on the architectural drawings, the prime Contractor shall request in writing that the Architect or the Engineer provide clarification or the specific dimension.

1.7 QUALITY ASSURANCE

A. Qualification of Manufacturer: Products used in work shall be produced by manufacturers regularly engaged in the manufacture of similar items.

B. Qualification of Installer: Use adequate number of skilled workmen, thoroughly trained and experienced in the necessary crafts, and completely familiar with the specified requirements contained in the plans and specifications.

C. Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, AWWA, or ANSI standards. Power-using equipment shall meet the California energy efficiency standards as defined in the current Title 24 requirements.

D. Welding procedures and testing shall comply with ANSI Standard B31.1.0 standard code for pressure piping and the American Welding Society – Welding Handbook. Welding shall also comply with Division of the State Architect and structural plan requirements for materials, procedures, qualifications, and inspections.

1.8 DRAWINGS AND SPECIFICATIONS

A. Drawings and specifications are intended to complement each other. Where a conflict exists between the requirements of the drawings and/or specifications, the contractor shall immediately and before commencing work, request clarification from Engineer.

B. The Engineer shall interpret the drawings and the specifications, and the Engineer's decision as to the true intent and meaning thereof and the quality, quantity, and the sufficiency of the materials and workmanship furnished there under shall be accepted as final and conclusive.

C. In case of conflicts not clarified prior to bidding deadline, use the most costly alternative (better quality, greater quantity, or larger size) in preparing the Bid. A clarification will be issued to the successful Bidder as soon as feasible after the Award, and if appropriate a deductive change order will be issued.

D. All provisions shall be deemed mandatory except as expressly indicated as optional by the word "may" or "option".

E. Examine and compare the contract drawings and specifications with the drawings and specifications of other trades. Report any discrepancies to the architect. Install and coordinate the work in cooperation with the other trades.

1.9 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Maintain uniformity of manufacturer for equipment used in similar applications and sizes. Provide products and materials that are new, clean, free from defects, damage, and corrosion. Provide name/data plates on major components with manufacturer's name, model number,

serial number, date of manufacturer, capacity data, and electrical characteristics permanently attached in a conspicuous location on the equipment.

B. Protect materials stored at site and installed from damage.

C. Verify dimensions of equipment and fixtures prior to ordering.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all equipment per the manufacturer's instructions for installing, connecting, and adjusting. A copy of the instructions shall be kept at the equipment during installation and provided to the engineer at his/her request.

B. Adjust pipes, ducts, panels, equipment, etc., to accommodate the work to prevent interferences.

1. Right-of-Way: Lines which pitch have the right-of-way over those which do not pitch. Lines whose elevations cannot change have right-of-way over lines whose elevations can be changed.
2. Provide offsets, transitions, and changes in directions of pipes as required to maintain proper head room and pitch on sloping lines. Provide traps, air vents, drains, etc., as required. It is the intent of this paragraph that all cost associated with compliance be borne by the contractor.
3. All equipment shall be firmly anchored to building structural elements.
4. Carefully check space requirements with other trades and existing conditions to insure material, fixtures or equipment can be installed in the spaces allotted.

C. Install all plumbing fixtures and equipment to allow for service.

3.2 FIRESTOPPING

A. Firestop all penetrations of rated elements with approved firestop material such as Hilti FS-1 per manufacturer's plates. Provide plates to project inspector prior to installation.

3.3 ACCESS DOORS

A. Install access door for access to concealed valves, trap primers, water hammer arrestors and other equipment that requires accessibility for service or adjustment. Coordinate with framing contractor for proper location for functionality. Young regulators may be installed at balancing dampers. Restroom shall have stainless steel type access doors.

3.4 COMMISSIONING

A. Provide checklist with each fixture detailing the operational status of all plumbing fixtures and have been adjusted and tested for proper operation. Provide boiler start-up checklist. Provide building static water pressure. See specification section 01 9113 General Commissioning Requirements.

3.5 SPECIAL TOOLS AND TRAINING

A. The contractor shall provide to the owner any special tools need to service and access the equipment provided in this contract.

B. The plumbing shall provide to the owner two hours of training on cleaning and maintenance of the new plumbing equipment including flush valves. Provide demonstration on gasket replacement and adjustment of flush valves.

3.6 SPECIAL CONDITIONS

A. Contractor shall re-use existing toilets, urinals and flushometers per notes on P1.0. Contractor shall remove fixtures at the beginning of project and safely store materials for re-installation as construction progresses. Storage containers are the contractor's responsibility.

END OF SECTION 220500

SECTION 22 0510

PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, notes, and general provisions of the Contract, including General and Supplemental Conditions and Division 01 specification sections, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings for domestic water, condensate drains, filtered water, natural gas, rainwater, waste and vent, vacuum, and filtered cold water.
2. Escutcheons.
3. Cleanouts.
4. Vandal-proof vent caps.
5. Supply tubes.

1.3 REFERENCES

A. ANSI B31.9 - Building Service Piping.

B. ASME B16.3 - Malleable Iron Threaded Fittings.

C. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.

D. ASTM A47 - Ferritic Malleable Iron Castings.

E. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

F. ASTM A74 - Cast Iron Soil Pipe and Fittings.

G. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.

H. ASTM B32 - Solder Metal.

I. ASTM B88 - Seamless Copper Water Tube.

J. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

K. ASTM D1785 - Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.

L. ASTM D2241 - Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR).

M. ASTM D2466 - Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.

N. ASTM D2564 - Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings.

O. ASTM D2855 - Making Solvent-Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings.

P. ASTM D3034 - Poly Vinyl Chloride (PVC) Plastic Sewer Pipe SDR-35.

Q. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

R. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.

S. ASTM D2513 - SDR11.5 Polyethylene Gas Pipe.

T. ASTM D1784 – Low Extractable Polyvinyl Chloride for filtered water.

1.4 SUBMITTALS

A. Product Data:.For the following products:

1. Piping and fittings.
2. Escutcheons.
3. Cleanouts.
4. Vandal-proof vent caps.
5. Supply tubes.

B. Project Record Documents

1. Submit the following:
2. Record actual locations of valves and piping.

C. Operation and Maintenance Data

1. Submit the following:
2. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.5 REGULATORY REQUIREMENTS

A. Perform work in accordance with 2016 California plumbing code.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of the general requirements.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER PIPING, ABOVE GROUND

A. Hard Copper Tube: ASTM B88, Type L water tube, drawn temper.

1. Wrought-copper solder-joint fittings: ASME B16.22, wrought-copper pressure fittings with non-lead bearing solder.
2. Bronze Flanges: ASME B16.24, class 150, with solder-joint ends.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
4. US Manufactured

2.2 DOMESTIC WATER PIPING, BELOW GRADE

A. Copper Tube: ASTM B88, Type K water tube, annealed temper.

1. Copper solder-joint fitting: ASME B16.22, wrought-copper pressure fittings. No joints under slabs.
2. US Manufactured

2.3 CONDENSATE DRAIN PIPING

A. Hard Copper Tube: ASTM B88, type L water tube, drawn temper.

1. Wrought-copper solder-joint fittings: ASME B16.22, wrought-copper pressure fittings.

2.4 NATURAL GAS PIPING, BURIED

A. Polyethylene Pipe: ASTM D2513, SDR 11.5 with socket type fittings and fusion welded joints.

1. Fittings – ASTM D2466, polyethylene.
2. Transitions from underground PE to above-ground steel shall be made with listed pre-bent transition fittings.
3. An unbroken number 18 tracer wire shall be installed with and attached to underground non-metallic pipe and shall terminate above grade at each end. Labeled plastic tape shall be installed over plastic gas pipe.
4. Note special requirements on plans for tie-in to existing piping.

2.5 NATURAL GAS PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53, black steel, schedule 40.

1. Malleable-iron threaded fittings: ASME B16.3, class 150, standard weight.
2. Unions: ASME B16.39, class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

B. Flexible Connector for final Gas Appliance Connection

1. Manufacturer – Dormont
   a. with stress guard rotational fittings, braided stainless steel, (snapfast quick disconnect at gas dryers only).

2.6 ABOVE GRADE RAINWATER AND SANITARY WASTE AND VENT PIPING

A. Above grade - Hubless cast-iron pipe and fittings: ASTM A888 or CISPI 301.

B. Standard shielded couplings, stainless steel: CISPI 310.

C. Heavy-duty couplings, stainless steel: ASTM C564.

D. All cast-iron pipe and fittings shall be manufactured in the U.S.

E. Indirect waste shall be DWV copper with cast DWV fittings.

2.7 BELOW GRADE STORMWATER, WASTE, & VENT PIPING

A. PVC Schedule 40 DWV with solvent welded fittings

B. ASTM 1785 – US Manufactured

C. Adapt to cast iron 6" above finished floor with Mission Rubber transitions fittings.

2.8 ESCUTCHEONS

A. Escutcheons for water and waste piping penetrations.

1. Manufacturers: subject to compliance with requirements, provide products by the following: Brasscraft.
2. Description: chrome-plated cast brass with set screws.

2.9 CLEANOUTS

A. Cleanouts for waste piping.

1. Manufacturers: subject to compliance with requirements, provide products by one of the following:

a. J.R. Smith
b. Zurn.

3. Description: cast-iron with threaded bronze plug. 18 gage stainless cover with vandal-proof screws for wall cleanout. Polished brass non-slip cover for floor cleanout.
4. At condensate piping – female threaded fitting with bronze plug.

2.10 VANDAL-PROOF VENT CAPS

A. Vandal-proof vent caps

1. Manufacturers: subject to compliance with requirements, provide products by one of the following:

a. J.R. Smith
b. Zurn.

2. Description: cast-iron dome secured with recessed Allen Key Set screws.

2.11 SUPPLY TUBES

A. Supply tubes:

1. Manufacturers: subject to compliance with requirements, provide products by the following:
   a. Brasscraft.
   b. No-Burst.

5. Description: braided stainless steel, ½" FIP x ½" compression.

2.12 Seismic Joint Fitting

1. Metraflex or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with Manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient.

D. Install piping to conserve building space and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

I. Establish elevations of buried piping outside the building to ensure not less than 30 inch of cover. Exception: Localized areas may be 18" deep to accommodate existing conditions.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

K. Provide support for utility meters in accordance with requirements of utility companies.

L. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.

M. Excavate in accordance with this Section for work of this Section.

N. Backfill in accordance with this Section for work of this Section.

O. Install plumbing vents per CPC requirements Size per Table 703.2. Increase one pipe size at horizontal runs exceeding 1/3 total permitted length per COC 904.2. Provide all coring, support, flashing and vent termination. All plumbing vents not shown on drawings for clarity. Route to be based on contractor's coordination efforts. Provide as-built venting plan at conclusion of installation.

P. Install valves with stems upright or horizontal, not inverted.

Q. Underground Alert: Before laying out piping and performing trenching, contractor shall determine locations of existing underground utilities. Contact "Dig Alert / Underground Service Alert of Southern California" - 1-800-422-4133. Contractor shall also contact District's representative to ascertain locations of underground piping and other conditions affecting trenching, and shall perform testing and subsurface exploration as necessary to locate utilities. Do not perform trenching until all utilities have been located and marked.

R. Trenching: material shall be excavated from trenches and piled adjacent to the trench. Material shall be piled in such a manner that will cause a minimum of inconvenience to public travel. All rock, boulders, and stones shall be removed to provide a minimum clearance of six (6) inches under and around pipes. Excavations shall be kept free of water. Trenches shall be dug to true and smooth bottom grades and in accordance with the lines indicated on drawings and as directed. Trench widths shall not exceed 30 inches or 1.5 times outside diameter of the pipe plus 18 inches whichever is greater. Minimum trench width shall be the outside diameter of pipe installed plus 12 inches. Depth of trenching for water and gas piping shall be such as to give a minimum cover of 18 inches over the top of the pipe. Deeper excavation may be required due to

localized breaks in grade, or to install the new piping under existing culverts or other utilities where necessary. Trenching for sewers and drains shall be of sufficient width to permit proper jointing of the pipe and backfilling of material along the sides of the pipe. Trench width at the surface of the ground shall be kept to the minimum amount necessary to install the pipe in a safe manner. Trenches shall be excavated below the barrel of the pipe a sufficient distance to provide for bedding material where the trench bottom is in a material which is unsuitable for foundation or which will make it difficult to obtain uniform bearing for the pipe. Such material shall be removed and a stable foundation provided. This shall include the preparation of the native trench bottom and/or the top of the foundation material to a uniform grade so that the entire length of pipe rests firmly on a suitable properly compacted material (sand or gravel required). Gravel to be used for foundation purposes shall be of a type and gradation to provide a solid compact bedding in the trench.

S. Backfill: Contractor shall complete bedding and then backfill to 6 inches over the top of the pipe with sand or gravel before starting backfilling operations. Take all precautions necessary to protect the pipe from damage, movement and shifting. Compaction equipment used above the pipe zone shall be of a type that does not injure the pipe. Where original excavated material is unsuitable for trench backfill, backfill gravel shall be placed. Unsuitable material shall be removed to a disposal area. Wherever a trench is excavated in a paved roadway, sidewalk or other area where minor settlements would be detrimental and where native excavated material is not suitable for compaction as backfill, trench shall be backfilled with backfill gravel. Warning tape markers and tracer wires shall be installed during backfill operations. When working in an existing traveled roadway, restoration and compaction shall be achieved as the trench is backfilled so as to maintain traffic. Provide temporary, traffic-bearing steel plates over excavations in public rights-of-way, if backfilling and re-paving cannot be accomplished before end of work period. Trench backfill under roadway shall be mechanically compacted to 95 percent of maximum density except for trenches over 8 feet in depth. In any trench in which 95 percent density cannot be achieved with existing backfill, the top 4 feet shall be replaced with backfill gravel mechanically compacted to 95%. The method of compaction shall be at contractor's option, unless excavation permit requires a specific type. Contractor shall be responsible to provide the proper size and type of compaction equipment and select the proper method of utilizing said equipment to attain the required compaction density. Compaction by water jetting will not be permitted. Where backfill is required to be certified, compliance shall be performed in accordance with the requirements of the governing authority. Allow testing service to inspect and approve each subgrade and fill layer before further fill, backfill or construction work is performed.

T. Seal all penetrations per specification section

U. Disinfect all water piping per AWWA requirements

1. Acceptable Disinfectants

a. Sodium Hypochlorite

b. Calcium Hypochlorite.

2. Flush system prior to disinfection. Add solution to bring system to 25 PPM for 24 hours. Neutralize solution prior to dumping to sewer.

3. Testing Requirements for demonstration of compliance with the Maximum Containment Level (MCLs) of the Safe Drinking Water Act: Test at five locations on first floor including drinking fountain, men's and women's shower, coach's showers. At second floor test at drinking fountain.

a. Total chlorine concentration of less than 1 mg/L (1 ppm).

b. The absence of any coliform bacteria.

c. Less than 200 non-coliform bacteria per 100 mL sample

4. Repeat disinfection if test results are not satisfactory.

V. Install cleanouts on condensate piping at changes of direction and every 40 feet.

W. Support & brace cast iron piping at transition from underground piping so that PVC does not support cast iron.

X. Completely debur all piping after cutting.

3.4 APPLICATION

A. Install unions downstream of valves, relief piping and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.5 ERECTION TOLERANCES

A. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum. Pothole point of connection at the beginning of project. Layout to furthest fixtures to verify 1/'4"/ft slope.

END OF SECTION 220510

SECTION 22 0523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Bronze swing check valves.
3. Lubricated plug valves.
4. Low-extractable PVC ball valves.
5. Brass angle stops.
6. Seismic safety gas valves.
7. Hydrants.

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. NIBCO INC. S-585-70 LFto 2"; NIBCOT-FP-600N › 2".
c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Sweat.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.
k. Lead-free compliant

2.3 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. NIBCO INC.
b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.
g. Crispin Valve.
h. DFT Inc.
i. Lead-free compliant

2.4 LUBRICATED PLUG VALVES

A. Class 125, Regular-Gland, Lubricated Plug Valves with Threaded Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. McDonald 10604 for low pressure 1 ½" and smaller.
b. McDonald 10554 for medium pressure 1 ½" and smaller.

2. Description:

a. Standard: MSS SP-78, Type II.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
d. Pattern: Regular.
e. Plug: Cast iron or bronze with sealant groove.

B. Class 125, Regular-Gland, Lubricated Plug Valves with Flanged Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Nordstrom Valves, Inc. Rockwell Super Nordstrom 200 CWP flanged.

2. Description:

a. Standard: MSS SP-78, Type II.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
d. Pattern: Regular.
e. Plug: Cast iron or bronze with sealant groove.

2.5 BRASS ANGLE STOPS

A. Brass angle stops, heavy pattern.

1. Subject to compliance with requirements, provide products by the following:
   a. Brasscraft.
   b. Chicago faucet

2. Description: heavy pattern, angle, ½" FIP inlet x ½" compression, loose key, lead-free compliant.

2.7 SEISMIC SAFETY GAS SHUTOFF VALVES

A. Earthquake shutoff valves

1. Manufacturer: subject to compliance with requirements, provide products by the following:
   a. Pacific Seismic Products.

2.8 HYDRANTS

A. Hydrants

1. Manufacturer: subject to compliance with requirements, provide products by the following:
   a. J.R. Smith.
   b. Zurn.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior 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. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Domestic Water Shutoff Service: Ball valves.
2. Throttling Service: Globe valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, 2"and Smaller: Soldered ends.
2. For Copper Tubing, 2-1/2" to NPS 4". Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Steel Piping, 2-1/2" and Smaller: Threaded ends.
4. For Steel Piping, 2-1/2" TO 4". Flanged ends except where threaded valve-end option is indicated in valve schedules below.
5. For Steel Piping, NPS 5 and Larger: Flanged ends.
6. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.

END OF SECTION 220523

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Equipment supports shall be capable of supporting combined operating weight of supported equipment and connected systems and components.

B. Seismic-restraint hangers and supports for piping and equipment shall be per 1998 SMACNA Seismic Restraint Manual – Guidelines for Mechanical Systems with September 2000 Addendum #1.

C. All exterior steel support components shall be hot-dipped galvanized. All welds shall be ground smooth and painted with three coats of zinc-rich paint.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Mechanical fastener systems.
4. Pipe positioning systems.
5. Trapeze pipe hangers. Include Product Data for components.
6. Metal framing systems. Include Product Data for components.
7. Pipe stands. Include Product Data for components.
8. Equipment supports.

B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
4. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.
3. Tolco Inc.
4. Unistrut
5. Superstrut

C. Galvanized, Metallic Coatings: Hot dipped.

D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Unistrut Corp.; Tyco International, Ltd.
c. Tolco

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Power-Strut Div.; Tyco International, Ltd.
4. Tolco Inc.
5. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated. Exterior components shall be hot-dipped galvanized.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

C. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

D. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

E. Provide submittal.

2.6 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated (interior use) Type 304 stainless steel (exterior use), for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Anchor must have ICC report. Provide report with submittal and one copy to the inspector. See State Architect Requirements for testing.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Simpson
d. Or equal.

C. Pre- placed concrete inserts

2. Manufacturers:

a. Tolco
b. or equal.

2.7 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping. See plans for details.

B. All exterior steel supports shall be hot dipped galvanized.

C. No piping supports shall be mounted directly on roof membrane.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized. All exterior steel supports shall be hot dipped galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 .
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
4. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
9. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
10. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
11. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles. With retainer strap.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use mechanical-expansion anchors or inserts instead of building attachments where required in concrete construction. All anchors shall have a current ICC ESR report.

N. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install concrete inserts prior to concrete placement per manufacturer's listing.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface.

G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

N. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING & PERSONNEL PROTECTION

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1/2 inches below nut.

C. Provide personnel protection at mechanical rooms, equipment areas and any equipment maintenance area from strut and threaded rods ends. Install soft protective materials to prevent skin and skull injuries. Install protection as soon as practicable after installation.

3.6 PAINTING

A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09

B. Galvanized Surfaces: Clean welds, bolted connections, cut and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 220529

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.3 SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8" inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black

C. Background Color: White

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
2. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting."

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Domestic Water Piping:

   a. Background Color: White.
   b. Letter Color: Blue (Cold) Red (Hot).

2. Sanitary Waste and Storm Drainage Piping:

   a. Background Color: Black.
   b. Letter Color: White.

3. Gas Piping
   a. Background – White
   b. Leter Color - Yellow

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 22 0700

PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:
   a. Mineral fiber.

B. Related Sections include the following:

1. Division 23 Section "HVAC Insulation."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with 2016 CBC 720 and CPC 609.11.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements,

   a. Fibrex Insulations Inc.; Coreplus 1200.
   b. Johns Manville; Micro-Lok.
   c. Knauf Insulation; 1000(Pipe Insulation.
   d. Manson Insulation Inc.; Alley-K.
   e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ

Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water:

1. 2" and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   b. Cover with kraft paper vapor barrier jacket and PVC fitting covers.

B. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   b. Cover with kraft paper vapor barrier jacket and PVC fitting covers.

2.3 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over piping; kraft paper vapor barrier with PVC fitting covers.

B. Piping, Exposed at Lavatories and Accessible Sinks:

1. Truebro LavGuard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.6 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.
5. Edges.

3.7 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

END OF SECTION 220700

SECTION 22 4000

PLUMBING FIXTURES AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following plumbing fixtures, equipment, and related components:

1. Faucets for lavatories and sinks.
2. Flushometers.
3. Toilet seats.
4. Protective shielding guards.
5. Fixture supports.
6. Interceptors.
7. Shower receptors.
8. Dishwasher air-gap fittings.
9. Disposers.
10. Water closets.
11. Urinals.
12. Lavatories.
13. Commercial sinks, including District-supplied.
14. Kitchen sinks.
15. Service sinks.
16. Laundry trays.
17. Drinking fountains.
18. Roof drains, area drains, planter drains, and roof receivers.
19. Floor drains.
20. Floor sinks.
21. Trap primers.
22. Water hammer arrestors.
23. Backflow preventers.
24. Water pressure regulators.
25. Circulating pump.
26. Whirlpool Tubs
27. Ice Machine
28. Boiler
29. Tempering Valve

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

F. FRP: Fiberglass-reinforced plastic.

G. PMMA: Polymethyl methacrylate (acrylic) plastic.

H. PVC: Polyvinyl chloride plastic.

I. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Accessible Plumbing Fixture Regulatory Requirements: Accessible plumbing fixtures shall comply with all of the requirements of 2016 CBC Section 1115B & 2016 CPC. Height and locations of all fixtures shall be according to CBC Table 1115B-1. Fixture controls shall comply with CBC Section 1118B.

B. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in 2016 CEC, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Plastic Laundry Trays: ANSI Z124.6.
3. Plastic Mop-Service Basins: ANSI Z124.6.
4. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.
5. Vitreous-China Fixtures: ASME A112.19.2M.
6. Water-Closet, Flushometer Tank Trim: ASSE 1037.

I. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucets: ASME A112.18.1.
5. Hose-Connection Vacuum Breakers: ASSE 1011.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
8. NSF Potable-Water Materials: NSF 61.
9. Pipe Threads: ASME B1.20.1.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Supply Fittings: ASME A112.18.1.
12. Brass Waste Fittings: ASME A112.18.2.

J. Comply with the following applicable standards and other requirements specified for bathtub and shower faucets:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.

2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
3. Deck-Mounted Bath/Shower Transfer Valves: ASME 18.7.
4. Faucets: ASME A112.18.1.
5. Hand-Held Showers: ASSE 1014.
6. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
7. Hose-Coupling Threads: ASME B1.20.7.
8. Manual-Control Antiscald Faucets: ASTM F 444.
9. Pipe Threads: ASME B1.20.1.
10. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
11. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
12. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

K. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Dishwasher Air-Gap Fittings: ASSE 1021.
4. Manual-Operation Flushometers: ASSE 1037.
5. Plastic Tubular Fittings: ASTM F 409.
6. Brass Waste Fittings: ASME A112.18.2.
7. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

L. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.
2. Dishwasher Air-Gap Fittings: ASSE 1021.
3. Flexible Water Connectors: ASME A112.18.6.
4. Floor Drains: ASME A112.6.3.
5. Hose-Coupling Threads: ASME B1.20.7.
6. Hot-Water Dispensers: ASSE 1023 and UL 499.
7. Off-Floor Fixture Supports: ASME A112.6.1M.
8. Pipe Threads: ASME B1.20.1.
9. Plastic Shower Receptors: ANSI Z124.2.
10. Plastic Toilet Seats: ANSI Z124.5.
11. Supply and Drain Protective Shielding Guards: ICC A117.1.
12. Whirlpool Bathtub Equipment: UL 1795.

1.6 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of whirlpools that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures of unit shell.

b. Faulty operation of controls, blowers, pumps, heaters, and timers.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period for Commercial Applications: One year from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
3. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than 12 of each type.
4. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
5. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

A. Lavatory Faucets:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Zurn Faucets.
   b. Hard wired sensor activated with transformer.

2.2 SINK FAUCETS

A. Sink Faucets:

1. Manufacturers: Subject to compliance with requirements, provide products by one the following:
   a. Chicago Faucets.

2.3 FLUSHOMETERS

A. Flushometers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Zurn Plumbing Products Group; Commercial Brass Operation.

2. Description: Flushometer for urinal or water-closet-type fixture. Include brass body with corrosion-resistant internal components, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.

3. Battery operated sensor activated with push button override.

4. Re-use existing flushometers and provide additional per plans.

2.4 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Standard Companies, Inc.
   b. Bemis Manufacturing Company.
2. Re-use existing and provide additional matching seats

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. TRUEBRO, Inc.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. TRUEBRO, Inc.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

2.6 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.

5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Water-Closet Supports:

1. Description: Combination carrier designed for accessible or standard mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

2. Note special installation requirements on structural plans at grade beams.

3. Install new water closet supports for re-used and new toilets.

C. Urinal Supports:

1. Description: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture for wall-mounting, urinal-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.
3. Install new urinal supports for re-used urinals.

D. Lavatory Supports:

1. Description: Support brackets by Bradley for Omnideck.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.7 WATER CLOSETS

A. Water Closets:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. American Standard Afwall

2. Description: Wall-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.
   a. Style: One piece.

      1) Bowl Type: Elongated with siphon-jet design.
      2) Design Consumption: 1.6 gal./flush (6 L/flush).

3. Re-use existing water closets and provide additional new fixtures per sheet P1.0
      1) Remove and store for re-installation at appropriate time in construction process. Install on new carrier.

2.8 URINALS

A. Urinals:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. American Standard

2. Description: Wall-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.

3. Re-use existing urinals and flushometer with new carrier.

2.9 LAVATORIES

A. Lavatories:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Bradley.

2. Description: Omnideck
   a. Type: selc-contatined unit
   b. Faucet Hole Punching: Three holes, 4-inch (102-mm) centers.
   c. Color: White.
   d. With electric dryer, mounting brackets, soap dispenser, aerator, shield
   e. With strainers, tailpieces, traps and insulation.
3. Coordinate with framer for backing per structural.

2.10 SINKS

A. Sinks:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Just Manufacturing Company.
   b. Elkay

2. Description: Counter-mounting or free-standing, stainless-steel sink.
   a. With drain & strainers, tailpieces, traps and insulation.

2.11 SERVICE SINKS

A. Service Sinks:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Fiat.

2. Description: Flush-to-wall, floor-mounting, precast terrazzo fixture with rim guard.

3. Faucet Manufacturer: Chicago.

2.14 WATER BOILERS AND TANK

A. Gas fired water heater

1. Manufacturers: subject to compliance with requirements, provide products by the following:
   a. Raypak XFyre

2. Description: Natural gas fired condensing modulating domestic water heating boiler with sequencer (Bacnet connection) & pump
3. Stainless steel AL294c flue with flashing and termination.
4. RJ Hansen insulated storage tank

2.15 DRINKING FOUNTAINS

A. Drinking Fountains:

1. Manufacturers: subject to compliance with requirements, provide products by the following:
   a. Elkay Corporation.

2. Description: wall-mounting, dual height bowl with bottle filler and vandal resistant bublers, stainless steel, accessible, with factory mounting system.

2.16 FLOOR DRAINS

A. Floor Drains:

1. Manufacturers: subject to compliance with requirements, provide products by the following:
   a. J.R. Smith.
   b. Zurn.

2. Description: cast iron body, square non-slip bronze grate, adjustable, with trap primer connection.

2.17 FLOOR SINKS

A. Floor Sinks:

1. Manufacturers: subject to compliance with requirements, provide products by the following:
   a. J.R. Smith.
   b. Zurn.

2. Description: enameled cast iron.

2.18 TRAP PRIMERS

A. Trap Primers:

1. Manufacturers: subject to compliance with requirements, provide products by the following:
   a. Mifab.

2. Description: with distribution unit. Behind J.R. Smith 4730-UNB stainless access panel.

2.19 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:

1. Manufacturers: subject to compliance with requirements, provide products by the following:
   a. J.R. Smith.
   b. Zurn.

2. Description: behind J.R. Smith 4730-UNB stainless access panel.

2.22 WATER PRESSURE

A. Pressure Regulators:

1. Manufacturers: subject to compliance with requirements, provide products by the following:
   a. Watts.
   b. Multiple sizes for varying flows

2.24 CIRCULATING PUMPS

A. Water Circulating Pumps:

1. Manufacturers: subject to compliance with requirements, provide products by the following:
   a. Grundfos.

2.25 WHIRLPOOL TUBS

1. Whitehall Model H-15-S. with mixing valve, hose, turbine assembly, anchor clips
2. Provide waste and water piping.

2.26 ICE MACHINE

1. Indigo Model ID-0606A
2. Provide indirect waste piping to floor sink.

2.27 TEMPERING VALVE

a. Powers
b. With thermometers

2.28 EXPANSION TANK

a. Amtrol
b. With valve, pressure gauge.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

N. Install toilet seats on water closets.

O. Install trap-seal liquid in dry urinals.

P. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

R. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

S. Install shower flow-control fittings with specified maximum flow rates in shower arms.

T. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.

U. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

V. Set service basins in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."

W. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

X. Remove existing toilets, urinals, and flushometer, store for re-installation on new carriers.

Y. Install indirect waste from ice machine and whirlpools.

Z. Install lavatory with dryer, shield, and soap dispenser.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

D. Install fresh batteries in sensor-operated mechanisms.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

3.8 BOILER START-UP

A. Provide factory start-up with start-up report.

END OF SECTION 224000

SECTION 22 42 16
LAVATORY DECKS AND FAUCETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

1. Commercial lavatory faucets.

1.2 RELATED SECTIONS

1. Division 22 Section "Domestic Water Piping Specialties" for thermostatic mixing valves.
2. Division 22 Section "Commercial Lavatories and Faucets" for single and multiple user lavatories and lavatory systems.

1.3 REFERENCES:

A. American Society of Sanitary Engineering (ASSE):

1. ASSE 1070 - Water Temperature Limiting Devices.

B. American National Standards Institute (ANSI):

1. ANSI Z 124.3 - Plastic Lavatories.
2. ANSI Z 124.6 - Plastic Sinks.
3. ANSI/ICPA SS-1-2001 - Performance Standard for Solid Surface Materials.

C. American Society of Mechanical Engineers (ASME):

1. ASME A112.18.1 Plumbing Supply Fittings.

D. ASTM International (ASTM):

1. ASTM C 170 - Standard Test Method for Compressive Strength of Dimension Stone.
2. ASTM D 570 - Standard Test Method for Water Absorption of Plastics.
3. ASTM D 785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.
4. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
5. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. Canadian Standards Association (CSA):

1. CSA B125 - (See ASME A112.18.1 - Plumbing Fixture Fittings).

F. GREENGUARD Environmental Institute (GEI):

1. GREENGUARD listed and certified low emitting products.

G. International Association of Plumbing and Mechanical Officials (IAPMO):

1. Universal Plumbing Code (cUPC both U.S. and Canada).

H. International Code Council (ICC):

1. ICC/ANSI A117.1 – Accessible and Usable Buildings and Facilities.

I. National Fire Protection Association (NFPA):

1. NFPA 70 – National Electrical Code.

J. State of Texas:

1. Texas Accessibility Standards (TAS).

K. Underwriters Laboratories, Inc. (UL):

1. UL 723 - Test For Surface Burning Characteristics of Building Materials.
2. UL 1951 - Electric Plumbing Accessories.

L. United States Green Building Council (USGBC):

1. LEED Green Building Rating System (LEED).

M. US Federal Government:

1. Public Law 102-486 - Energy Policy Act. 1992 (EPACT).
2. U.S. Architectural & Transportation Barriers Compliance Board. Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG).

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets, installation instructions, and maintenance recommendations.

B. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency, when requested by Architect.

C. Shop Drawings: Prepared by manufacturer. Include rough-in requirements and power, signal, and control wiring diagrams. Provide mounting requirements and rough-in dimensions. Include details of electrical and mechanical operating parts.

1.5 INFORMATION SUBMITTALS

A. Sample warranty.

B. Manufacturer's Certificates.

C. Indoor environmental quality certificates.

1.6 MAINTENANCE SUBMITTALS

A. Furnish indicated spare parts that are packaged with identifying labels listing associated products.

B. Operation, maintenance and cleaning data.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in the manufacture of plumbing fixtures. Manufacturers seeking approval must submit the following:

1. Product data, including test data from qualified independent testing agency indicating compliance with requirements.
2. Samples of each component of product specified.
3. List of successful installations of similar products available for evaluation by Architect.
4. Submit substitution request not less than 15 days prior to bid date.

B. Source Limitations: Obtain each type of plumbing fixture and compatible accessories through one source from a single approved manufacturer.

C. Accessibility Requirements: Comply with requirements of ADA and with requirements of authorities having jurisdiction.

D. Water Flow and Consumption Requirements: Comply with EPACT.

E. Drinking Water Standard: Comply with NSF 61.

F. Electrical Components: Listed and labeled per NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

G. Indoor Environmental Quality Certification: Provide certificate indicated that lavatory deck materials have been certified under the following programs, or a comparable certification acceptable to Owner:

1. GREENGUARD Indoor Air Quality Certified.
2. GREENGUARD Certified for Children and Schools.

1.8 COORDINATION

A. Field Measurements: Verify locations of lavatory decks and adjacent walls prior to fabrication.

1.9 WARRANTY

A. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace commercial lavatory decks that fail in materials or workmanship.

1. Solid surface material: 10 years.
2. Faucets: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide commercial lavatory decks and faucets manufactured by Bradley Corporation, Menomonee Falls, WI 53051, (800)272-3539, fax (262)251-5817; Email info@BradleyCorp.com; Website www.bradleycorp.com.

1. Submit requests for substitution in accordance with Instructions to Bidders and Division 01 General Requirements.

2.2 MATERIALS

A. **Solid Surface Material**: Where indicated as constructed of solid surface material, fabricate plumbing fixtures from thermoset acrylic modified polyester resin certified by approved independent testing agency as complying with ANSI/ICPA-SS-1, ANSI Z124.3, and ANSI Z124.6, [with minimum 25 percent preconsumer recycled content and] with the following minimum properties:

1. Basis of Design Product: Bradley, **Terreon**.
2. Thickness: 1/2 inch (13 mm), minimum.

2.3 LAVATORY DECKS, SINGLE AND MULTIPLE STATION

A. ADA/ABA Compliant Wall-Mounted, Multiple-Station Lavatory Fixture **[LAV#1]**: With integral bowls, molded water overflow, drain, strainer, and tailpiece.

1. Basis of Design Manufacturer/Model: **Bradley, OmniDeck Model LD-3010 Terreon**.
2. Material: Solid surface material.
3. Configuration: single or multiple station deck with extended deck as indicated on drawings.
4. Deck Edge Accessories: Solid surface integral coved backsplash, Side splashes **and** Front apron.
5. Deck Nosing: 3/8 inch (9.5 mm) radiused (LD-3010).
6. Trap Cover: Stainless steel.
7. Mounting: Stainless steel mounting brackets.
8. Overall Unit Size: As indicated.
9. Deck Colors: As selected by Architect from manufacturer's full line.
10. Integral Molded Lavatory Bowl for Solid Surface Decks:

    a. Bowl Material and Size: HS-TR1 solid surface material, rectangular, 22 by 16 inch (558 by 406 mm).
    b. Color: As selected by Architect from manufacturer's full line of solid surface colors.

11. Water Supply: **[**Single tempered line**]** **[**Thermostatic mixing valve assembly**]**, with single point rough-in for unit.
12. Waste Hookup: Single point rough-in for unit.

13. **Sensored Soap Dispenser**: Deck-mounted, sensor-operated, chrome-plated plastic, with LED battery and soap level indicators, with single dispenser 120VAC power pack **or** 4 dispenser 120VAC power pack, 27 oz. (798 mL) capacity bottle **or** 54 oz. (1597 mL) capacity (LD-3010 only).

    a. Basis of Design Manufacturer/Model: **Bradley, Model 6315**.

2.4 2.5 SENSOR-OPERATED LAVATORY FAUCETS

A. Capacitive-Sensor-Operated Faucet with Remote Tempering Control**:** Vandal-resistant accessible faucet meeting ASME A112.18.1/CSA B125. ADA/ANSI A117.1 compliant.

1. Basis of Design Manufacturer/Model: **Bradley CAP-DCA**.
2. Body: Polished chrome plated commercial solid cast brass spout.
3. Aerator: Flow rate 0.5 gpm (0.032 L/s) at operating range of 20 to 80 psi (138 to 552 kPa).
4. Tempered Water Supply: Single thermostatic mixing valve.
5. Sensor Module: Water-conserving, vandal-resistant adjustable sensor unit with timing turn-off delay and stationary object automatic timed cutoff, with battery diagnostic audible signal, remote serviceable.

    a. Adjustable Sensing Distance: 0 to 3-1/2 inch (0 to 88.9 mm).

6. Power Supply: 120/24 VAC plug-in transformer.
7. **Thermostatic Mixing Valve**: Lead-free thermostatic mixing valve, ASSE 1070 listed, with glass-filled polysulfone valve body, thermoplastic polymer cartridge, and integral check valves and strainers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and verify opening measurements prior to commencing installation. Proceed with installation once conditions meet requirements.

3.2 INSTALLATION

A. Assemble fixtures and associated fittings and trim in accordance with manufacturer's instructions.

B. Install fixture supports attached to building structure for fixtures requiring supports.

C. Install fixtures onto waste-fitting seals or flanges and attach to supports or building structure.

D. Install fixtures level, plumb, and firmly in place in accordance with manufacturer's rough-in drawings.

E. Single-Point Connections:

1. Install water supply piping to unit. Provide stop on each supply in readily-serviced location. Fasten supply piping to supports or substrate.
2. Install trap and waste piping to unit.

F. Install escutcheons at exposed piping penetrations in finished locations and within cabinets.

G. Seal joints between fixtures and walls, floors, and countertops with joint sealant specified in Division 07 Section "Joint Sealants."

3.3 CLEANING AND PROTECTION

A. Repair or replace defective work, including damaged fixtures and components.

B. Clean unit surfaces, test fixtures, and leave in ready-to-use condition.

C. Install new batteries in battery-operated devices at time of Substantial Completion.

D. Turn over keys, tools, maintenance instructions, and maintenance stock to Owner.

E. Protect units with water-resistant temporary covering. Do not allow temporary use of plumbing fixtures unless approved in writing by Architect. Remove protection at Substantial Completion and dispose.

3.4 TESTING AND ADJUSTING

A. Set field-adjustable temperature set points of temperature-actuated water mixing valves. Adjust set point within allowable temperature range.

B. Test and adjust installation.

C. Remove and replace malfunctioning thermostatic mixing valves and retest.

END OF SECTION

SECTION 23 0500

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Sleeves.
3. Escutcheons.
4. HVAC demolition.
5. Equipment installation requirements common to equipment sections.
6. Painting and finishing.
7. Concrete bases.
8. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.5 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated

2.6 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.7 DUCT PENETRATIONS OF FINISHED SURFACES

A. 1. Provide 24 ga. Sheet metal trim ring.

PART 3 - EXECUTION

3.1 HVAC DEMOLITION

A. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.

B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

C. Maintain fire-resistive assemblies per CFC 703.1/Chapter 33

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

1. New Piping:
   a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish and set screw.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
   a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
   b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
   c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

      1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

4. At cored locations opening shall have 1" clear annular space between pipe and concrete.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases if dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi , 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.9 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.10 COMMISSIONING

A. All HVAC systems shall be fully function tested for all modes of operation.

B. Contractor shall provide proposed testing list for engineer's review and comment of all components including sensors, thermostats, dampers, motors, valves, pumps, boilers, chiller, and air handlers, and spilt systems. Include make and model number of each component and location.

C. Prior to air and water balance all components shall be tested for proper operation. A written report based on testing list shall be provided to the engineer Provide written report of testing to engineer prior to final review.

D. See specification section 01 9113 General Commissioning Requirements for more information.

3.11 DUCTING AND PIPING INSTALLATION

A. All ducts and pipes are shown diagrammatically. Contractor shall coordinate with other trades and structure prior to installation and shall adjust piping and ducting elements to avoid conflicts. Provide offsets and transitions as needed. Offsets and transitions at ducting shall be of equivalent size. Transitions shall minimize pressure drop.

END OF SECTION 230500

SECTION 23 0513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 23 0519

METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.
6. Test-plug kits.

B. Related Sections include the following:

1. Division 23 Section "Instrumentation and control for HVAC".

1.3 SUBMITTALS

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

B. Wiring Diagrams: For power, signal, and control wiring.

C. Product Certificates: For each type of meter and gage, from manufacturer.

D. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ashcroft Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type: Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.2 FILLED-SYSTEM THERMOMETERS

A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:

1. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

   a. Design for Air-Duct Installation: With ventilated shroud.
   b. Design for Thermowell Installation: Bare stem.

2. Accuracy: Plus or minus 1 percent of scale range.

2.3 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.4 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR.

4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.5 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ashcroft Inc.
   b. Trerice, H. O. Co.
   c. Weiss Instruments, Inc.

2. Standard: ASME B40.100.
3. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.6 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass ball, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

H. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

I. Install remote-mounted pressure gages on panel.

J. Install valve and snubber in piping for each pressure gage for fluids (except steam).

K. Install valve and syphon fitting in piping for each pressure gage for steam.

L. Install test plugs in piping tees.

M. Install flow indicators in piping systems in accessible positions for easy viewing.

N. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

O. Install flowmeter elements in accessible positions in piping systems.

P. Install wafer-orifice flowmeter elements between pipe flanges.

Q. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.

R. Install permanent indicators on walls or brackets in accessible and readable positions.

S. Install connection fittings in accessible locations for attachment to portable indicators.

T. Mount thermal-energy meters on wall if accessible; if not, provide brackets to support meters.

U. Install thermometers and pressure gages in the following locations and where indicated on plans:

1. Inlet and outlet of each hydronic boiler.
2. Inlets and outlets of each chiller.
3. Inlet and outlet of each hydronic coil in air-handling units.
4. Inlet and outlet of pumps

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each hydronic boiler shall be one of the following:

1. Liquid-filled, bimetallic-actuated type.

B. Thermometers at inlets and outlets of each chiller shall be one of the following:

1. Liquid-filled, bimetallic-actuated type.

C. Thermometers at inlet and outlet of each hydronic coil in air-handling units and fan coils shall be one of the following:

1. Liquid-filled, bimetallic-actuated type.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: Minus 40 to plus 160 deg F.

B. Scale Range for Heating, Hot-Water Piping: 0 to 250 deg F.

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at inlet and outlet of each chiller chilled-water shall be one of the following:

1. Liquid-filled-mounted, metal case.

2. 0-60 PSIG

B. Pressure gages at suction and discharge of each pump shall be one of the following:

1. Liquid-filled, direct-mounted, metal case.

2. 0-60 PSIG

END OF SECTION 230519

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for HVAC system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Fiberglass strut systems.
5. Thermal-hanger shield inserts.
6. Fastener systems.
7. Pipe stands.
8. Equipment supports.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
3. Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

4. Division 23 Section "Hydronic Piping".

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment per 1998 SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems with 2000 Addendum. Hazard level is "A."

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Fiberglass pipe hangers.
3. Thermal-hanger shield inserts.
4. Powder-actuated fastener systems.

B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-Line Systems, Inc.; a division of Cooper Industries. (Tolco)
2. ERICO/Michigan Hanger Co.
3. Unistrut.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.

5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type interior/exterior steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used. Install per ICC listing.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Simpson

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized. All exterior steel shall be hot dipped aluminized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
4. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
9. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
10. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
11. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
13. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.

14. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
15. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use mechanical-expansion anchors for building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions and ICC report.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

N. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 230529

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.

1.3 SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Exterior Equipment:

1. Material and Thickness: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Interior Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the

Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches (32 mm) for ducts; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard.
2. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.

1. Tag Material: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass beaded chain.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13.1, on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Chilled-Water Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

2. Heating Water Piping:

   a. Background Color: Blue.
   b. Letter Color: Black.

3. Refrigerant Piping:

   a. Background Color: White.
   b. Letter Color: Black.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

   a. Chilled Water: 2 inches (50 mm), round.
   b. Refrigerant: 2 inches (50 mm), round.
   c. Hot Water: 2 inches (50 mm), round.
   d. Gas: 2 inches (50 mm), round.

2. Valve-Tag Color:

   a. Chilled Water: Natural.
   b. Refrigerant: Natural.
   c. Hot Water: Green.
   d. Gas: Yellow.

3. Letter Color: Black

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.
b. Variable-air-volume systems.

2. Balancing Hydronic Piping Systems:

a. Constant-flow hydronic systems.
b. Variable-flow hydronic systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS

A. Certified TAB reports.

B. Sample report forms.

C. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.

3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB, or TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB or TABB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB or TABB as a TAB technician.

B. TAB Conference: Meet with Engineer on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Coordination and cooperation of trades and subcontractors.
d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB 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 TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems – Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

J. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

K. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine system pumps to ensure absence of entrained air in the suction piping.

N. Examine operating safety interlocks and controls on HVAC equipment.

O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or SMACNA's "HVAC Systems – Testing, Adjusting, and Balancing" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

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. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and –treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

    a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written

instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.

5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data.

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.8 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

    a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Engineer and comply with requirements in Division 23 Section "Hydronic Pumps."

2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.

    a. Monitor motor performance during procedures and do not operate motors in overload conditions.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 10 percent of design.

D. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.

E. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.

F. Set calibrated balancing valves, if installed, at calculated presettings.

G. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

H. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

I. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.

2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

J. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

K. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.

L. Check settings and operation of each safety valve. Record settings.

3.9 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.10 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.11 PROCEDURES FOR CHILLERS

A. Balance water flow through each evaporator and condenser to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. For water-cooled chillers, condenser-water entering and leaving temperatures, pressure drop, and water flow.
3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
4. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
6. Capacity: Calculate in tons of cooling.
7. For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

3.12 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.13 PROCEDURES FOR BOILERS

A. Hydronic Boilers: Measure and record entering- and leaving-water temperatures and water flow.

B. Steam Boilers: Measure and record entering-water temperature and flow and leaving-steam pressure, temperature, and flow.

3.14 PROCEDURES FOR FUME HOODS

A. Set flowrates and test for compliance with ASHRAE 110.

3.15 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.16 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare weekly progress 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.

3.17 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.

11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.

i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. 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.

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Entering-air temperature in deg F.
c. Leaving-air temperature in deg F.
d. Air temperature differential in deg F.
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.

h. Low-fire fuel input in Btu/h.
i. High-fire fuel input in Btu/h.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.
l. Operating set point in Btu/h.
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

J. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

   a. Air flow 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.

L. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

   a. Unit identification.
   b. Location.
   c. Service.
   d. Make and size.
   e. Model number and serial number.
   f. Water flow rate in gpm.
   g. Water pressure differential in feet of head or psig.
   h. Required net positive suction head in feet of head or psig.
   i. Pump rpm.
   j. Impeller diameter in inches.
   k. Motor make and frame size.
   l. Motor horsepower and rpm.
   m. Voltage at each connection.
   n. Amperage for each phase.
   o. Full-load amperage and service factor.
   p. Seal type.

2. Test Data (Indicated and Actual Values):

   a. Static head in feet of head or psig.
   b. Pump shutoff pressure in feet of head or psig.
   c. Actual impeller size in inches.
   d. Full-open flow rate in gpm.
   e. Full-open pressure in feet of head or psig.
   f. Final discharge pressure in feet of head or psig.
   g. Final suction pressure in feet of head or psig.
   h. Final total pressure in feet of head or psig.
   i. Final water flow rate in gpm.
   j. Voltage at each connection.
   k. Amperage for each phase.

M. Instrument Calibration Reports:

1. Report Data:

    a. Instrument type and make.
    b. Serial number.
    c. Application.
    d. Dates of use.
    e. Dates of calibration.

3.18 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

    a. Measure airflow of at least 10 percent of air outlets.
    b. Measure water flow of at least 5 percent of terminals.
    c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
    d. Verify that balancing devices are marked with final balance position.
    e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Engineer.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Engineer.
3. Engineer shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.19 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 23 0700

HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Flexible elastomeric.
b. Mineral fiber.

2. Adhesives.
3. Sealants.
4. Field-applied jackets.
5. Tapes.
6. Securements.

B. Related Sections:

1. Division 22 Section "Plumbing Insulation."
2. Division 23 Section “Metal Ducts” for duct liners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings:

C. Qualification Data: For qualified Installer.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the requirements in 2016 CBC 720 & CMC 506.7.3.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Calcium Silicate.

G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, include, but are not limited to, the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I, II with factory-applied vinyl jacket, III with factory-applied FSK jacket, III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

I. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint

to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.

1. Products: Subject to compliance with requirements provide one of the following:

    a. Owens Corning; VaporWick Pipe Insulation.

J. Glass Fiber duct liner, flexible.

1. Manufacturers:

    a.. Certainteed Tough Guard R with ES.
    b. Cetainteed Toughgard ultra round spiral duct liner.

2.2 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; CP-76.
    b. Foster Products Corporation, H. B. Fuller Company; 30-45.
    c. Marathon Industries, Inc.; 405.
    d. Mon-Eco Industries, Inc.; 44-05.
    e. Pittsburgh Corning Corporation; Pittseal 444.
    f. Vimasco Corporation; 750.

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; CP-76-8.
    b. Foster Products Corporation, H. B. Fuller Company; 95-44.
    c. Marathon Industries, Inc.; 405.
    d. Mon-Eco Industries, Inc.; 44-05.
    e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following:

   a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.4 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; Metal Jacketing Systems.
   b. PABCO Metals Corporation; Surefit.
   c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

   a. Sheet and roll stock ready for shop or field sizing.
   b. Finish and thickness are indicated in field-applied jacket schedules.
   c. Moisture Barrier for Outdoor Applications: ~~[~~3-mil- thick, heat-bonded polyethylene and kraft paper~~]~~ ~~[2.5-mil- thick Polysurlyn]~~.
   d. Factory-Fabricated Fitting Covers:

      1) Same material, finish, and thickness as jacket.

2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.5 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
b. Compac Corp.; 104 and 105.
c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.6 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products; Bands.
b. PABCO Metals Corporation; Bands.
c. RPR Products, Inc.; Bands.

2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, ½ inch.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

    a. Products: Subject to compliance with requirements, provide one of the following:

    1) AGM Industries, Inc.; CWP-1.
    2) GEMCO; CD.
    3) Midwest Fasteners, Inc.; CD.
    4) Nelson Stud Welding; TPA, TPC, and TPS.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

G. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

H. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be

butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

I. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

J. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with

weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07 Section "Penetration Firestopping."

3.8 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in nonconditioned space.
4. Indoor, exposed return located in nonconditioned space.
5. Indoor exhaust.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, and rectangular supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

B. C. Exposed, round and flat-oval, supply-air duct insulation shall be the following:

1. 1" lined.

3.10 PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:

    a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch.

B. Chilled Water, above 40 Deg F:

1. 3-6 inch : Insulation shall be the following:

    a. Mineral-Fiber, Pipe Insulation Wicking System 2 inches thick.

2. ½" to 2-1/2" Insulation shall be the following:

    a. Mineral Fiber Pipe Insulation Wicking System 1" thick

C. Heating-Hot-Water Supply and Return, 200 Deg F and below:

1. NPS 4" and d Smaller: Insulation shall be the following:

    a. Mineral-Fiber, Preformed Pipe, Type I: 1 inches thick.

D. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: ¾" inch thick.

E. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: 1 inch thick.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Chilled Water:

1. All Pipe Sizes: Insulation shall be the following:

   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick with aluminum jacket and formed aluminum fittings.

END OF SECTION 230700

SECTION 23 0900

INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The contract documents shall apply in their entirety to the work specified herein.

B. Submittals: Submit shop drawings and manufacturer's data in accordance with this section.

C. Maintenance and Operation Manuals: Provide 2 copies of manufacturer's operation and maintenance manual to owner.

1. Include: Shop drawings, wiring diagrams, network architecture and manufacturers' Owners manuals.

1.2 SYSTEM DESCRIPTION

A. This document contains the specification, input/output summaries for the Building Automation and Control System (BACS). The system architecture shall be an EIA-485 BACnet controller network. Operator Workstations may be connected to the controller network via direct EIA-232, modem, or Ethernet local area network connections through a microprocessor-based communication device.

B. Owner currently is operating a Campus-wide Automated Logic Control System. No substitution is allowed.

1.3 SCOPE OF WORK

A. General: Furnish and install all necessary hardware, software, wiring and computing equipment as defined in this specification.

B. System Requirements:

1. All materials and equipment used shall be standard components, regularly manufactured and available and not custom designed especially for this project. All systems and components, except site specific software, shall have previously been thoroughly tested and proven in actual use prior to installation on this project.

2. The system architecture shall be fully modular permitting the expansion of application software, system peripherals, and field hardware.

3. The DDC system upon completion of the installation and prior to acceptance of the project shall perform all operation functions as detailed in these specifications.

C. System hardware shall include all necessary controllers, thermostats, control transformers, relays, wiring and all other devices and equipment required to provide a complete and operating system.

D. Include all programming and building graphics to control the HVAC systems shown on the plans. Included in the programming shall be alarm limits and system trending.

1.4 SUBMITTALS, DOCUMENTATION AND ACCEPTANCE

A. Submittals:

1. Shop drawings. A minimum of three copies of shop drawings shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog sheets and installation instructions. Shop drawings shall also contain complete wiring and routing, ID numbers of devices and any other details required to demonstrate that the system will function properly. Drawings shall show proposed layout and installation of all equipment and the relationship to other parts of the work.
2. Programming.
3. Block diagram.
4. Equipment.

B. Project Specific Manuals.

C. Acceptance Test and Acceptance.

1.5 RELATED SECTIONS

A. Sections 01 9113 General Commissioning Requirements

PART 2 - PRODUCTS

2.1 HARDWARE

A. Network Computer

1. Owner has existing computer with Automated Logic Programming installed.

B. System Components – The Contractor shall provide the following:
1. All thermostats and controllers necessary to perform standard HVAC operations.
2. All relays, conduit, transformers, conduit, j-boxes, switches, indicating devices, and transducers required providing a complete and functional control system.
3. All control enclosures shall be manufactured by Hoffman and listed for the intended service.

2.2 CONTROLS MANUFACTURER

A. Manufacturer: Subject to compliance with requirements, provide products by the following:

1. Automated Logic Controls.

2.3 SOFTWARE MANUFACTURER

A. Manufacturer: Subject to compliance with requirements, provide products by the following:

1. Automated Logic Controls. No substitution allowed.

B. Install the most recent version of program. Upgrade existing campus programming as needed to be compatible with new software version.

PART 3 - EXECUTION

3.1 EXECUTION

A. Provide all necessary programming to fully optimize the operation of the building's HVAC systems. Provide fully commented programming and notes to owner. Provide submittal of control block diagram for Owner's and Engineers review and approval. Include in bid two revisions of programming for control optimization. Integrate programming and graphics into existing system. Coordinate any system shutdowns with Owner.

B. Provide 4 hours of training to Owner's representative after system is fully functional.

1. Provide system manual to Owner.
2. Provide documentation of complete system testing.

C. Install all necessary equipment including but not limited to: controllers, thermostats, computer interface, programming, surge protectors, wiring, cables, connectors, conduit, relays, etc. required to provide a complete working energy management system.

D. Label all control components per Division 16 requirements. All boxes with controller shall have an accurate laminated control diagram fixed to the inside cover.

E. Minimum conduit size shall be 3/4 inch.

F. Provide for 2 sets of minor programming changes to any and all systems to optimize system after continuous operation is observed in both heating and cooling seasons respectively.

3.2 SEQUENCE OF OPERATION

A. The new Building Automation System (bas) shall control all mechanical equipment, except where noted. The bas shall be Automated Logic Corp. (alc) controls system. The system shall control, monitor and generate alarms as specified herein. The system program shall maintain trending information on all system functions, unless otherwise specified. Each piece of mechanical equipment shall be controlled by a unitary control module (module), unless otherwise specified.

B. Air Handling Units (AH-1): This is a heat exchanger unit providing tempered outside air to the building and other air handlers and fan coils. AH 1 shall be started and stopped on a schedule per College parameters. The ahu fan shall run continuously during the scheduled occupied mode. The bas shall control the vfds on the supply and return fans.

1. AH-1 Supply air speed (also known as dedicated outside air (DOA)) shall be controlled by pressure sensor located at FC-7. Pressure sensor setting shall be based on required pressure to supply a constant volume of DOA per fan coil schedule. AH-1 Exhaust Air Flow minimum air flow shall be based on pressure sensor located in exhaust duct at Room 101 to maintain a constant exhaust air flow as shown on M3.0.
2. AH-1 fans shall shut-down if fire alarm or duct smoke detector is active.

C. AH-2&3 These units condition the air for gymnasium.

1. AH-2 has a direct outside air connection for use as an economizer when the outside air is cooler than 65 Deg. F. AH-3 has a direct connection to AH-1 for tempered DOA operation when the outside air is too warm for economizer function. Both system are constant volume. During low occupancy and load only one air handler operates to maintain temperature 68 F heating and 72 f cooling (adj) and CO2 levels below 1000 PPM. If either of these parameters can't be maintained the second air handler will be made operational.
2. Heating and cooling valves shall be controlled to modulate for increasing or decreasing supply air temperatures. Both cooling and heating setpoints shall adjusted based on thermostat readings using a tuned proportional integral algorithm. The heating range for supply air shall be 90 F to 100 F. The cooling range for supply air shall be 65 to 55 F.

D. Chiller shall operate based on building schedule. The chiller shall have a Bacnet connection. The chilled water setpoint shall adjusted based on outside air temperature (OAT) from 55 F @ 70F OAT to 45 F @ 90 F OAT (adj). Pump shall modulate based upon water pressure which will remain constant and based on air balance analysis for that pressure which maintains the maximum flow at FC-7.

E. Boiler shall operate based on building schedule. The boiler system controller shall have a Bacnet connection. The hot water setpoint shall adjusted based on outside air

temperature (OAT) from 140 F @ 60F OAT to 170 F @ 40 F OAT (adj). Pump shall modulate based upon water pressure which will remain constant and based on air balance analysis for that pressure which maintains the maximum flow at FC-7. Raypak controller shall maintain the lead lag alternate function for the system.

F. Fan coils are constant volume and shall operate when the building is occupied. Heating a cooling valves shall modulate to maintain room temperature. 68 F for heating mode and 74 F for cooling mode.

G. FC-9 shall operate when cooling is required in electrical room. If building systems are off and cooling is required in the space then chiller pump shall turn on with chiller off until room reaches 95 F. At this point chiller will start and maintain 55 F water temp.

H. Split System: Computer Room: The following applies to fan coil/condensing unit utilized in the buildings communications rooms. The Fan Coil fan shall run continuously. System setpoint is 74 F.

I. Boiler Alarms:

1. An alarm shall be generated when the primary lop pump is called "on" and the flow switch fails verify hhw flow.
2. An alarm shall be generated when the primary pump is called "on" and the pump status sensor fails to verify pump "on".
3. An alarm shall be generated when the secondary loop pump is called "on" and the pump status sensor fails to verify the pump "on".
4. An alarm shall be generated when the pumps are verified "on", the flow switch is made and the pressure sensor fails to verify proper loop pressures.
5. An alarm shall be generated when the boiler is enabled and the temperature sensor fails to verify specified hhw temperatures (boiler failure).

J. Chiller Alarms:

1. An alarm shall be generated when the primary loop pump is called "on" and the flow switch fails verify chw flow.
2. An alarm shall be generated when the primary pump is called "on" and the pump status sensor fails to verify pump "on".
3. An alarm shall be generated when the secondary loop pump is called "on" and the pump status sensor fails to verify the pump "on".
4. An alarm shall be generated when the pumps are verified "on", the flow switch is made and the pressure sensor fails to verify proper loop pressures.
5. An alarm shall be generated when the chiller is enabled and the temperature sensor fails to verify specified chw temperatures (chiller failure).

K. Unoccupied Mode: The chiller system shall have the capability of running in the unoccupied mode when a zone tlo (timed local override) is activated and an "on" call is broadcast to the chiller module.

3.3 TESTING

A. All control functions shall be tested for performance. This testing shall be done after all programming and graphics have been completed and installed on the Owner's computer system.

B. Reports shall be provided that details each element, including but not limited to sensors, vav boxes, controllers, and its verified performance.

C. After the reports are provided and reviewed, the Engineer and Owner shall witness test (with Controls Contractor) the operation of the system.

END OF SECTION 230900

SECTION 23 2113

HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Hot-water heating piping.
2. Chilled-water piping.
3. Makeup-water piping.
4. Air-vent piping.
5. Safety-valve-inlet and -outlet piping.
6. Condensate Piping
7. Volume Tank

B. Related Sections include the following:

1. Division 23 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.3 DEFINITIONS

1.4 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Hot-Water Heating Piping: 125 psig> at 200 deg F.
2. Chilled-Water Piping: 125 psig> at 200 deg F.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Pipe and fittings.
2. Pressure-seal fittings.

3. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
4. Air control devices.
5. Chemical treatment.
6. Hydronic specialties.

B. Welding certificates.

C. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

1.7 EXTRA MATERIALS

A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L. US Manufactured

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K. US Manufactured

C. Wrought-Copper Unions: ASME B16.22. US Manufactured

D. Wrought Copper Fittings US Manufactured

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article. US Manufactured

B. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article. US Manufactured

C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article. US Manufactured

D. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

E. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

F. Steel Pressure-Seal Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Victaulic Company of America. Only acceptable at final connections to air handlers, tanks, and chiller.

2. Housing: Steel.
3. O-Rings and Pipe Stop: EPDM.
4. Tools: Manufacturer's special tool.
5. Minimum 300-psig working-pressure rating at 230 deg F.

G. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Hart Industries International, Inc.
    d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.

3. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.

c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

2.5 VALVES

A. Butterfly Valves

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Stockham
b. Nibco

B. Ball Valves

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Stockham
b. Nibco

C. Swing Check Valves

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Stockham
b. Nibco

D. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section "Instrumentation and Control for HVAC."

E. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong Pumps, Inc.
b. Bell & Gossett Domestic Pump; a division of ITT Industries.
c. Griswold Controls.
d. Taco.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.

5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

F. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armstrong Pumps, Inc.
    b. Bell & Gossett Domestic Pump; a division of ITT Industries.
    c. Griswold Controls.
    d. Taco.
    e. Tour & Andersson; available through Victaulic Company of America.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

G. Diaphragm-Operated, Pressure-Reducing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Amtrol, Inc.
    b. Armstrong Pumps, Inc.
    c. Bell & Gossett Domestic Pump; a division of ITT Industries.
    d. Conbraco Industries, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.

7. Low inlet-pressure check valve.
8. Inlet Strainer.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

H. Diaphragm-Operated Safety Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Amtrol, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Domestic Pump; a division of ITT Industries.
   d. Conbraco Industries, Inc.
   e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Wetted, Internal Work Parts: Brass and rubber.
8. Inlet Strainer.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

2.6 AIR CONTROL DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett Domestic Pump; a division of ITT Industries.
4. Taco.

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

C. Automatic Air Vents:

1. Body: Bronze or cast iron.
2. Internal Parts: Nonferrous.
3. Operator: Noncorrosive metal float.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/4.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 240 deg F.

D. Bladder-Type Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
3. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

E. In-Line Air Separators:

1. Tank: Manufacturer: Bell & Gossett
2. Maximum Working Pressure: Up to 175 psig.
3. Maximum Operating Temperature: Up to 300 deg F.

2.7 CHEMICAL TREATMENT

A. Bypass Chemical Feeder: Welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.

1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

2.8 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: [40] [60]-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

B. Spherical, Rubber, Flexible Connectors:

1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

C. Seismic Joint Loops
1. Metraflex or equal

D. Volume Tank
1. Rj Hansen pre insulated steel volume tank with baffles.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered, brazed or pressure seal joints.
2. Schedule 40 steel pipe; fittings; cast-iron flanges and flange fittings; and threaded joints.

B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.
2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

C. Chilled-water piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered, brazed or pressure-seal joints.
2. Schedule 40 steel pipe; fittings; cast-iron flanges and flange fittings; and threaded joints.

D. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.

2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

E. Makeup-water piping installed aboveground shall be:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.

F. Makeup-Water Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints. No joints under slabs.

G. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

H. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

I. Condensate Piping shall be:
1. Type L Copper with soldered wrot copper fittings.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. Install strainers on inlet side of each chiller, control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

S. Install seismic expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."

T. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."

U. Condensate Piping shall be install at all air handlers, fan coils and ceiling cassettes. Install piping sloping to drain with threaded plug cleanouts at change of direction.

V. Install insulated volume tank at location shown on drawings.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS ¾: Maximum span, 7 feet; minimum rod size, ¼ inch.
2. NPS 1: Maximum span, 7 feet; minimum rod size, ¼ inch.
3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
7. NPS 4: Maximum span, 10 feet; minimum rod size, ½ inch.
8. NPS 6: Maximum span, 10 feet; minimum rod size, ½ inch.

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS ¾: Maximum span, 5 feet; minimum rod size, ¼ inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, ¼ inch.
3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.

G. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.

C. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches above the floor. Install feeder in minimum NPS ¾ bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS ¾ pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

D. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages for HVAC Piping."

E. Install flexible connection for above ceiling cassettes.

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.

6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 23 2123

HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Close-coupled, in-line centrifugal pumps.

1.3 DEFINITIONS

A. Buna-N: Nitrile rubber.

B. EPT: Ethylene propylene terpolymer.

1.4 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Shop Drawings: Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store pumps in dry location.

C. Retain protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: One mechanical seal for each pump.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bell & Gossett; Div. of ITT Industries.
2. Grundfos/Paco Pumps Corporation.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump for installation with pump and motor shafts mounted horizontally or vertically.

C. Motor: Single speed, with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Inverter rated

D. Capacities and Characteristics: See Schedule on Plans.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

A. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

B. Suspend vertically mounted, in-line centrifugal pumps per detail on plans. Install pumps with motor and pump shafts vertical.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping, or install single gage with multiple input selector valve.

F. Install check valve and gate or ball valve on each condensate pump unit discharge.

G. Install flexible electrical connections for power, controls, and devices.

END OF SECTION 232123

SECTION 23 2300

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.4 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Piping and fittings.
2. Filter dryers.
3. Strainers.

B. Welding certificates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.7 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 VALVES AND SPECIALTIES

A. Straight-Type Strainers.

B. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).

C. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina or charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig (14 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 240 deg F (116 deg C).

2.3 REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

B. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

C. Install a full-sized, three-valve bypass around filter dryers.

D. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

E. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Compressor.

F. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

G. Install receivers sized to accommodate pump-down charge.

H. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. When brazing or soldering, 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.

O. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

P. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

S. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.

T. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).

C. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). 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 (14 kPa).
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water 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. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 23 2500

HVAC WATER TREATMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following HVAC water-treatment systems:

1. Bypass chemical-feed equipment and controls for heating hot water and chilled water.
2. Chemical treatment test equipment.
3. HVAC water-treatment chemicals.

1.3 DEFINITIONS

A. EEPROM: Electrically erasable, programmable read-only memory.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

C. RO: Reverse osmosis.

D. TDS: Total dissolved solids.

E. UV: Ultraviolet.

1.4 PERFORMANCE REQUIREMENTS

A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

C. Closed hydronic systems, including hot-water heating and chilled water shall have the following water qualities:

1. pH: Maintain a value within 7 to 9.
2. Nontoxic organic corrosion and scale inhibitor. Control level: 2000 ppm as total organic inhibitor.
3. Molydate: Control level: 200-300 ppm.
4. Nitrate: Control level: 500-700 ppm Hot Water as NO2.

1.5 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for the following products:

1. Bypass feeders.
2. Chemical test equipment.
3. Chemical material safety data sheets.
4. Chemicals.

B. Shop Drawings: Pretreatment and chemical[, and/or ozone-generator biocide, and/or UV-irradiation biocide treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: Power and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For sensors, injection pumps, water softeners, RO equipment, or water filtration units, and controllers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

1.7 MAINTENANCE SERVICE

A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion, scale formation, and biological growth for chilled-water piping and heating, hot-water piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion, and shall include the following:

1. Initial water analysis and HVAC water-treatment recommendations.
2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
3. Periodic field service and consultation.

4. Customer report charts and log sheets.
5. Laboratory technical analysis.
6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ampion Corp.
2. Anderson Chemical Co, Inc.
3. Aqua-Chem, Inc.; Cleaver-Brooks Div.
4. Barclay Chemical Co.; Water Management, Inc.
5. Boland Trane Services
6. GE Betz.
7. GE Osmonics.
8. H-O-H Chemicals, Inc.
9. Metro Group. Inc. (The); Metropolitan Refining Div.
10. ONDEO Nalco Company.
11. Watcon, Inc.

2.2 EQUIPMENT

A. See Schedule on Plans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install water testing equipment on wall near water chemical application equipment.

C. Install interconnecting control wiring for chemical treatment controls and sensors.

D. Mount sensors and injectors in piping circuits.

E. Bypass Feeders: Install in closed hydronic systems, including hot-water heating and chilled water, and equipped with the following:

1. Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
2. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.

F. Test system for leaks at 60 PSI for 24 hours. Flush system with clean water and then clean system with non-foaming detergent per manufacturer recommendations and then flush detergent to sewer.

G. Install water treatment chemicals per manufacturer's requirements treatment standards:

1. Closed Recirculating Water Systems: Hot water, glycol, chilled water and closed condenser water (220° F).

a. Nontoxic organic corrosion and scale inhibitor.
Control level: 2000 ppm as total organic inhibitor.
b. Molydate:
Control level: 200-300 ppm.
c. Nitrate:
Control level: 500-700 ppm Hot Water as NO^2.
d. PH:
Control level: 7-9.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in Division 23 Section "Common Work Results for HVAC."

D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Division 23 Section "Hydronic Piping"

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of HVAC systems' startup procedures.

4. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
5. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
6. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
7. Repair leaks and defects with new materials and retest piping until no leaks exist.

B. Remove and replace malfunctioning units and retest as specified above.

C. Sample water at one month intervals after boiler & chiller startup for a period of three months and prepare test report advising Owner of changes necessary to adhere to Part 1 "Performance Requirements" Article for each required characteristic.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment. Provide one hour of training. Schedule a minimum of two weeks prior to training.

END OF SECTION 232500

SECTION 23 3113

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Seismic-restraint devices.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Ductwork materials

2. Liners and adhesives.
3. Sealants and gaskets.
4. Seismic-restraint devices.

B. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.
7. Coordinate with sprinkler piping and electrical conduits
8. Coordinate with plumbing piping.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.
    d. Sheet Metal Connectors, Inc.
    e. Spiral Manufacturing Co., Inc.
    f. Omni Duct Systems.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints -

Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 and G90. (G90 for all exterior ductwork).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. 304 Stainless Steel

1. For fume hood and autoclave exhaust ductwork.
2. With stainless ductmate connectors.

2.4 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, and NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.

2. Maximum Thermal Conductivity:

a. Type I, Flexible: 0.27 Btu x in./h x sq. ft.x deg F at 75 deg F mean temperature.
b. Type II, Ridgid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

   a. Fan discharges.
   b. Intervals of lined duct preceding unlined duct.
   c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

   a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.

3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
9. VOC: Maximum 395 g/L.
10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.7 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide a product by one of the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Ductmate Industries, Inc.
3. Hilti Corp.
4. Kinetics Noise Control.
5. Loos & Co.; Cableware Division.
6. Mason Industries.
7. TOLCO; a brand of NIBCO INC.
8. Unistrut Corporation; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by the Division of the State Architect (DSA).

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 492, stainless-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Ductmate SpiralMate and Ovalmate shall be used for connections at exposed areas.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

F. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

G. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
3. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than2-Inch wg: Seal Class A.
4. Unconditioned Space, Exhaust Ducts: Seal Class C.
5. Unconditioned Space, Return-Air Ducts: Seal Class B.

6. Conditioned Space, Supply-Air Ducts in Pressure Classes2-Inch wg and Lower: Seal Class C.
7. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
8. Conditioned Space, Exhaust Ducts: Seal Class B.
9. Conditioned Space, Return-Air Ducts: Seal Class C.
10. At exposed areas use self sealing joint assembly – Ductmate Spiralmate.

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by the Division of the State Architect (DSA).

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Supply air systems.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

    a. Pressure Class: Positive 2-inch wg.
    b. Minimum SMACNA Seal Class: A.
    c. SMACNA Leakage Class for Rectangular: 12.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Constant-Volume Air-Handling Units:

    a. Pressure Class: Positive 3-inch wg.
    b. Minimum SMACNA Seal Class: A.

c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

3. Ducts Connected to Variable-Air-Volume Air-Handling Units:

a. Pressure Class: Positive 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 3.
d. SMACNA Leakage Class for Round and Flat Oval: 3.

4. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3-inch wg.
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.

c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

3. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

a. Exposed to View: Type 304, stainless-steel sheet.
b. Concealed: Type 304, stainless-steel sheet.
c. Welded seams and joints.
d. Pressure Class: Positive or negative 3-inch wg.
e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
f. SMACNA Leakage Class: 3.

4. Ducts Connected to Dishwasher Hoods:

a. Type 304, stainless-steel sheet.
b. Welded seams and flanged joints with watertight EPDM gaskets.
c. Pressure Class: Positive or negative 3-inch wg.
d. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
e. SMACNA Leakage Class: 3.

5. Ducts Connected to Fans Exhausting Laboratory and Process (ASHRAE 62.1, Class 3 and 4) Air:

a. Type 304, stainless-steel sheet.

1) Exposed to View: No. 4 finish.
2) Concealed: No. 2B finish.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

   a. Velocity 1000 fpm or Lower:

      1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
      2) Mitered Type RE 4 without vanes.

   b. Velocity 1000 to 1500 fpm:

      1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

   c. Velocity 1500 fpm or Higher:

      1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

   a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
   c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

      1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.

2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam or Welded.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 23 3135

FAN COILS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fan Coils.

1.2 RELATED SECTIONS

A. Section 230700 - Ductwork Insulation: Duct Liner.

B. Section 234100 - Air Cleaning.

C. Section 230900 - Energy Management Control System.

1.3 REFERENCES

A. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.

B. ANSI/ASHRAE - 90A - Energy Conservation in New Building Design.

C. ANSI/ASHRAE - 103 - Heating Seasonal Efficiency of Central Furnaces and Boilers, Methods of Testing.

D. ANSI/NEMA MG 1 - Motors and Generators.

E. ANSI/NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

F. ANSI/UL 207 - Refrigerant - Containing Components and Accessories, Non-Electrical.

G. ANSI/UL 303 - Refrigeration and Air-Conditioning Condensing, and Air-Source Heat Pump Equipment.

H. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

I. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

J. ARI 520 - Positive Displacement Refrigerant Compressors, Compressor Units and Condensing Units.

K. ASHRAE 52 - Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

L. FS F-F 310A - Filter, Air Conditioning: Viscous Impingement and Dry Types, Replaceable.

M. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

1.5 SUBMITTALS

A. Submit shop drawings under provisions of the general requirements.

B. Submit shop drawings indicating assembly, required clearances, and location and size of field connections.

C. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

D. Design data: Indicate refrigerant pipe sizing.

E. Manufacturer's Installation Instructions: Indicate rigging, assembly, and installation instructions.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation data under provisions of the general requirements.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI/ASHRAE 15.

B. Maintain one copy of each document on site.

1.8 WARRANTY

A. Provide one year warranty under provisions of the general requirements.

B. Warranty: Include coverage for furnace.

1.8 EXTRA MATERIALS

A. See Section 15885 for extra filter requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. See Equipment Schedule on plans.

2.2 MANUFACTURED: UNITS

A. Configuration: Upflow and Horizontal types.

1. Units:; Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, coils, controls, air filter.
2. ENVIRO-TEC® Model H, V or VR Belt Drive Blower Coil Units
3. All units shall be fabricated of minimum 18 gauge galvanized steel, able to withstand a 125 hour salt spray test per ASTM B-117. Panels shall be die-formed "multibend" construction for optimum strength and rigidity. All exterior panels shall be (single wall insulated with 1 inch thick fiberglass insulation) (foil faced-insulated with 1" thick, 1.5 pound per cubic foot density scrim reinforced foil faced insulation), rated for a maximum air velocity of 5000 f.p.m. In addition to using adhesive complying with NFPA 90A, the insulation shall incorporate a secondary mechanical fastener attached to the unit casing wall (weld pin). Adhesive as the only method of fastening the insulation to the casing is not acceptable. Maximum thermal conductivity shall be 0.24. Insulation must meet all requirements of UL 181 and NFPA 90A. All units shall have minimum 1" duct collars on discharge and return. All access panels shall be fully insulated and attached with standard fasteners on at least two opposite sides. No single access panel shall be larger than 30" x 36" for safety and ease of handling. No coil or drain piping or electrical connections shall pass through any access panel. Each unit shall be furnished with a one-piece heavy gauge (G90 steel) (IAQ stainless steel) drain pan with welded corner construction. All units shall be provided with 9/16" diameter hanger rod holes in the top and bottom panels for "through-bolt" type suspension installation.
4. All units shall be furnished with a flat filter rack with hinged access on both sides designed to accept a 2" nominal standard sized filters. All units shall be provided with Merv 8 pleated filters. Replace initial filters after 30 days. One complete set of spare Merv 8 pleated 2" filters shall be provided for each unit

B. Ceiling Cassettes

1. Multiaqua with heating and coiling coils with filter. Condensate drain.

2. Little Giant Condensate Pump

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that floors are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available for fan coil.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install to NFPA 90A and ANSI/NFPA 90B.

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C. Clean return plenum prior to delivery to owner.

D. Seal all connections to ductwork, coils and plenums.

E. Provide flex connection to ducting.

F. Install p-trap at condensate piping.

G. Install condensate pump at ceiling cassettes. Connect to unit power. Coordinate with plumbing contractor for connection to condensate piping.

3.3 SCHEDULE

A. See Equipment Schedule on plans.

END OF SECTION 233135

SECTION 23 3300

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Combination fire and smoke dampers.
4. Flange connectors.
5. Turning vanes.
6. Remote damper operators.
7. Duct-mounted access doors.
8. Flexible connectors.
9. Duct accessory hardware.

B. Related Sections:

1. Division 23 Section "Metal Duct".

1.3 SUBMITTALS

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

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

C. Comply with 2016 CBC Chapter 7 and 2016 CMC Chapter 6.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180) and G90 (Z275).
2. Exposed-Surface Finish: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Duro Dyne Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Pottorff; a division of PCI Industries, Inc.
6. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm (10 m/s).

D. Maximum System Pressure: 1-inch wg (0.25 kPa).

E. Frame: 0.052-inch- (1.3-mm-) thick, galvanized sheet steel.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, 0.025-inch- (0.6-mm-) thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Felt.

I. Blade Axles:

1. Material: Galvanized steel.
2. Diameter: 0.20 inch (5 mm).

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.

    a. Sleeve Thickness: 20-gage (1.0-mm) minimum.
    b. Sleeve Length: 6 inches (152 mm) minimum.

6. Screen Mounting: Rear mounted.
7. Screen Material: Galvanized steel.
8. Screen Type: Insect.
9. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Air Balance Inc.; a division of Mestek, Inc.
    b. McGill AirFlow LLC.
    c. METALAIRE, Inc.
    d. Nailor Industries Inc.

e. Pottorff; a division of PCI Industries, Inc.
f. Ruskin Company.

2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Single blade for ducts up to 24". Multiple blades for ducts greater than 24".
b. Opposed blade design for multiple blade dampers.
c. Stiffen damper blades for stability.
d. Galvanized-steel, 0.064 inch (1.62 mm) thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

9. Remote damper actuator

a. Pottorff or equal
b. Install at areas where damper is inaccessable

2.4 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers: Subject to compliance with 2016 CBC/CFC/CMC requirements, provide products by one of the following:

1. Pottorff, a division of PCI Industries, Inc.

2. Ruskin

2.5 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.

B. Description: Add-on, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel for galvanized steel ducts.

D. Material: Stainless steel for stainless steel ducts.

E. Gage and Shape: Match connecting ductwork.

2.6 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Single wall.

E. Vane Construction: Single wall for ducts up to 48 inches (1200 mm) wide and double wall for larger dimensions.

2.7 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pottorff; a division of PCI Industries, Inc.
2. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Brass.

D. Cable: Stainless steel.

E. Wall-Box Mounting: Recessed, 2 inches (50 mm) deep.

F. Wall-Box Cover-Plate Material: Steel.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Greenheck Fan Corporation.
3. McGill AirFlow LLC.
4. Nailor Industries Inc.
5. Pottorff; a division of PCI Industries, Inc.
6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches.
d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.

3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 10-inch wg (2500 Pa).
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.9 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).
2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).

G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz./sq. yd. (542 g/sq. m).

2. Tensile Strength: 285 lbf/inch (50 N/mm) in the warp and 185 lbf/inch (32 N/mm) in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F (Minus 55 to plus 260 deg C).

2.10 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and stainless-steel accessories in stainless-steel ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Connect ducts to duct silencers rigidly.

I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.

5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot (15-m) spacing.
8. Upstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

L. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

B. Damper testing shall be per 2016 CBC section 717.3.1.

C. Dampers shall have access and identification per 2016 CBC 717.4.

END OF SECTION 233300

SECTION 23 3713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Diffusers.

B. Registers/grilles.

1.2 RELATED WORK

A. Division 9 - Painting: Painting of ductwork visible behind outlets and inlets.

B. Section 15990 - Testing, Adjusting And Balancing

1.3 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

D. ARI 650 - Air Outlets and Inlets.

E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

F. SMACNA - Low Pressure Duct Construction Standard.

1.4 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

1.5 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

1.6 SUBMITTALS

A. Provide product data for items required for this project.

B. Submit schedule of outlets and inlets indicating type, size, location, application, and noise level.

C. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS AND RETURN REGISTERS/GRILLES.

A. Manufacturers:

1. See equipment schedule on plans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install items in accordance with Manufacturer's instructions. Install plumb and level.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

F. All air outlets shall be factory painted unless otherwise noted at the Air Distribution Schedule.

G. Screws color shall match distribution device.

3.2 AIR OUTLET AND INLET SCHEDULE

A. See equipment schedule on plans

END OF SECTION 233713

SECTION 23 5218

MODULATING VERTICAL BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged, factory-fabricated and -assembled, gas-fired, modulating vertical boilers, trim, and accessories for generating hot water.

1.3 SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.

B. Source quality-control test reports.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For boilers, components, and accessories to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

F. Other Informational Submittals:

1. ASME "A" Stamp Certification and Report: Submit "A" stamp certificate of authorization as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.
2. Startup service reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in California Electric Code, 2016, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

C. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

D. DOE Compliance: Minimum efficiency shall comply with 10 CFR 430, Subpart B, Appendix N, "Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers."

E. Comply with the requirements in 2016 CMC Chapter 8 & 9.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 MODULATING VERTICAL BOILERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Raypak

B. Description: Factory-fabricated, -assembled, and -tested boiler with tubes sealed into headers pressure tight, and set on a steel base; including insulated jacket, flue-gas vent, combustion-air intake connections, water supply and return connections, and controls.

C. Heat Exchanger:

1. Cylindrical, multi-pass.

D. Burner:

1. Gas Train: Control devices and full-modulation control sequence shall comply with requirements in AGA and ASME CSD-1. In addition to these requirements, include shutoff cock, pressure regulator, and control valve.
2. Pilot: Hot-surface pilot ignition with 100 percent main-valve and pilot-safety shutoff with electronic supervision of burner flame.
3. Low NOX: Boiler shall comply with latest Ventura County APCD Low NOX requirements.

E. Trim:

1. Modulating combination gas valve.
2. Safety Relief Valve: ASME rated.

F. Controls: Boiler Sequencer, Bacnet module.

G. Boiler Pump

H. Boiler cascade controller with Bacnet connection.

2.2 ELECTRICAL POWER

A. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.

2.3 CAPACITIES AND CHARACTERISTICS – SEE SCHEDULES ON PLANS

2.4 FLUE

A. Flue shall be stainless steel AL-29 4C with matching fittings. With 22 ga. flashing counterflashing, and termination.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before boiler installation, examine roughing-in for equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.

1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BOILER INSTALLATION

A. Install boilers level on base.

B. Install gas-fired boilers according to NFPA 54.

C. Install control wiring to field-mounted electrical devices.

D. Install flue to roof with flashing and termination. Patch roofing as required.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas train connection. Provide a reducer if required.

D. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

E. Install piping from safety relief valves to nearest floor drain.

F. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

G. Connect wiring according to Division 26 Section "Low-Voltage, Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform installation and startup checks according to manufacturer's written instructions.
2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

    a. Burner Test: Adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency.
    b. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
    c. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 235218

SECTION 23 6420
AIR COOLED SCROLL LIQUID CHILLER

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of this Section shall conform to the general provisions of the Contract, including General and Supplementary Conditions, Conditions of the Contract, and Contract Drawings.

1.2 SCOPE

A. Provide Microprocessor controlled, multiple scroll compressors, air-cooled, liquid chillers of the scheduled capacities as shown and indicated on the Drawings, including but not limited to:

1. Chiller package
2. Charge of refrigerant and oil
3. Electrical power and control connections
4. Chilled liquid connections
5. Manufacturer start-up

1.3 QUALITY ASSURANCE

A. Products shall be Designed, Tested, Rated and Certified in accordance with, and Installed in compliance with applicable sections of the following Standards and Codes:

B. AHRI 550/590 – Water Chilling Packages Using the Vapor Compression Cycle

C. AHRI 370 – Sound Rating of Large Outdoor Refrigerating and Air-Conditioning Equipment

D. ANSI/ASHRAE 15 – Safety Code for Mechanical Refrigeration

E. ANSI/ASHRAE 34 – Number Designation and Safety Classification of Refrigerants

F. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings

G. ANSI/NFPA 70 – National Electrical Code (N.E.C.)

H. ASME Boiler and Pressure Vessel Code, Section VIII, Division 1

I. OSHA – Occupational Safety and Health Act

J. Manufactured in facility registered to ISO 9001

K. Conform to Intertek Testing Services for construction of chillers and provide ETL/cETL Listed Mark

L. Factory Run Test: Chiller shall be pressure-tested, evacuated and fully charged with refrigerant and oil, and shall be factory operational run tested with water flowing through the vessel.

M. Chiller manufacturer shall have a factory trained and supported service organization.

N. Warranty: Manufacturer shall Warrant all equipment and material of its manufacture against defects in workmanship and material for a period of eighteen (18) months from date of shipment or twelve (12) months from date of start-up, whichever occurs first.

O. Comply with the requirement in 2016 CMC Chapter 11.

1.4 DELIVERY AND HANDLING

A. Unit shall be delivered to job site fully assembled with all interconnecting refrigerant piping and internal wiring ready for field installation and charged with refrigerant and oil by the Manufacturer.

B. Provide protective covering over vulnerable components for unit protection during shipment. Fit nozzles and open ends with plastic enclosures.

C. Unit shall be stored and handled per Manufacturer's instructions.

PART 2 - PRODUCTS

2.1 AIR COOLED CHILLER

A. Manufacturer: Provide as indicated on the plans and the specification herein, a Quantech air cooled chiller as basis of design.

B. Alternate – York of equal or better characteristics

2.2 CHILLER MATERIALS AND COMPONENTS

A. General: Install and commission, as shown on the schedules and plans, factory assembled, charged, and tested air cooled scroll compressor chiller(s) as specified herin. Chiller shall be designed, selected, and constructed using a

refrigerant with Flammability rating of "1", as defined by ANSI/ASHRAE STANDARD 34 Number Designation and Safety Classification of Refrigerants. Chiller shall include not less than two refrigerant circuits above 50 tons (200kW), scroll compressors, direct-expansion type evaporator, air-cooled condenser, refrigerant, lubrication system, interconnecting wiring, safety and operating controls including capacity controller, control center, motor starting components and special features as specified herin or required for safe, automatic operation.

B. Cabinet: External structural members shall be constructed of heavy gauge, galvanized steel coated with baked on powder paint which, when subject to ASTM B117, 1000 hour, 5% salt spray test, yields minimum ASTM 1654 rating of "6".

C. Operating Characteristics: Provide low and high ambient temperature control options as required to ensure unit is capable of operation from 30°F to 115°F (-1°C to 46°C) ambient temperature. [Optional: 0°F to 125°F (-18°C to 52°C) ambient.]

D. Service Isolation valves: Discharge (ball type) isolation valves factory installed per refrigerant circuit. Includes a system high-pressure relief valve in compliance with ASHRAE15.

E. Pressure Transducers and Readout Capability

1. Discharge Pressure Transducers: Permits unit to sense and display discharge pressure.
2. Suction Pressure Transducers: Permits unit to sense and display suction pressure.
3. High Ambient Control: Allows units to operate when the ambient temperature is above 115°F (46°C). Includes discharge pressure transducers

2.1 COMPRESSORS

A. Compressors: Shall be hermetic, scroll-type, including:

1. Compliant design for axial and radial sealing.
2. Refrigerant flow through the compressor with 100% suction cooled motor.
3. Large suction side free volume and oil sump to provide liquid handling capability.
4. Compressor crankcase heaters to provide extra liquid migration protection.
5. Annular discharge check valve and reverse vent assembly to provide low-pressure drop, silent shutdown and reverse rotation protection.
6. Initial oil charge.
7. Oil level sight glass.

8. Vibration isolator mounts for compressors.
9. Brazed-type connections for fully hermetic refrigerant circuits.
10. Compressor Motor overloads capable of monitoring compressor motor current. Provides extra protection against compressor reverse rotation, phase-loss and phase-imbalance.
11. Provide outdoor factory sound blanket for compressors.

2.2 REFRIGERANT CIRCUIT COMPONENTS

A. Each refrigerant circuit shall include: a discharge service ball type isolation valve, high side pressure relief, liquid line shutoff valve with charging port, low side pressure relief device, filter-drier, solenoid valve, sight glass with moisture indicator, thermostatic expansion valves, and flexible, closed-cell foam insulated suction line and suction pressure transducer.

2.3 HEAT EXCHANGERS

A. Evaporator:

1. Evaporator shall be brazed-plate stainless steel construction capable of refrigerant working pressure of 650 psig (3103 kPa) and liquid side pressure of 150 psig (1034 kPa) [Option for 300 psig (2068 kPa) available].

2. Brazed plate heat exchangers shall be UL listed.

3. Exterior surfaces shall be covered with 3.4" (19mm), flexible, closed cell insulation, thermal conductivity of 0.26k ([BTU/HR-Ft² - °F]/in.) maximum.

4. Water nozzles shall be provided with grooves for field provided ANSI/AWWA C-606 mechanical couplings.

5. Evaporator shall include vent and drain fittings and thermostatically controlled heaters to protect to -20°F (-29°C) ambient in off-cycle.

6. A 20-mesh, serviceable wye-strainer and mechanical couplings shall be provided for field installation on evaporator inlet prior to startup.

7. Evaporator shall be provided with piping extension kit and mechanical couplings to extend liquid connection from evaporator to edge of unit. Thermal dispersion type flow switch shall be factory installed in the evaporator outlet pipe extension and wired to the unit control panel. Insulation and heat trace on piping shall be responsibility of installing contractor. Extension kit nozzle connections shall be ANSI/AWWA C-606 (grooved).

B. Air-cooled Condenser:

1. Coils: Condenser coils shall be constructed of a single material to avoid galvanic corrosion due to dissimilar metals. Coils and headers are brazed as one piece. Integral sub cooling is included. Coils shall be designed for a design working pressure of 650 PSIG (45 bar). Condenser coil shall be washable with potable water under 100 psi (7 bar) pressure.
2. Low Sound Fans: Shall be dynamically and statically balanced, direct drive, corrosion resistant glass fiber reinforced composite blades molded into a low noise, full-airfoil cross section, providing vertical air discharge and low sound. Each fan shall be provided in an individual compartment to prevent crossflow during fan cycling. Guards of heavy gauge, PVC (poly- vinylchloride) coated or galvanized steel shall be factory installed.
3. Fan Motors: High efficiency, direct drive, 6 pole, 3 phase, insulation class "F", current protected, Totally Enclosed Air-Over (TEAO), rigid mounted, with double sealed, permanently lubricated, ball bearings.
4. Louvered cabinet/coil casing covers; unit shall HDG steel panels, powder coated for sea coast protection, with punched louvers, designed to protect the coils, and not hinder airflow.
5. Coils shall have Luvata coating.
6. Five year factory coil warranty

2.4 CONTROLS

A. General: Automatic start, stop, operating, and protection sequences across the range of scheduled conditions and transients.

B. Power/Control Enclosure: Rain and dust tight NEMA 3R powder painted steel cabinet with hinged, latched, and gasket sealed door.

C. Microprocessor Control Center:

1. Automatic control of compressor start/stop, anti-coincidence and anti-recycle timers, automatic pumpdown at system shutdown, condenser fans, evaporator pump, evaporator heater, unit alarm contacts, and chiller operation from 0°F to 125°F (-18°C to 52°C) ambient. Automatic reset to normal chiller operation after power failure.

2. Software stored in non-volatile memory, with programmed setpoints retained in lithium battery backed real-time-clock (RTC) memory for minimum 5 years.

3. Forty character liquid crystal display, descriptions in English (or Spanish, French, Italian, or German), numeric data in English (or Metric) units. Sealed keypad with sections for Setpoints, Display/Print, Entry, Unit Options & clock, and On/Off Switch.

4. Programmable Setpoints (within Manufacturer limits): display language; chilled liquid temperature setpoint and range, remote reset temperature range, daily schedule/holiday for start/stop, manual override for servicing, low and high ambient cutouts, low liquid temperature cutout, low suction pressure cutout, high discharge pressure cutout, anti-recycle timer (compressor start cycle time), and anti-coincident timer (delay compressor starts).

5. Display Data: Return and leaving liquid temperatures, low leaving liquid temperature cutout setting, low ambient temperature cutout setting, outdoor air temperature, English or metric data, suction pressure cutout setting, each system suction pressure, liquid temperature reset via a 4-20milliamp or 0-10 VDC input, anti-recycle timer status for each compressor, anti-coincident system start timer condition, compressor run status, no cooling load condition, day, date and time, daily start/stop times, holiday status, automatic or manual system lead/lag control, lead system definition, compressor starts/operating hours (each), status of hot gas valves, evaporator heater and fan operation, run permissive status, number of compressors running, liquid solenoid valve status, load & unload timer status, water pump status.

6. System Safeties: Shall cause individual compressor systems to perform auto shut down; manual reset required after the third trip in 90 minutes. System Safeties include: high discharge pressure, low suction pressure, high pressure switch, and motor protector. Compressor motor protector shall protect against damage due to high input current or thermal overload of windings.

7. Unit Safeties: Shall be automatic reset and cause compressors to shut down if low ambient, low leaving chilled liquid temperature, under voltage, and flow switch operation.

8. Alarm Contacts: Low ambient, low leaving chilled liquid temperature, low voltage, low battery, and (per compressor circuit): high discharge pressure, and low suction pressure.

9. BAS Communications: BACnet MS/TP, Modbus and N2 communication capabilities are standard.

D. Manufacturer shall provide any controls not listed above, necessary for automatic chiller operation. Mechanical Contractor shall provide field control wiring necessary to interface sensors to the chiller control system.

2.5 POWER CONNECTION AND DISTRIBUTION

A. Power Panels:

1. NEMA 3R/12 rain/dust tight, powder painted steel cabinets with hinged, latched, and gasket sealed outer doors. Provide main power connection(s) with a non fused disconnect, control power connections, compressor and fan motor start contactors, current overloads, and factory wiring.

2. Power supply shall enter unit at a single location, be 3 phase of scheduled voltage, and connect to individual terminal blocks per compressor. Separate disconnecting means and/or external branch circuit protection (by Contractor) required per applicable local or national codes.

B. Compressor, control and fan motor power wiring shall be located in an enclosed panel or routed through liquid tight conduit.

2.6 ACCESSORIES AND OPTIONS

A. Microprocessor controlled, Factory installed Across-the-Line type compressor motor starters as standard.

B. Outdoor Ambient Temperature Control

C. Power Supply Connections:

1. Single Point Power Supply: Single point Terminal Block for field connection and interconnecting wiring to the compressors. Non Fused Disconnect Separate external protection must be supplied, by others, in the incoming power wiring, which must comply with the National Electric Code and/or local codes.

D. Thermal Dispersion Flow Switch (Factory installed and wired in piping extension kit): Normally open, 30bar pressure rating, stainless steel 316L construction, IP67, -4°F to 158°F ambient rating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Rig and Install in full accordance with Manufacturer's requirements, Project drawings, and Contract documents.

B. Location: Locate chiller as indicated on drawings, including cleaning and service maintenance clearance per Manufacturer instructions. Adjust and level chiller on concrete slab.

C. Components: Installing Contractor shall provide and install all auxiliary devices and accessories for fully operational chiller.

D. Electrical: Coordinate electrical requirements and connections for all power feeds with Electrical Contractor (Division 16).

E. Controls: Coordinate all control requirements and connections with Controls Contractor. Provide factory support to controls contractor for Bacnet connection

F. Finish: Installing Contractor shall paint damaged and abraded factory finish with touch-up paint matching factory finish.

END OF SECTION 236420

SECTION 23 7200

AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Packaged energy recovery units.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, furnished specialties, and accessories.

B. Field quality-control reports.

C. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in 2004 CEC, by a qualified testing agency, and marked for intended location and application.

B. ARI Compliance: Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Rating Air-to-Air Energy Recovery Equipment."

C. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
2. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."

D. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

E. UL Compliance: Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."

1.5 COORDINATION

A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy Recovery Units: One year.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of each type of filter specified.
2. Fan Belts: One set of belts for each belt-driven fan in energy recovery units.

PART 2 - PRODUCTS

2.1 PACKAGED ENERGY RECOVERY UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Dynamic Air Inc.

B. General Description

Factory-assembled, the unit consists of fan and motor assemblies (supply and exhaust), heat recovery device (Flat Plate Heat Exchanger), all necessary dampers, hoods, plenums, filters, drain pans, wiring, controls and other accessories as specified.

C. Unit Cabinet

1. Unit is to be installed by the mechanical contractor. Indoor units weatherized for outdoor use are not acceptable.
2. All unit panels are attached with zinc plated hexagonal-head type screws complete with a washer and rubber gasket for weatherproof assembly. All panel seams shall be caulked and sealed for an airtight unit.
3. When rigging, base frame deflection shall be less than 1/360 of the unit length. All major components shall be supported by the base without sagging or pulsating.
4. Unit base shall be constructed from structural steel (5" [127mm]).
5. Unit base shall accommodate curb or concrete pad installation. Single wall and non-insulated floor construction is not acceptable.
6. Unit base shall be internally insulated with 4" [102mm], 3.5 lb/cu. ft. mineral wool (R16.8).
7. Single wall construction with coated insulation is not acceptable. Exposed insulation edges in the airstream are not acceptable.
8. Unit floor shall be constructed from 18 gauge galvanized steel. Unit sub-floor shall be constructed of 26 gauge galvanized steel.
9. The rigid frame provides stable construction allowing for panel removal without affecting the unit integrity.
10. Panels shall be double wall construction using 2" [51mm] thick mineral wool insulation (R8.4), galvanized steel painted exterior panels and galvanized steel inner liners.
11. Internal partition shall be insulated and constructed in the same manner as the unit cabinet.
12. Double-sloped IAQ drain pans shall be made of formed sections of stainless steel. Drain pans shall be sloped at a minimum of 1.5% with a drain pipe connection of 1 1/4" MPT ending over the structural base channel. All drain pan corners shall be welded.
13. Outdoor units shall have a 3% minimum roof pitch to prevent water accumulation. Rain gutters shall be provided above access doors. All roof joint seams shall be "T" shape construction, minimum height of 1" [25mm], metal strip sealed and encapsulated. The unit shall be designed to resist snow, ice and wind loads.
14. Weather hood(s) for outdoor units shall be provided with birdscreen and rain gutters. Hoods shall be shipped loose for field-assembly.
15. Paint options:
    a. Outdoor units shall have one coat of grey air-dried paint.
    b. All galvanized steel surfaces requiring paint shall be made of satincoat-finished galvanized steel of the specified gauge(s).
    c. All galvanized steel surfaces without any paint shall be made of galvanized steel of the specified gauge(s).
    d. All unit surfaces requiring paint shall be cleaned and free of oil, dirt and other contaminants before painting.

D. Access Doors

1. Full size access door(s) allowing for periodic maintenance and inspections must be provided for all serviceable components. Door insulation shall be the same as unit panels. Doors shall be provided with heavy duty corrosion resistant aluminum hinges that allow doors to open at 180° with no shear effect on the full perimeter gasket on the hinge side. Doors shall be double wall construction made of galvanized steel for both outer and inner liner for maximum rigidity.
2. Compression type handles operable from both sides and neoprene resilient bubble gaskets for a seal-tight enclosure shall be provided.
3. Door openings shall be flush with all surrounding panels.

E. Flat Plate Heat Exchanger

1. Flat plate assembly shall be ARI CERTIFIED (Standard 1060) and tested in accordance with ASHRAE 84-91. Flat plate shall be cross-flow type made of 6-mil embossed pure aluminum designed to maximize efficiency and cleaning while minimizing pressure loss.
2. An access section with a sloped drain pan shall be provided both upstream and downstream of each flat plate airstream to allow for flat plate heat exchanger servicing.

F. Fans

1. Fans shall be factory-tested and performance ratings shall comply with AMCA 210.
2. Fans shall be statically and dynamically designed and balanced for continuous operation at the maximum rated fan speed and motor horsepower in accordance with AMCA 300.
3. Fans shall be of centrifugal type, rigidly braced and reinforced to help prevent vibration or pulsation. Wheel diameters and outlet areas shall be in accordance with the sizes adopted by AMCA.
4. Fan and motor assemblies shall be mounted inside the unit casing with 1" [25mm] (90% minimum efficiency) deflection spring vibration isolators and supplied with flexible neoprene connections.
5. Removable shipping restraints shall be provided to protect the fan, motor and base during shipment.
6. Fan shall be selected for stable operation, at least 20% under the first critical speed of the fan. Unit shall be equipped with forward-curved, DWDI supply and exhaust fans. All forward-curved fans shall be built in accordance with the AMCA Standard.
7. Fan shaft shall be solid steel, turned, ground, polished and finished off with a corrosion resistant coating. Fan wheels shall be keyed to the shaft.
8. Bearings shall be heavy duty, grease-lubricated, self-aligning ball or pillow block type, selected for a minimum average bearing life (L-50) in excess of 200,000 hours at maximum operating speed in accordance with AFBMA 9 Standards.

9. Fan drives shall be designed for a 1.3 service factor. Drives are factory-mounted with final alignment and belt adjustment completed before unit start-up.
10. Motors and fan pulleys shall be of fixed pitch.

G. Motors

1. All motors are enclosed in the unit casing and are mounted on an adjustable base that allows for belt alignment and tensioning.
2. Fan motors shall be heavy duty, 1800 rpm, high efficiency (EPAct), open drip proof (ODP), NEMA Design B with Class F insulation and have a 1.15 service factor. Motors shall run at constant speed and field voltage (460/3/60).
3. Fan motor torque shall efficiently accelerate the drive loads.
4. Motor shall be of minimum size as indicated in the equipment schedule. Unless indicated, motor shall not operate in the service factor range.
5. Temperature rating shall be 122°F [50°C] maximum temperature rise at 104°F [40°C] ambient for continuous duty at full load (Class B Insulation).
6. Motor construction shall be to NEMA Standard MG 1, general purpose, continuous duty, Design B.
   a. Base shall be adjustable.
   b. Bearings shall be:
      i) Ball or roller type with inner and outer shaft seals.
      ii) Grease lubricated.
      iii) Designed to resist thrust loading where belt or other drives produce lateral or axial thrust in motors.
   c. Energy efficient motors shall have a minimum efficiency in accordance with IEEE Standard 112-B. If efficiency is not specified, motors shall give a higher efficiency than "average standard industry motors" in accordance with IEEE Standard 112-B.

H. Filters

1. Filters shall be of UL 900 Class II.
2. Outside and return air inlets shall be equipped with galvanized steel racks that permit filter slide out removal (side access) for units equal or less than 78" [1,981mm] tall and universal holding frames with upstream access for units taller than 78" [1,981mm].
3. Filter air velocity shall not exceed 500 fpm through each filter bank.
4. Unit shall include 2" [51mm] disposable-type air prefilters, MERV 7 (approx. 25-30% DSE).

CAPACITIES AND CHARACTERISTICS – SEE SCHEDULES ON PLANS.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Unit Support: Install unit level on structure. Coordinate wall penetrations and flashing with wall construction. Secure air-to-air energy recovery equipment to structural support with anchor bolts.

B. Install wind and seismic restraints according to manufacturers' written instructions.

C. Retain first paragraph below for suspended units. Retain option for projects in seismic areas.

D. Install units with clearances for service and maintenance.

E. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements for ductwork specified in Division 23 Section "Metal Ducts."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Adjust seals and purge.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Set initial temperature and humidity set points.
5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

D. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 237200

SECTION 23 7318

CUSTOM AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Design, performance criteria, controls, and installation requirements for Custom Air Handling Units.

1.2 REFERENCES

A. AMCA Standard 99

B. AMCA Standard 203

C. AMCA Standard 210

D. AMCA Standard 300

E. AMCA Standard 500

F. ARI Standard 410

G. ASHRAE/ANSI Standard 111

H. ASHRAE Standard 52

I. ANSI/ASHRAE 15

J. ANSI/UL 900

K. NFPA 70

L. NFPA 90A; NFPA 90B

M. UL Standard 1995

1.3 SUBMITTALS

A. Submit shop drawings and product data in accordance with Division 1

B. Submittals shall include the following:

1. Dimensioned plan and elevation view drawings, including motor starter and control cabinets, required clearances, and location of all field connections.

2. Summary of all auxiliary utility requirements such as: electricity, water, compressed air, etc. Summary shall indicate quality and quantity of each required utility.

3. Ladder-type schematic drawing of the power and auxiliary utility field hookup requirements, indicating all items that are furnished by the manufacturer.

4. Manufacturer's performance of each unit. Selection shall indicate, as a minimum, the following:

   a. Input data used for selection.
   b. Model number of the unit.
   c. Net capacity.
   d. Rated load amp draw.
   e. Fan curves.
   f. Approximate unit shipping weight.

1.4 OPERATION AND MAINTENANCE DATA

A. Include data on design, inspection and procedures related to preventative maintenance. Operation and maintenance manuals shall be submitted at the time of unit shipment.

1.5 QUALIFICATIONS

A. Manufacturer shall be a company specializing in the design and manufacture of commercial / industrial custom air handling equipment.

B. Each unit shall bear an ETL or UL label.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under the supervision of the owner.

1.7 WARRANTY

A. The complete unit shall be covered by a parts warranty issued by the manufacturer covering the first year of operation. This warranty period shall start on the date of startup or six months after the date of shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design is by Dynamic Air Technology, Inc., acceptable alternates by Temtrol, Governair or Webco, providing full compliance of plans and specifications will be considered equal.

2.2 GENERAL

A. Industrial / commercial quality equipment shall be furnished and installed. Units shall be completely factory assembled and tested. The equipment's cooling and heating capacity and performance shall meet or exceed that shown on the schedule. Tags and decals to aid in service or indicate caution areas shall be provided. Electrical wiring diagrams shall be attached to the control panel access doors. Operation and maintenance manuals shall be furnished with each unit.

2.3 CABINET CONSTRUCTION

Cabinets shall be constructed in a watertight and airtight manner.

A. Paint: The exterior of the cabinets shall be electro-statically finished with high solids, all aliphatic, two components, polyurethane coating. Temperature range from 20 °F to 275 °F. Unit coating shall be tested for 1000 hours of salt spray in accordance with ASTM-B117 and 1000 hours of UV resistance is accordance with ASTM-G53.

B. Perimeter Base: The unit shall be constructed on a welded structural steel channel perimeter base frame which shall be reinforced with cross and parallel members. The steel channel shall be hot rolled structural "C" channel with the height as indicated in the equipment schedule and engineering drawings. Floors shall be designed to deflect no more than 1/200 of span under operating conditions. The perimeter base frame shall have welded integral lifting lugs. Lifting lugs shall be located and sized to allow rigging and handling of the unit.

Floor Construction, Double Wall: Floors shall be double wall and insulated. Floor panels shall be fabricated of 16 gauge G-90 galvanized steel. The unit floor panels shall be welded to the structural rigid frame at 4" centers. Floor insulation shall be 2" thick 1.5 lbs density fiberglass insulation. Floor under liner shall be 22 gauge G90 galvanized steel.

C. Panel Construction, Double Wall: Panels shall be fabricated of 18 gauge G-90 galvanized steel. Panels shall be attached to the structural rigid frame with zinc plated self-tapping screws at 8" centers. All vertical and horizontal joints between panels shall be sealed, interior

and exterior, with high performance polycarbomate sealant to form a water and airtight seal. Individual panels shall be removable without removing the roof or compromising the integrity of the cabinet wall. Panel insulation shall be 2" thick 1.5 lbs density fiberglass insulation. Panel liners shall be 22 gauge G-90 galvanized steel.

2.3.1 ACCESS DOORS

A. Access doors shall be double wall with 2" insulation. Access doors shall be constructed with the same material as the wall panels of the unit. Access doors will be bracketed with pressure channel straps that will be attached to fully adjustable hinges. Neoprene gasket will be applied between the frame and the door. All doors will have roller cams with Allegis type handles. A door entering into any section of unit which contains rotating fans or any moving parts that could cause bodily injury will be provided with ETL approved tool locked handles.

2.4 FAN ASSEMBLY

A. Fan shall be wall mounted, direct driven centrifugal type, welded steel, designed for industrial duty and suitable for continuous operation. Fan shall be licensed to bear the AMCA Air & Sound Performance seal with performance ratings based on tests conducted in accordance with AMCA Standard 211 and comply with the requirements of the AMCA Certified Ratings Program. The horsepower characteristic of the fan shall be truly non-overloading and shall peak at maximum efficiency within the normal selection range. Fans shall be arranged in a fan array, and provide uniform flow through the AHU.

B. Motors: All motors shall be NEMA design B with Class F insulation. Motors shall have electrical characteristics and horsepower as specified on the mechanical schedule. All motors shall have a minimum service factor of 1.15. Motors shall be premium efficiency, open drip proof.

2.5 FILTERS

A. Filter Frames: Filter frames shall be fabricated from no less than 18 gauge G-90 galvanized steel. The filter frames shall be designed to use standard size filters only. Odd sized filters are not allowed.

B. Medium Efficiency Pleated Filters: Pleated filters shall be 2" thick, MERV 8 and 12" thick MERV 13 as rated be ASHRAE Standard 52.1 test methods.

2.6 COILS (AHU-2 TO 4 ONLY)

A. General: All coils shall meet or exceed all capacities specified on the mechanical schedule for the project. All water coil performances shall be certified by the manufacturer to be in accordance with ARI Standard 410. Coil air face velocities shall not exceed the specified velocities of the mechanical schedule.

B. Drain Pans: Cooling coil sections shall have a pitched drain pan constructed from 16 gauge 304 stainless steel. All corners shall be welded watertight. The drain pan shall be completely insulated. The coil drain pan shall have a 1" M.P.T. stainless steel drain connection extended to the exterior of the air handler.

C. Hot and Chilled Water Coils: Internal tubes shall be staggered with plate-type tempered fins for maximum performance with minimal air pressure drop. Internal tubes shall be round seamless 5/8", 0.020" wall copper which have been deoxidized by the addition of phosphorous. Coil casings shall be constructed of continuous galvanized steel. Coil fins shall be plate-type, die-formed corrugated 0.006" or 0.008" aluminum. The copper circuiting tubes shall be mechanically expanded to the fins.

2.7 DAMPERS

A. Galvanized Low Leakage Control Damper: Galvanized damper shall be heavy-duty construction designed for industrial applications. Blades shall be opposed blade type, 3V shaped galvanized steel. The frame shall be fabricated from galvanized steel. Jamb seal shall be compressible metal. Dampers shall be tested for leakage and air pressure drop in accordance with AMCA Standard 500.

B. Plate type heat exhanger (AHU-1 ONLY)

1 The exchanger plates shall be 99.9% pure aluminum. Plates made from aluminum alloys, plastic, fiber, steel or other material(s) are unacceptable.

2 The plates shall be die formed with the patented positive/negative dimple stamping that provides the Hoval Series' exclusive plate profile and discontinuous channel design. Plate profiles of the laminar flow design type are unacceptable.

3 Aluminum plate thickness shall be 0.005" (0.127 mm) for the best possible effectiveness. Thicker aluminum plates shall not be acceptable.

4 The connecting plate edges shall be multiple folded. The double fold shall provide a six fold material thickness on the leading and trailing edges of

the plate exchanger and provide protection from the cutting edge of the exchanger plates within the double fold. Construction methods that use a single fold, or glue at the leading and trailing edges of the exchanger are not acceptable.

5 The air-to-air plate exchanger core shall be assembled into a strong, self-supporting frame made of aluminum corner extrusions and 20 gauge galvanized steel end plates.

6 The corners of the assembled exchanger package and the inside of the double folded seams shall be sealed with synthetic casting resin.

7 The aluminum corner extrusions shall be hollow to accept mounting screws and shall provide a 45° corner support angle.

8 The air-to-air plate exchanger package with synthetic resin sealed corners shall be resistant to temperatures up to 194°F (90°C).

9 The air-to-air plate exchanger shall withstand, without significant change in its performances and pressure drops, a pressure differential of at least 6" w.g.. It shall withstand a pressure differential of 10" w.g. without permanent deformation.

10 Drain Pans: Heat exchanger sections shall have a pitched drain pan constructed from 16 gauge 304 stainless steel. All corners shall be welded watertight. The drain pan shall be completely insulated. The coil drain pan shall have a 1" M.P.T. stainless steel drain connection extended to the exterior of the air handler.

2.8 ELECTRICAL POWER AND CONTROLS

A. General: Units operating voltage shall be 460V, 3 phase, 60Hz. All wiring and electrical equipment supplied by the manufacturer shall conform to and be installed in accordance with the requirements of UL1995.

1. Provide externally mounted U.L. listed NEMA 3R enclosure with motor overload protection.
2. Mount a permanent nameplate on the unit to display the manufacturer, serial number, and model number, date of manufacture, horsepower, current and voltage.

2.9 UNIT TESTING AND QUALITY CONTROL

A. Standard Factory Tests: The fans shall be factory run tested to insure design integrity and proper RPM. All electrical circuits shall be tested to ensure correct operation before shipment of unit. All Units shall be factory run-tested and shall pass quality control and be thoroughly cleaned prior to shipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in strict accordance with manufacturer's requirements, shop drawings, and Contract Documents.
B. Review access to mechanical mezzanine for equipment installation.
C. Provide new housekeeping pad and unit anchorage.

3.2 START-UP

A. Factory Start-Up Services: Start-up is to be supervised by the unit manufacturer or a manufacturer-certified service organization. Physical connections and start-up are provided by the installing contractor. Provide for as long a period of time as is necessary to ensure proper operation of the unit but in no case for less than 2 full working days. The start-up engineer shall conduct such operating tests as required to ensure that the unit is operating in accordance with design. Complete testing of all safety and emergency control devices shall be made. The start-up engineer shall submit a written report to the owner and manufacturer containing all test data recorded as required above and a letter certifying that the unit is operating properly.

B. Operation and Maintenance Manuals: Provide complete with descriptive literature, model, and serial number of all equipment, performance data, manufacturer's instructions for operating and maintenance, lubrication recommendation and schedule, and winter shutdown procedure.

END OF SECTION 237318

SECTION 26 0000

GENERAL PROVISIONS

PART 1 - GENERAL

A. The general contract provisions apply to this section and take precedent over this section in case of conflict.

1.01 GENERAL PROVISIONS

A. This division supplements the applicable requirements of other divisions.

1.02 DEFINITIONS

A. For the purposes of Division 260000, the following definitions apply:

1. Provide: Furnish and install.

2. Indicated: As shown on the drawings or specified herein.

3. Circuit Designation: Panel designation and circuit number, i.e., LA-13.

4. Approved equal: Approved by the engineer of record as equal in his sole determination.

1.03 SCOPE OF WORK

A. The Specifications for Work of Division 260000 include, but are not limited to the following sections:

26 0000–General Provisions
26 0030–Tests and Identification
26 0050–Basic Electrical Materials and Methods
26 0060–Minor Electrical Demolition for Remodeling
26 0080–Technical Services Division Start-Up Service
26 0111–Conduits
26 0112–Plug-In Strips
26 0114–Cable Trays
26 0115–Wireways
26 0116–Wire Basket Cable Trays
26 0118–Duct Bank
26 0120–Conductors
26 0122–Medium Voltage Cables
26 0130–Electrical Boxes
26 0133–Terminal Cabinets
26 0140–Wiring Devices
26 0142–Nameplates and Warning Signs

26 0163–Distribution Panelboards
26 0164–Branch Circuit Panelboards
26 0170–Disconnects
26 0190–Support Devices
26 0585–Horizontal Boring System
26 2450–Grounding
26 2480–Motor Starting Equipment and Wiring
26 2510–Lighting Fixtures
26 4721–Fire Alarm and Detection System
26 4745–Networking & Data Communications
26 4750–Cabling and Distribution System
26 4901–General Control Devices
26 4920–Motor Control

B. Work Included: 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 division, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all divisions for related work required to be included as work under this division.

2. General provisions for electrical work.

3. Site observation including existing conditions.

C. Related Work Specified Elsewhere but included in the scope of work:

1. Motors and their installation.

2. Control wiring and conduit for heating, ventilating and air conditioning.

D. Work Not In Contract (N.I.C.):

1. Telephone instruments.

E. Coordination

1. The following supplements are additional General Requirements pertaining to work of this Division. Provisions of Division 1 - General Requirements shall remain in effect.

a. Coordinate work of various sections of Division 26 and 27.

b. Coordinate work of this Division 26 with work of Divisions 2 through 25.

1.04 REFERENCE STANDARDS

A. American National Standards Institute (ANSI).

B. Association of Edison Illuminating Companies (AEIC).

C. Electrical Testing Laboratories (ETL).

D. Illuminating Engineering Society (IES).

E. Institute of Electrical and Electronic Engineers (IEEE).

F. Insulated Cable Engineers Association (ICEA).

G. National Electrical Manufacturers Association (NEMA).

H. National Fire Protection Association (NFPA).

I. Underwriters Laboratories, Inc. (UL).

J. California State Fire Marshal (CSFM).

K. California Energy Commission (CEC) Title 24.

1.05 QUALITY ASSURANCE

A. Regulations: All the electrical equipment and materials, including their installations, shall conform to the following applicable latest codes and standards:

1. California Electric Code, Latest Adopted Edition (CEC), 2011 unless a more current version has been adopted.

2. Local and State Fire Marshal.

3. Occupational Safety and Health Act (OSHA).

4. Requirements of the Serving Utility Company.

5. State Codes Ammendments.

6. Requirements of the Office of the California State Architect (OSA).

7. California Administrative Code, Title 8, Chapter 4, Industrial Safety Orders.

8. California Administrative Code, Title 24.

9. County of Ventura Codes and Regulations.

B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply. In instances where plans and specifications are at variance or conflict the most restrictive requirement shall apply. Contractor shall be responsible for all his associated work and materials and also the work and materials of related or affected trades.

C. Contractor's Expense: Obtain and pay for all required bonds, insurance, licenses, and pay for all taxes, fees and utility charges required for the electrical work.

D. Testing and Adjustment:

1. Perform all necessary tests required to ascertain that the electrical system has been properly installed, that the power supply to each item of equipment is correct, and that the system is free of grounds, ground faults, and open circuits, that all motors are rotating in the proper directions, and such other tests and adjustments as may be required for the proper completion and operation of the electrical system. Contractor shall provide a copy of all test reports to prove these tests have been performed.

2. If, during the course of testing, it is found that system imbalance is in excess of 20%, rearrange single-pole branch circuit in lighting and receptacle panels to bring system balance to within 20% on all phases. Record all such changes on the typewritten panelboard schedule and submit a summary of changes to the Engineer on the record drawings.

1.06 SUBMITTALS

A. Procedure: In accord with the Submittal Section.

B. Shop drawings: Detailed shop drawings for the following equipment:

1. Distribution panelboards.

2. Branch circuit panelboards.

3. Circuit breaker.

4. Cable trays and accessories.

5. Switchboards.

6. Ground fault protection.

7. Fire alarm system.

8. Motor control centers.

9. Contactors and cabinet.

10. Low voltage cabling riser diagram

C. Product data: Detailed manufacturer's data for:

1. Cable tray.

2. Cabinets.

3. Concrete pull boxes.

4. Disconnects.

5. Individually mounted circuit breakers.

6. Transformers.

7. Lighting fixtures and associated equipment including control.

8. Electric door strikes.

9. Audio systems.

D. Test results for the following:

1. Fire alarm system.

2. Circuit breakers.

3. Grounding systems.

4. Cables.

E. Include sufficient information to indicate complete compliance with Contract Documents. Include illustrations, catalog cuts, installation instructions, drawings, and certifications. On each sheet show manufacturer's name or trademark.

F. Operating, maintenance, and instruction data for:

1. Switchboards.

2. Ground fault protection.

3. Alarm and detection.

4. Audio equipment.

G. Instruction materials:

1. Provide at the time of personnel instruction period three bound copies of instruction manuals for the systems as listed in Subparagraph 1.04.A.4.f.

2. Include the following (minimum) information in each copy of instruction manual:

a. Manufacturers' names and addresses including phone numbers.

b. Serial numbers of items furnished.

c. Catalog cuts, exploded views and brochures, complete with technical and performance data for all equipment, marked to indicate actual items furnished and intended use.

d. Recommended spare parts.

1.07 OWNER'S PERSONNEL INSTRUCTIONS

A. Prior to completion of the contract, and at the Owner's convenience, instruct verbally and demonstrate to the Owner's personnel, the operation of the systems as listed under operating, maintenance, and instructional data and/or emergency generator, automatic transfer switch and fire alarm annunciator panel.

1.08 CLEANING

A. Clean exterior surfaces and interiors of equipment and remove all dirt, cement, plaster and other debris. Protect interior of equipment from dirt during construction and clean thoroughly before energizing.

B. Clean out cracks, corners and surfaces on equipment to be painted. Remove grease and oil spots so that paint may be applied without further preparation.

1.09 PROJECT RECORD DOCUMENTS - Prepare the following and submit to the engineer before final acceptance:

A. Mark Project Record Documents daily to indicate all changes made in the field.

1. In addition to general requirements of Project Record Drawings, indicate on drawings, changes of equipment locations and ratings, trip sizes, and settings on circuit breakers, alterations in raceway runs and sizes, changes in wire sizes, circuit designations, installation details, one-line diagrams, control diagrams and schedules.

B. Use green to indicate deletions and red to indicate additions.

1. Use the same symbols and follow the same drafting procedures used on the Contract Drawings.

C. Locate dimensionally off of contract drawings all underground conduit stubbed-out for future use, underground feeder conduits, and feeder pull box locations using building lines by indicating on the Project Record Drawings.

D. At the completion of underground conduit installation provide underground conduit record documents to owner's representative.

E. Two copies, in binder form, of all test results as required by these specifications - 260030.

F. Two copies of local and/or state code enforcing authorities final inspection certificates.

G. Two copies, in binder form, of electrical equipment cut sheets, manufacturer's installation instructions, warranty certificates, and product literature for all products utilized on project.

1.10 SERVICE INTERRUPTIONS AND UTILITY

A. Coordinate with the Owner the interruption of services necessary to accomplish the work.

B. Coordinate with the utility company all work associated with power and communications distribution systems and service entrance equipment.

C. Electrical contractor shall supply temporary power for all trades.

1.11 MINIMUM SPECIFICATION REQUIREMENTS (ALL WORK OF DIVISION 260000)

A. As a minimum Specification requirement, all materials and methods shall comply with applicable governing codes.

1.12 PENETRATION SEALING 078400

A. Seal penetration through exterior walls and fire rated walls, floors, ceilings, and roofs with 3M Firestopping materials of fire rating capacity rated per architectural plans and UBC or prevailing building code requirements.

1.13 PLACING EQUIPMENT IN SERVICE

A. Do not energize or place electrical equipment in service until all interested parties have been duly notified and are present or have waived their rights to be present. Where equipment to be placed in service involves service or connection from

another contractor of the owner, notify the owner in writing when the equipment will be ready for final testing/connection and schedule to the owner's satisfaction of this service connection. Notify the owner two weeks in advance of the date the various items of equipment will be complete.

1.14 OWNER-FURNISHED ITEMS

A. Pick up Owner-furnished items and handle, deliver, install, and make all final connections.

1. Assume responsibility for the items when consigned at the storage facility or in the field in accord with requirements of the Contract Documents.

1.15 ELECTRIC ITEM LOCATION

A. Electrical drawings are generally diagrammatic. Verify equipment sizes with shop drawings and manufacturers' data and coordinate location layout with other trades. Notify owner and engineer of any changes of location requirements prior to installation and obtain engineer's written acceptance for all changes/revisions.

1.16 DEMOLITION

A. Scope: Provide and perform demolition, preparatory and miscellaneous work as indicated and specified, complete.

B. Principle Items of Work:

1. Demolition and removal of existing electrical conduit, wiring and equipment required to complete the project.

2. Preparation of the existing building to receive or connect the new work.

3. Miscellaneous demolition, cutting, alteration, and repair work in and around the existing building necessary for the completion of the entire project.

4. Disconnecting and reconnection of electrical equipment as required by the construction modifications.

C. Existing Conditions: Make a detailed survey of the existing conditions pertaining to the work. Check the locations of all existing structures, equipment and wiring (branch circuiting and controls). Provide at bid time any exclusions for existing conditions work.

D. Salvage and Disposal: All removed material other than items to be reused shall be returned to the owner or disposed of in accordance with instructions from the

owner's representative. Disposal shall be done in accordance with EPA and governing body requirements and regulations. Contractor shall pay all fees and charges for disposal.

1.17 ELECTRICAL WORKMANSHIP REQUIREMENTS

A. It is required that all electrical construction of this Contract be performed by journeyman electricians. All journeyman electricians shall have a minimum of 4 years of apprenticeship training and hold a valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards. This is intended to mean that a person who does not hold a valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards will not be permitted to do electrical work of any kind that involves new construction, nor make repairs, alterations, additions, or changes of any kind to any existing system of electrical wiring, apparatus, equipment, light, heat, or power.

B. Contractor may employ electrical helpers or apprentices on any job of electrical construction, new or existing, when the work of such helpers or apprentices is performed under direct and constant personal supervision of a journeyman electrician holding a valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards.

1. Each journeyman electrician will be permitted to be responsible for quality of workmanship for a maximum of eight helpers or apprentices during any same time period, provided the nature of work is such that good supervision can be maintained and quality of workmanship achieved is the best, as expected by Owner and as implied by the latest edition of the California Electrical Code (National Electrical Code with State of California amendments).

2. Before each journeyman electrician commences work, deliver to Owner at project site a photocopy of journeyman's valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards.

C. All electrical systems shall be installed in a neat and workmanlike manner per National Electrical Code requirements and ANSI approved NEIS National Electrical Installation Standards.

1.18 DESIGN CHANGES AFTER AWARD OF BID

A. When a change in the quantity or size of conductors is made, the conduit size will remain in accordance with that indicated in the original contract drawings rather

than the drawing symbol conduit table. When code permits, provide conductor insulation 'THWN' where required to maintain conduit fill conformance with the National Electrical Code.

1.19 MATERIAL AND EQUIPMENT SUBSTITUTION

A. Where two or more trade names or manufacturers are mentioned, selection shall be made from the group listed for use in the base bid. The order in which names are listed is not intended to be any indication of preference.

B. Where a single manufacturer, product or trade name is stated, that manufacturer, product or trade name shall be used in the base bid. The use of other manufacturers, products or trade names will be considered by the engineer of record (unless that product is indicated for no substitution) only if submitted as alternate items at the time of bidding, with evidence of equality and a statement of net price difference as compared to the specified item. After approval by the engineer of record, the architect and owner reserve the right to review such submittals and to determine the acceptability for use.

C. Equipment other than that specified will be accepted only when written approval is given by the engineer of record and architect, in accordance with Division 1.

D. The contractor shall be held responsible for all physical changes in piping, equipment, etc. resulting from equipment substitution and likewise bear any increased cost of other trades in making said substitution. Approval by the architect of equipment other than that specified does not relieve this contractor of this responsibility.

1.20 REQUESTS FOR INFORMATION

A. The contractor shall submit all requests for information (RFI's) typewritten on the attached form.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

LUCCI & ASSOCIATES, INC.
CONSULTING ELECTRICAL ENGINEERS
3251 Corte Malpaso # 511, Camarillo, CA 93012
Voice: 805-389-6520 Fax: 805-389-6519

REQUEST FOR INFORMATION (RFI)

RFI Number: _____

Project Name: _____ Bid/Project No. _____

Requested By: _____ Date: _____

Issued To: _____

CC: _____

_____ Drawing Number Detail _____ Specification Section _____ Page

YOUR RESPONSE TO THE FOLLOWING REQUEST FOR INFORMATION IS REQUESTED ASAP

REQUEST FOR INFORMATION:

CONTRACTOR'S COMMENTS:

RESPONSE:

Potential Cost Impact:_____ **Schedule Impact:**_____ **Urgent:**_____ **Additional Pages Attached:**_____

THE FOLLOWING RESPONSE IS PROVIDED FOR CLARIFICATION PURPOSES ONLY - THIS IS NOT A CHANGE ORDER!

_____ **Date:** _____
Engineer's Signature

By:

_____ _____ _____
Name *Title* *Organization*

SECTION 26 0030

TESTS AND IDENTIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Tests and identification.

1.02 SUBMITTALS

A. In accord with Section 260000.

B. All test values.

1.03 DEFINITION

A. Circuit designation: This term is construed to mean panel designation and circuit number; i.e., LA-13.

1.04 TESTS AND ADJUSTMENTS

A. Prior to energizing, test all systems. Test to ensure systems are:

1. Free from short circuits and grounds.

2. Free from mechanical and electrical defects.

B. Circuit breakers (main and feeder circuits that are adjustable only): Testing and adjustments of circuit breakers shall be made by Owner-approved independent testing firm. Testing firm shall meet the criteria for full membership of the International Electrical Testing Association (NETA).

1. Visual and mechanical inspection:

a. Compare nameplate data with Drawings and Specifications.

b. Inspect circuit breaker for correct mounting.

c. Operate circuit breakers to ensure smooth operation.

d. Inspect case for cracks or other defects.

e. Verify tightness of accessible bolted connections and/or cable connections by calibrated torque-wrench method in accord with manufacturer's published data.

f. Inspect mechanism contacts and arc chutes in unsealed units.

2. Electrical tests:

a. Perform a contact-resistance test.

b. Perform an insulation-resistance test at 1000 volts dc from pole-to-pole and from each pole-to-ground with breaker closed and across open contacts of each phase.

c. Perform adjustments for final settings in accord with coordination study supplied by Owner.

d. Perform long-time delay time-current characteristic tests by passing 300% rated current through each pole separately with ground fault functions defeated.

e. Determine short-time pickup and delay by primary current injection.

f. Determine ground-fault pickup and time delay by primary current injection. This test shall be done after short time and instantaneous testing are complete.

g. Determine instantaneous pickup current by primary injection using run-up or pulse method.

h. Verify correct operation of any auxiliary features such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free, and anti-pump function.

3. Test values:

a. Record all test values "as-found" and "as-left" conditions and provide certified copies to Owner.

b. Compare microhm or millivolt drop values to adjacent poles and similar breakers. Investigate deviations of more than 25%. Investigate any value exceeding manufacturer's recommendations.

c. Insulation resistance shall not be less than 100 megohms.

d. Trip characteristic of breakers shall fall within manufacturer's published time-current characteristic tolerance band, including adjustment factors. Circuit breakers not within tolerance band shall be tagged defective.

C. Adjust all installation and equipment for their intended use and rating as defined in manufacturer's specifications and test procedures.

1. Contractor recognizes and understands that the show and character lighting, electronic control equipment, special effects, etc., must have a minimum 4-week adjustment period, occurring after installation and verification of said equipment, for each area or facility. Contractor shall provide appropriate personnel (i.e., electricians, carpenters, laborers) as necessary to support Owner during this adjustment period. Adjustment is defined as orientation of adjustable lighting fixtures, installation of color filters to any lighting fixtures requiring same, location adjustment 6 ft., control system setting including programming of control functions, system debugging (i.e., cross-wiring). Contractor shall assume day and night activities during the adjustment period.

D. Adjust transformer taps under full load operating conditions, to provide nominal operating voltages at the loads.

E. Hi-Pot test procedures:

1. Test 25 pair, 10 pair, or 4 pair, multi-conductor cables installed in conduit, in the following manner and in presence of Owner:

a. Special Owner-furnished equipment: Hi-Pot Cable Tester & Adapters Model 500.

b. Perform visual inspection to verify:

1) Proper cable identification tags are installed.

2) Connector is installed properly and screws and clamps properly tightened.

3) Elco connector is keyed correctly.

c. Continuity and Hi-Pot:

1) Using the Hi-Pot cable tester and all necessary adapters:

a) Set tester on 1500 VDC, S.C. (short continuity), 50 pos.

b) Hook up cable to "Y" adapter if testing a cable in a conduit or tray.

c) Attach turnaround Elco test plug to opposite end of cable to be tested.

d) Attach ground lead of tester to center metal hold-down screw of Elco connector.

e) Push reset button until tester dial points to zero. Release reset button.

f) Press start button. Tester will step through all pairs and stop at bottom half of dial. This is because when using the turn-around plug, tester is checking 2-pair runs.

d. Error indication:

1) No-error dial will make 1/2 revolution and stop. Press reset button. Tester will step to top position.

2) Fault lights "short" or "open" dial will stop at a pin location indicated on face plate of dial. See chart on side of unit to give correct pin assignments. Press start buttons. Tester will step on through. If another "short" or "open" is found, tester will halt again.

e. Fault correction:

1) When a fault is indicated, remove both connector shells of cable under test and check indicated pins.

2) Repair fault using procedure steps as specified in Section 16121, paragraph "Repairing damaged pin-wire assembly."

f. Marking of accepted cable:

1) Record acceptance of all cables on inspection copy of cable schedule provided by Owner's representative, and submit in accord with Section 260010.

2) Place inspection stamp of Owner or dot sticker with initials on either white cable tag indicating cable assembly, or on connector shell.

F. Ground systems:

1. Visual and mechanical inspection: Verify ground system is in compliance with Drawings and Specifications.

2. Electrical tests:

a. Perform fall-of-potential test or alternative in accord with IEEE 81 on the main ground electrode or system.

b. Perform point-to-point tests to determine resistance between main ground system and all major electrical equipment frames, system neutral, and/or derived neutral points.

3. Test values:

a. Resistance between main ground electrode and ground shall be no greater than 10 ohms. Additional rods shall be installed and bonded to grounding system and driven to a depth of 50 ft. or refusal, whichever comes first.

b. Investigate point-to-point resistance values which exceed 0.5 ohm.

c. Record all test values and provide certified copies to Owner.

G. Cables:

1. Make insulation resistance tests on all power cables, using a self-contained instrument such as the direct-indicating ohmmeter of the generator type, or "megger" such as manufactured by J.G. Biddle Company, or Owner-approved equivalent. Insulation resistance values shall be at least 75% of shop test records.

a. Apply the following test voltages for 1 minute, except where specified otherwise herein, in accord with procedure recommended by manufacturer of test equipment and as specified herein.

Minimum Rated Circuit Voltage	Megger Voltage (DC)	Megger Reading
600 volts	500 volts	600 kilohms
1000 volts	500 volts	1 megohm
15,000 volts	1000 volts	15 megohms

2. Record all test values and provide certified copies to Owner.

3. Replace cables not meeting specified resistance values.

H. Miscellaneous tests:

1. Wiring: check all control circuits for continuity and conformance with wiring diagrams furnished by Owner and manufacturers.

2. Polarity tests: Make continuity and polarity tests on all current and potential transformers to determine whether polarity is as indicated on drawings, and the circuit is continuous.

3. Phasing tests: Identify phases of all switchgear and power cables by stenciling switchgear and tagging cables with approved tags, so that phases can be identified for connecting to proper phase sequence.

1.05 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates on all electrical distribution equipment shown on single-line diagram, and on control panels, dimmer panels, terminal cabinets, and separately mounted circuit breakers, disconnects, and starters.

B. Provide equipment and circuit designation on nameplates with minimum letter and plate sizes as indicated.

C. Provide engraved plastic nameplates with 1/4 in. minimum height letters indicating:

1. Circuit designation at branch overcurrent devices in distribution panelboards, switchboards, and motor control centers.

2. Circuit designation of panel, equipment-controlled or device-controlled on disconnect switches and on circuit breakers, starters, and controls which are individually enclosed.

3. Voltage rating and circuit designation of all outlets larger than 120V, 20A rating and more than 2 poles.

4. Designation of control and terminal cabinets including CUTC, as indicated.

5. Designation of each contactor and relay in control cabinets.

6. Designate area controlled for each dimmer in dimmer cabinet or rack.

7. Circuit designation at all ground fault detectors and ground fault test receptacles.

8. Equipment designation on front of switchboards, distribution panelboards, branch circuit panelboards, and load centers.

D. Secure nameplates with at least two rivets. Cementing and adhesive installation is not acceptable.

E. Provide two copies of a typewritten directory for each branch circuit panelboard, showing each circuit and its use. Attach one copy to panelboard door and deliver the other copy to Owner.

F. Provide caution label on branch circuit panelboards with integral control compartments. Caution label shall be red with white letters reading "CAUTION, EXTERNAL CONTROL VOLTAGE CIRCUIT WITHIN THIS PANEL."

G. Conductor identification:

1. Feeders: Identify with the corresponding circuit designation at over-current device and load ends, at all splices, and in pull boxes.

2. Branch circuits: Identify with corresponding circuit designation at overcurrent device and at all splices.

3. Control wires: Identify with indicated number and or letter designation at all terminal points and connections, including manufacturer pre-wired control sections and cabinets.

4. Alarm and detection wires: Identify with indicated wire and mnemonics numbers at all connections, terminal points, and coiled conductors within cabinets for future termination by Owner.

5. For identification of conductors, use heat shrinkable white marking sleeves such as Brady Permasleeve with type written identification.

END OF SECTION

SECTION 26 0050

BASIC ELECTRICAL MATERIALS & METHODS

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. This Section contains general requirements for the Sections in Division 26.

A. Related Work Not in Division 26: Refer to individual Division 26 Sections.

1.02 QUALITY ASSURANCE:

A. Codes: Entire installation shall comply with requirements of authorities having jurisdiction.

B. Permits: Contractor shall pay for all permits required by work under this Division.

C. Inspections: Contractor shall arrange for all inspections and correct non-complying installations.

1.03 SUBMITTALS: Refer to Division 1 for procedures.

A. Material and Equipment: Prior to start of work, 6 copies of a list of all materials and equipment covered by Division 26 shall be submitted for approval. Contractor shall allow ample time for checking and processing and shall assume responsibility for delays incurred due to rejected items. No installation of material concerned shall be made until such written approval has been obtained. Approval of materials and equipment shall in no way obviate compliance with the Contract Documents. Each item proposed shall be referenced to the applicable Section, Page, and Paragraph of Division 26. For each item proposed, give name of manufacturer, trade name, catalog data, and performance data.

B. Equipment Layout Drawings: Submit "Equipment Layout Drawings" for each equipment room or area containing equipment items furnished under this Division. Layout Drawings shall consist of plan view of room, to scale, showing projected outlines of all equipment, complete with dotted line indication of all required clearances including all those needed for removal or service. Location of all conduit and pull boxes shall be indicated.

C. Service Manuals: Refer to Submittal Section. Indexed Service Manuals shall be submitted which shall include test reports, service instructions, and renewal parts lists of all equipment.

1. Submission and Information: Service Manuals shall be submitted for approval at least 30 days before final inspection. The following information together with any pertinent data, shall be included in Service Manual:

a. Renewal part numbers of all replaceable items.

b. Manufacturer's cuts and rating data.

c. Serial numbers of all principal pieces of equipment.

d. Supplier's name, address, and phone number.

e. Final settings for all breakers, relays, and control devices (See Section 26032).

2. Copies: Four (4) copies of approved Service Manual shall be delivered on or before date required.

D. Record Drawings: Prepare and submit in accordance with requirements. Contractor shall make notations, neat and legible, daily as the work proceeds. Drawings shall be available for inspection at all times and kept at the job site. All buried conduit and/or indicated future connections outside any building shall be located both by depth and by accurate measurement from a permanently established landmark such as a building or structure.

E. Seismic Calculation: Refer to Article 3.01 herein.

F. Spare Parts: Conform to the Submittal Section. Deliver following spare parts to Owner and obtain receipts. Submit at same time as Operating Instructions:

1. Spare fuses; 1 set for each combination fuse breaker.

2. Spare pilot light lamps of each type used on project, in quantity of 10%, but not less than 2%.

3. Overload heater elements; 2 sets for each size used on project.

G. Special Tools: If any part of the equipment furnished under Division 26 requires a special tool for assembly, adjustment, resetting, or maintenance thereof and such tool is not readily available on the commercial tool market, it shall be furnished with the equipment as a standard accessory and delivered to the Owner.

H. Maintenance Paint: One (1) can of touch-up paint shall be delivered to Owner for each different color factory finish which is to be the final finished surfaces of the product.

1.04 DRAWINGS:

A. Diagrammatic Drawings: For purposes of clarity and legibility, drawings are essentially diagrammatic although size and location of equipment is drawn to scale wherever possible, Contractor shall make use of data in all the Contract Documents and verify information at building site.

B. Routing of Conduit and Piping: The drawings indicate required size and termination of conduits and raceways. It is not intent to indicate all necessary offsets and it shall be the responsibility under this Division to install conduit in such a manner as to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and make all equipment requiring inspection, maintenance and repair accessible without extra cost to the Owner.

C. Coordination with Other Trades: Check with other Divisions of the Specifications so that no interference shall occur and in order that elevations may be established for the work. Installed work which interferes with the work of other trades shall be removed and rerouted at the discretion of the Architect.

1.05 DAMAGE AND REPAIRS:

A. Emergency Repairs: Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding Contractor's warranty or relieving Contractor of his responsibility during warranty period.

B. Responsibility for Damage: Contractor shall be responsible for damage to grounds, buildings, or equipment due to work furnished or installed under this Division 26.

1.06 PROTECTION, CARE, AND CLEANING:

A. Protection: Provide adequate protection for finished parts of materials and equipment against physical damage from any cause during progress of work and until final completion. Sensitive electrical equipment shall not be installed until major construction is completed.

B. Care: During entire construction, properly cap all lines and equipment to prevent entrance of sand and dirt. Protect equipment against moisture, plaster, cement, paint or work of other trades by covering with polyethylene sheets.

C. Cleaning: After installation is completed, clean all systems as follows in addition to requirements specified:

1. Field Painted Items: Clean exterior of conduits, raceways, piping and equipment exposed in completed structure; removing all rust, plaster, cement and dirt by wire brushing. Remove grease oil and similar materials by wiping with clean rags and suitable solvents.

2. Factory Finished Items: Remove grease and oil on all factory finished items such as cabinets and controllers, and leave surfaces clean and polished.

D. Connection: Prior to energizing, check all electrical connection hardware and torque where necessary.

PART 2 - PRODUCTS

2.01 PRODUCTS: Products and materials shall be as specified in the pertinent Sections of Division 26.

2.02 MATERIALS AND EQUIPMENT: Wherever possible, all materials and equipment used in installation of this work shall be of same manufacturer throughout for each class of material or equipment. Materials shall be new and bear UL label, wherever subject to such approval. Comply with ANSI, IEEE and NEMA standards, where applicable.

PART 3 - EXECUTION

3.01 SEISMIC REQUIREMENTS: Electrical equipment for emergency systems shall be braced to withstand the lateral forces that result from earthquakes. Under Work of Division 26, submit seismic calculations stamped and signed by a registered California structural engineer confirming size, number, and location of

required anchoring hardware. Electrical equipment vendors shall furnish weights together with dimensions and the center of gravity location for all emergency electrical equipment for this purpose.

3.02 GENERAL LATERAL BRACING REQUIREMENTS: As shown on Drawings. Additional bracing requirements shall conform to specific requirements shown on Drawings or in other Sections of Division 26. Anchorages for equipment subject to thermal expansion and movement shall conform to manufacturer's recommendation and intent of general bracing requirements. When general and specific bracing requirements enumerated above are in conflict with referenced standards, the most stringent requirements shall govern.

3.03 EXCAVATION AND BACKFILL: Perform all excavation and back fill required to install Work of Division 26, both inside and outside. Perform all excavation and backfilling in accordance with Division 2.

A. Excavation: Bury conduits outside building to a depth of not less than 24" (or as required by Code) below finish grade, unless noted otherwise.

B. Backfilling: Do not backfill until after final inspection and approval of conduit installation by all legally constituted authorities and recording of the buried items on the Record Drawings.

3.04 CUTTING AND PATCHING:

A. Cutting of Existing Structural Work: Holes in existing slabs and concrete walls shall be cored to the minimum size required. The Contractor shall submit Drawings showing dimensioned sizes and locations for all such holes to Architect for approval before cutting. Where required for conduit installation, slabs on grade shall be saw-cut to minimum required width; submit cutting Drawings to the Architect for approval before cutting.

B. Patching: Holes or chases shall be patched to match adjacent surfaces.

3.05 CONCRETE WORK: Concrete construction required for the Work of Division 26 shall be provided under the Work of Division 26.

3.06 PAINTING: Finish painting of electrical equipment will be as specified in Division 9, unless equipment is herein specified to be furnished with factory applied finish coats. Equipment to be field painted shall be furnished with a factory applied prime coat.

A. Touch-Up: If factory finish on any equipment furnished under Division 26 is damaged in shipment or during construction of building, the equipment shall be refinished by Contractor to satisfaction of Architect.

B. Concealed Equipment: Uncoated cast-iron or steel that will be concealed, or will not be accessible when installations are completed, shall be given one heavy coat of black asphaltum before installation.

3.07 OPERATING INSTRUCTIONS: Contractor to provide services of an experienced Engineer to instruct Owner in operation of entire installation. Instructional period shall be during normal work day hours. This instruction period may be simultaneous with compliance tests.

3.08 COMPLIANCE TESTS: Conduct such tests of all portions of installation as may be necessary to ensure full compliance with the Drawings and Specifications. Tests shall be made in the presence of the Owner. Costs of test shall be borne by Contractor and Contractor shall provide all instruments, equipment, labor and materials to complete all the tests. Tests may be required on any item between installation of Work and the end of 1 year warranty period. Should these tests develop any defective materials, poor workmanship or variance with requirements of Specifications, Contractor shall make any changes necessary and remedy any defects at his expense.

A. All Feeders: Measure and record as follows:

1. 600 volt conductors shall be tested with 500 volt megger to ground on each phase. megger to be on test for one minute before any readings are taken. The minimum values on all feeders shall be 100,000 OHMS.

2. Copies of the certified test readings shall be transmitted to Owner.

3.09 SYSTEM ACCEPTANCE:

A. Final Review: The Contractor shall request a final review prior to system acceptance after:

1. Completion of installation of all systems required under the Contract Documents.

2. Submission and acceptance of operating and maintenance data.

3. Completion of identification program.

B. Acceptance: Is contingent on:

1. Completion of final review and correction of all deficiencies.

2. Satisfactory completion of acceptance tests demonstrating compliance with all performance and technical requirements of Contract Documents.

3. Satisfactory completion of training program and submission of manuals and Drawings required by Contract Documents.

3.10 PRELIMINARY OPERATION: The Owner reserves the right to operate portions of the electrical system on a preliminary basis without voiding the warranty or relieving the Contractor of his responsibilities.

3.11 CLEAN-UP: Conform to the Submittal Section. Upon completion and at other times during progress or Work, when required, remove all surplus materials, rubbish, and debris resulting from Work of Division 26.

END OF SECTION

SECTION 26 0060

MINOR ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Owner and Architect/Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect and make safe all electrical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with Utility Company and Owner's representative.

C. Provide temporary wiring and connections to maintain required existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and

connections. Obtain permission from Owner at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area when outage affects business operation.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and local fire service at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service and new system is accepted. Disable system only to make switchovers and connections. Notify Owner and Telephone Utility Company at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

G. Existing Security System: Maintain existing system in service until new system is complete and ready for service and new system is accepted. Disable system only to make switchovers and connections. Obtain permission from the Owner and security company at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of this Section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply and re-label devices as spares.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Disconnect and remove abandoned conduit.

J. Repair adjacent construction and finishes damaged during demolition and extension work.

K. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

L. Extend existing installations using materials and methods compatible with existing electrical installations, and in compliance with new project specifications.

M. Modify existing as-built drawings to note changes.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, and broken electrical parts.

3.05 INSTALLATION

A. Install relocated materials and as required by this section and Owner's representative.

END OF SECTION

SECTION 26 0080

TECHNICAL SERVICES DIVISION START-UP SERVICE

PART 1 - GENERAL

1.01 OVERVIEW

A. As part of this project, start-up services will be performed on the electrical distribution and control equipment as specified. This specification is intended as a part of the electrical portion of this project.

B. The start-up service company must follow job site electrical safety requirements, installation standards and electrical testing standards per NEMA®, ASTM®, IEEE®, ANSI® C2, OSHA®, ANSI/NFPA® 70, ANSI/NFPA 70B, NFPA 70E, ANSI/NFPA 78, and ANSI/NFPA 101 guidelines.

C. Documentation of all procedures performed shall be provided. Four bond copies shall be provided and forwarded to the engineer. Written documentation must contain recorded test values of all electrical tests performed per the individual product specification.

D. Individual product start-up procedures must be submitted and on file with start-up service company office 10 days prior to the specified bid date.

E. Start up of panelboards, lighting transformers, safety switches, enclosed circuit breakers, and lighting contactors will not be part of this specification.

F. Start-up service scheduling must be available through a 24-hour, toll-free national dispatch system.

G. The start-up service company shall be present during energization of the primary distribution equipment. Job site and equipment access must be provided by the electrical contractor. De-energization of equipment, when required for testing, must be available within 15 minutes of the start-up service company arrival at the job site.

H. The contractor shall supply a power source, specified by the start-up service company, for on-site test equipment.

I. Start-up service shall be performed by authorized employee(s) of the equipment manufacturer.

PART 2 - PRODUCT

2.01 INSPECTION AND TEST PROCEDURES

A. Switchgear and Switchboard Assemblies

1. Visual and Mechanical Inspection

a. Equipment nameplate data shall be documented.

b. Verify the presence of all the manufacturers intended Documentation.

c. Inspect physical, electrical, and mechanical condition of switchboard/switchgear and all components.

d. Confirm correct application of lubricants at manufacturer's recommended locations.

e. Verify that fuse and/or circuit breaker sizes and types correspond to drawings and coordination study.

f. Verify drawings for correct revision and date in accordance with customer and supplier records.

g. Verify that current and potential transformer ratios correspond to drawings.

h. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench.

i. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

j. Verify correct barrier and shutter installation and operation.

k. Inspect all mechanical indicating devices for correct operation.

l. Verify that filters are in place and/or vents are clear.

m. Test operation, alignment, and penetration of instrument transformer withdrawal disconnects.

n. Electrical Test

o. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground.

p. Perform secondary current injection tests on the entire current circuit in each section.

q. Perform control wiring performance test.

r. Determine accuracy of all {analog} meters.

s. Perform phasing check on double-ended switchgear to insure correct bus phasing from each source.

t. Verify correct function of control transfer relays located in switchgear with multiple power sources.

u. Verify operation of switchgear/switchboard heaters.

2. Test Value

a. Bolt torque levels are checked in accordance with U.S. Standards or manufacturer's specifications.

b. Insulation resistance testing is to be performed in accordance with the following guidelines:

MINIMUM VOLTAGE RATING TEST VOLTAGE
250 V 500 Vdc
600 V 1000 Vdc
5000 V 2500 Vdc
39000 V 5000 Vdc

c. Overpotential testing will not proceed until insulation resistance testing is completed.

d. Overpotential test voltages are applied in accordance with the following guidelines*.

TEST VOLTAGE kV	RATED kVac	dc
5	14.3	20.2
15	27.0	37.5
25	45.0	+
35	60.0	+

Final test voltages will be applied for one (1) minute.
* Derived from ANSI/IEEE C37.20.2 and C37.20.3.
+ Consult manufacturer

B. Circuit Breakers-Power

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify equipment nameplate ratings are in accordance with the customer's drawings and specifications.

c. Inspect physical and mechanical condition.

d. Confirm correct application of lubricants at manufacturer's recommended locations.

e. Inspect anchorage, alignment, and grounding.

f. Inspect arc chutes.

g. Verify that all maintenance devices are available for servicing and operating the circuit breaker.

h. Perform all mechanical operator and contact alignment tests on both the circuit breaker and its operating mechanism.

i. Verify tightness of accessible bolted bus connections by calibrated torque-wrench method.

j. Check cell fit and element alignment.

k. Check racking mechanism.

l. Verify that the circuit breaker is equipped with the correct rating plugs and current sensors.

m. Verify that the circuit breaker has the specified trip unit, LI, LIS, LISG, etc.

n. Verify that the circuit breaker has the specified accessories, auxiliary contacts, cell switches, shunt trip devices, undervoltage release, and etc.

o. Verify that the ground fault system has been wired in accordance with the specified wiring diagram and that the sensor grounds are either present or not present as specified.

p. Verify that the secondary control plug/connections are in accordance with the wiring diagram and specifications.

2. Electrical Tests

a. Perform a contact-resistance test in accordance with manufacturer's recommended procedure.

b. Perform an insulation-resistance test at 1000 Vdc from pole-to-pole and from each pole-to-ground with circuit breaker closed and across open contacts of each phase.

c. Make adjustments for the final settings in accordance with the coordination study supplied by owner.

d. Determine the following using secondary current injection:

(1) Minimum pickup current by

(2) Long-time delay

(3) Short-time pickup and delay

(4) Ground-fault pickup and delay

(5) Instantaneous pickup value

e. Activate auxiliary protective devices such as undervoltage relays, to insure operation of shunt trip devices.

f. Check the operation of electrically operated circuit breakers in their cubicles.

g. Verify correct operation of any auxiliary features such as trip and pickup indicator, electrical close and trip operation, trip-free, and anti-pump function.

h. Check electric charging mechanism, if applicable.

C. Circuit Breakers-Low Voltage Molded Case/Insulated Case.

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify equipment nameplate ratings are in accordance with the customer's drawings and specifications.

c. Inspect circuit breaker for correct mounting.

d. Operate circuit breaker to insure smooth operation.

e. Inspect case for cracks or other defects.

f. Verify tightness of accessible bolted connections and/or cable connections by calibrated torque-wrench method.

g. Verify that trip units, shunt trip coils, auxiliary contacts and all other accessories are in accordance with the job specifications.

2. Electrical Tests

a. Perform a contact-resistance test in accordance with manufacturer's recommended procedure.

b. Perform an insulation-resistance test at 1000 Vdc from pole-to-pole and from each pole-to-ground with circuit breaker closed and across open contacts of each phase.

c. Perform adjustments for final settings in accordance with coordination study supplied by owner, if available.

d. Verify correct operation of any auxiliary features such as trip and pickup indicators, electrical close and trip operation, trip-free, and anti-pump function.

e. Verify the calibration of all functions of the trip unit by means of secondary injection.

D. Air Switches (Bolted Pressure, QMB or equal): Low-Voltage

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify equipment nameplate ratings are in accordance with the customer's drawings and specifications.

c. Inspect physical and mechanical condition.

d. Confirm correct application of lubricants at manufacturer's recommended locations.

e. Verify appropriate anchorage and required area clearances.

f. Verify appropriate equipment grounding.

g. Verify correct blade alignment, blade penetration, travel stops, and mechanical operation.

h. Verify and record fuse sizes and types are in accordance with drawings and short-circuit and coordination studies, if available.

i. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.

j. Check all interlocking systems for correct operation and sequencing, and key distribution, if applicable.

k. Verify correct phase barrier materials and installation.

l. Inspect all indicating and control devices for correct operation.

2. Electrical Tests

a. Perform insulation-resistance tests on each pole, phase-to-phase and phase-to-ground with switch closed and across each open pole for one minute.

b. Switches equipped with solenoid trip, blown main fuse detector, etc, test each feature for proper operation To test blown fuse detector, activate it and confirm by attempting to close the circuit breaker without reset.

c. Square D/Schneider Electric BP switches:

d. Perform Blade Contact Resistance Test with the device de-energized, operate the device closed and open several times using either manual or electrical means. Apply a minimum current of 100 A dc through the closed contacts. Measure the contact resistance of each pole and compare with the following values:

BP SWITCH RATING	RESISTANCE (Maximum)
800 A	13 Micro-Ohms
1200 A	13 Micro-Ohms
1600 A	11 Micro-Ohms
2000 A	8 Micro-Ohms
2500 A	7 Micro-Ohms
3000 A	6Micro-Ohms
4000 A	7Micro-Ohms

E. Busway: Metal-Enclosed

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify busway nameplate ratings in accordance with customer drawings and specifications.

c. Inspect busway for physical damage and correct connection in accordance with single-line diagram.

d. Inspect for appropriate bracing, suspension, alignment, and enclosure ground.

e. Verify tightness of accessible bolted electrical connections by confirming that the outer head has been broken off and check torque to 70 lb-ft +/- 10 lb-ft (95 N•m +/- 13.5 N•m). Verify the

removal of the red plastic disk (VISI-TITE®) at each bus joint that should automatically occur when the head is broken off.

f. Confirm physical orientation in accordance with manufacturer's labels to insure adequate cooling.

g. Examine outdoor busway for removal of "weep-hole" plugs, if applicable, and the correct installation of joint shield.

h. Visually confirm correct phasing on each busway tie section energized by separate sources. (De-energized)

2. Electrical Tests

a. Measure insulation resistance of each busway, phase-to-phase and phase-to-ground for one minute.

F. Cables: Low-Voltage, 600 V Maximum

1. Visual and Mechanical Inspection

a. Verify cable sizing and insulation temperature rating in accordance with customer's drawings.

b. Inspect exposed sections of cables for physical damage and correct connection in accordance with single-line diagrams.

c. Verify tightness of accessible bolted connections by calibrated torque wrench.

d. Inspect compression-applied connectors for correct cable match and indentation.

e. Verify cable color-coding with applicable engineer's specifications.

2. Electrical Tests

a. Test cables and leads for continuity to ensure correct cable connection and phasing rotation.

b. Perform an insulation resistance test on each conductor between one conductor and ground with the other conductors grounded.

c. Each 480 V feeder cable shall be tested with the cable connected to the racked-in but open circuit breaker at the equipment. Connection at the other end of each of these cables shall be as follows:

(1) Cables to motor control centers shall be connected to the bus with the switches or circuit breakers in the starters open.

(2) Cables to motors and other equipment shall be connected to the motors and equipment with feeder switches open.

G. Direct-Current Systems: Batteries

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify equipment nameplate ratings are in accordance with the customer's drawings and specifications.

c. Inspect physical and mechanical condition.

d. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.

e. Measure electrolyte specific gravity and temperature and visually check fill level.

f. Verify adequacy of battery support racks, mounting, anchorage, and clearances.

g. Verify ventilation of battery room or enclosure.

h. Verify existence of suitable eyewash equipment.

2. Electrical Tests

a. Verify all charger functions and alarms.

b. Measure each cell voltage and total battery voltage with charger energized and in float mode of operation.

H. Drives: AC

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify equipment nameplate ratings are in accordance with the customer's drawings and specifications.

c. Inspect controller for physical and mechanical condition.

d. Inspect for proper grounding.

e. Check customer cables, power wiring, and control wiring to insure correct installation.

f. Check for proper heaters used in ISO/bypass unit.

g. Check transformer taps for proper connection.

h. Check all terminal wiring.

i. Verify motor and drive sizing.

2. Electrical Test

a. Verify the proper selection and operation of the electrical test equipment and record the date of the last calibration date and the date due re-calibration.

b. Verify input voltages.

c. Verify all transformer output voltages.

d. Test all pilot devices, e.g., lights, speed pots, meters.

e. Check D.I.P. switches for proper setup.

f. Calibrate max speed.

g. Setup acceleration and deceleration potentiometers to application.

h. Setup hand minimum speed.

i. Calibrate all meters.

j. Align drive to customer's automatic control signal.

k. Verify proper connection of alarm, smoke detectors, and remote devices.

l. Check for proper motor rotation.

m. Setup all option cards.

n. Operate drive at all allowable speed and load conditions.

o. Confirm ISO/bypass unit operation.

I. Grounding Systems

1. Visual and Mechanical Inspection

   a. Verify ground system is in compliance with drawings and specifications.

2. Electrical Tests

   a. Verify the proper selection and operation of the electrical test equipment and record the date of the last calibration date and the date due re-calibration.

   b. Perform fall-of-potential test or alternative in accordance with IEEE Standard 81-1991 on the main grounding electrode or system.

   c. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

J. Ground-Fault Protection Systems

1. Visual and Mechanical Inspection

   a. Document equipment nameplate data on test report.

   b. Verify equipment nameplate ratings are in accordance with the customer's drawings and specifications.

   c. Visually inspect the components for damage and errors in polarity or conductor routing.

   d. Verify that ground connection is made ahead of neutral disconnect link and on the line side of any ground fault sensor.

   e. Verify that neutral sensors are connected with correct polarity on both primary and secondary.

   f. Verify that all phase conductors and the neutral pass through the sensor in the same direction for zero sequence systems.

   g. Verify that grounding conductors do not pass through zero sequence sensors.

   h. Verify that the grounded conductor usually neutral. is bonded to ground in accordance with the power system specifications.

   i. Verify tightness of all electrical connections including control circuits.

j. Verify correct operation of all functions of the self-test panel.

k. Verify that the control power transformer has adequate capacity for the system.

l. Set pickup and time-delay settings in accordance with the settings provided in the owner's specifications.

2. Electrical Tests

a. Perform the following pickup tests using primary injection.

(1) Verify that the relay does not operate at 90% of the pickup setting.

(2) Verify pickup is less than 125% of setting or 1200 A, whichever is smaller.

b. For summation type systems utilizing phase and neutral current transformers, verify correct polarities by applying current to each phase-neutral current transformer pair.

c. Relay should operate when current direction is the same relative to polarity marks in the two current transformers.

d. Relay should not operate when current direction is opposite relative to polarity marks in the two current transformers.

e. Measure time delay of the relay at 150% or greater of pickup. Verify operability of I2t function, if being used, of ground fault trip device.

f. Verify reduced control voltage tripping capability: 55% for ac systems and 80% for dc systems.

g. Verify blocking capability of zone interlock systems.

K. Instrument Transformers

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify equipment nameplate ratings are in accordance with the customer's drawings and specifications.

c. Inspect physical and mechanical condition.

d. Verify correct connection of transformers with system requirements.

e. Verify that adequate clearances exist between primary and secondary circuit wiring.

f. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.

g. Verify that all required grounding and shorting connections provide contact.

h. Verify that all shorting blocks are in the correct position, either grounding or open, as required.

i. Verify correct operation of transformer withdrawal mechanism and grounding operation.

j. Verify correct primary and secondary fuse sizes for potential transformers.

2. Electrical Tests - Current Transformers

a. Perform insulation-resistance test of the current transformer and wiring-to-ground at 500 Vdc.

b. Perform a polarity test of each current transformer.

c. Perform a ratio-verification test using the voltage or current method in accordance with ANSI C5XVIII.1.

3. Electrical Tests - Voltage Transformers

a. Perform insulation-resistance tests winding-to-winding and each winding-to-ground.

b. Perform a polarity test on each transformer to verify the polarity marks or H1-X1 relationship as applicable.

L. Motor Control Centers: Low and Medium Voltage

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify equipment nameplate ratings are in accordance with the customer's drawings and specifications.

c. Inspect physical, electrical, and mechanical condition.

d. Confirm correct application of lubricants at manufacturer's recommended locations.

e. Verify appropriate anchorage, required area clearances, physical damage, and correct alignment and cleanliness.

f. Verify that fuse and/or circuit breaker sizes and types correspond to drawings and coordination study, if available, as well as to the circuit breaker's address for microprocessor-communication packages.

g. Verify that current and potential transformer ratios correspond to drawings.

h. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.

i. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

j. Attempt closure on locked-open devices. Attempt to open locked-closed devices.

k. Make key exchange with devices operated in off-normal positions.

l. Inspect insulators for evidence of physical damage or contaminated surfaces.

m. Verify correct barrier and shutter installation and operation.

n. Exercise all active components.

o. Verify that filters are in place and/or vents are clear.

p. Test operation, alignment, and penetration of instrument transformer withdrawal disconnects, current carrying and grounding.

q. Inspect control power transformers.

r. Inspect physical damage, cracked insulation, broken leads, tightness of connections, defective wiring and overall general condition.

s. Verify that primary and secondary fuse ratings or circuit breakers match drawings.

2. Electrical Tests

a. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground at the minimum dc Test voltage appropriate for the equipment.

b. Perform control wiring performance test.

c. Verify operation of motor control center (MCC) heaters.

d. Determine accuracy of all meters.

M. Motor Starters: Low-Voltage

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify equipment nameplate ratings are in accordance with the customer's drawings and specifications. This to include: contactor, fuses, overloads, circuit breakers, overload relay heaters power factor correction capacitors and control power transformer.

c. Inspect physical and mechanical condition.

d. Motor-Running Protection

(1) Compare overload element rating with motor full-load current rating to verify correct sizing.

(2) If power-factor correction capacitors are connected on the load side of the overload protection, include the effect of the capacitive reactance in determining appropriate overload element size.

(3) If fuses provide motor-running protection, verify correct rating considering motor characteristics and power-factor correction capacitors, if applicable.

e. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.

2. Electrical Tests

a. Verify the proper selection and operation of the electrical test equipment and record the date of the last calibration date and the date due re-calibration.

b. Measure insulation resistance of each combination starter, phase-to-phase and phase-to-ground, with the starter contacts closed and the protective device open.

c. Perform operational tests by initiating control devices.

N. Surge Arresters: Medium and High Voltage Surge Protection Devices

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify equipment nameplate ratings are in accordance with the customer's drawings and specifications.

c. Inspect physical and mechanical condition.

d. Inspect for correct mounting and adequate clearances.

e. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.

f. Verify that the ground lead on each device is individually attached to a ground bus or ground electrode.

g. Verify that stroke counter, if present, is correctly mounted and electrically connected.

O. Switchgear Assemblies: Low Voltage & Medium Voltage

1. Visual and Mechanical Inspection

a. Document equipment nameplate data.

b. Verify the presence of all the manufacturers intended Documentation.

c. Inspect physical, electrical, and mechanical condition of switchboard/switchgear and all components.

d. Confirm correct application of lubricants at manufacturer's recommended locations.

e. Verify that fuse and/or circuit breaker sizes and types correspond to drawings and coordination study.

f. Verify drawings for correct revision and date in accordance with customer and supplier records.

g. Verify that current and potential transformer ratios correspond to drawings.

h. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench.

i. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

j. Verify correct barrier and shutter installation and operation.

k. Inspect all mechanical indicating devices for correct operation.

l. Verify that filters are in place and/or vents are clear.

m. Test operation, alignment, and penetration of instrument transformer withdrawal disconnects.

2. Electrical Tests

a. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground.

b. Perform secondary current injection tests on the entire current circuit in each section.

c. Perform control wiring performance test.

d. Determine accuracy of all {analog} meters.

e. Perform phasing check on double-ended switchgear to insure correct bus phasing from each source.

f. Verify correct function of control transfer relays located in switchgear with multiple power sources.

g. Verify operation of switchgear/switchboard heaters.

P. Transformers: Dry Type – Small (167 kVA Single-Phase, 500 kVA Three-Phase, and Smaller)

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify Transformer nameplate ratings in accordance with customer drawings and specifications.

c. Inspect physical and mechanical condition.

d. Verify that resilient mounts are free and that any shipping brackets have been removed.

2. Electrical Tests

a. Perform insulation-resistance test from winding-to-winding and each winding-to-ground.

b. Calculate polarization index.

c. Verify that winding turns-ratio measurements and polarities are in accordance with nameplate.

d. Verify that as-left tap connections are as specified.

Q. Transformers: Dry-Type: All Voltages - Large (Greater than 167 kVA Single-Phase and 500 kVA Three-Phase)

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify transformer nameplate ratings in accordance with customer drawings and specifications.

c. Inspect physical and mechanical condition.

d. Verify that control and alarm settings on temperature indicators are as specified.

e. Verify that cooling fans operate correctly and that fan motors have correct overcurrent protection.

f. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.

g. Verify that shipping brackets or fixtures have been removed.

h. Insure that resilient mounts are free.

i. Verify that winding core, frame, and enclosure groundings are correct.

j. Verify that as-left tap connections are as specified.

R. Electrical Tests

a. Perform insulation-resistance tests winding-to-winding and each winding-to-ground.

b. Calculate polarization index.

c. Perform a turns-ratio test on all tap connections. Verify that winding polarities are in accordance with nameplate.

d. Verify that core is solidly grounded.

S. Transformers: Liquid-Filled: All Voltages

1. Visual and Mechanical Inspection

a. Document equipment nameplate data on test report.

b. Verify transformer nameplate ratings in accordance with customer drawings and specifications.

c. Inspect physical and mechanical condition.

d. Inspect impact recorder prior to unloading, if applicable.

e. Verify that alarm, control, and trip settings on temperature indicators are as specified.

f. Verify that cooling fans and pumps operate correctly and that fan and pump motors have correct overcurrent protection.

g. Verify operation of all alarm, control, and trip circuits from temperature and level indicators, pressure relief device, and fault pressure relay.

h. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench.

i. Verify correct liquid level in all tanks and bushings.

j. Verify that positive pressure is maintained on nitrogen-blanketed transformers.

k. Verify correct equipment grounding.

2. Test load tap-changer.

3. Electrical Tests

a. Perform insulation-resistance tests, winding-to-winding and each winding-to-ground.

b. Calculate polarization index.

c. Perform a turns-ratio test on all no-load tap-changer positions and all load tap-changer positions. Verify that tap setting is as specified. Verify that winding polarities are in accordance with nameplate.

END OF SECTION

SECTION 26 0111

CONDUITS

PART 1 - GENERAL

A. The general provisions apply to this section.

1.01 WORK INCLUDED

A. Conduits; including:

1. Rigid steel conduit.
2. Intermediate metal conduit (IMC).
3. Electrical metallic tubing (EMT).
4. Rigid aluminum conduit.
5. Polyvinyl chloride conduit (PVC).
6. Flexible metal conduit.
7. Liquid-tight flexible metal conduit.

1.02 DEFINITION

A. Conduit: This term shall be construed to mean conduit and conduit fittings; and tubing and tubing fittings.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Support material: Section 260190.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION - ALL MATERIALS SHALL BE MANUFACTURED IN THE USA.

A. Rigid Steel Conduit: Hot-dipped galvanized or sherardized including the threads, manufactured in accordance with ANSI C80.1 and UL6.

1. Threaded, hot-dipped galvanized or sherardized fittings manufactured in accordance with ANSI C80.4.

B. Intermediate Metal Conduit: Hot-dipped galvanized including the threads, manufactured in accordance with UL 1242.

C. Electrical Metallic Tubing: Manufactured in accordance with ANSI C80.3 and UL 797.

1. Provide compression fittings in walls, ceiling spaces or exposed construction areas.

2. Provide compression (water tight) fittings in damp areas or areas exposed to weather.

D. Rigid Aluminum Conduit: Manufactured in accordance with ANSI C80.5.

1. Threaded fittings, manufactured in accordance with ANSI C80.4.

E. Polyvinyl Chloride Conduit: Schedule 40 and schedule 80, manufactured in accordance with ANSI C33.91, UL 651, and Nema TC-2.

1. Cemented type fittings of the same manufacturer as the conduit.

F. Polyvinyl Chloride Conduit: Type EB, heavy wall, manufactured in accordance with ANSI C33.91, UL651, and Nema TC-8.

1. Cemented fittings of the same manufacturer as the conduit.

G. Flexible Metal Conduit: Hot-dipped galvanized steel, manufacturer in accordance with UL 1.

1. Squeeze type, malleable iron, cadmium plated, straight and angle connectors for all sizes and twist-in connectors for 1/2-inch and 3/4-inch flexible metal conduit.

H. Liquid-Tight Flexible Conduit: Hot-dipped galvanized with liquid-tight vinyl jacket.

1. Liquid-tight fittings.

PART 3 - EXECUTION

3.01 USE

A. EMT for all exposed and concealed work except as indicated in Paragraphs B, C, D, E, F, and G.

B. Rigid steel, IMC, or rigid aluminum conduit in areas where exposed conduit could be subject to physical damage or where conduit is exposed and conductor phase to ground voltage exceeds 300 volts.

C. Rigid aluminum conduit may be used for all feeder runs exposed or concealed in stud walls and spaces above suspended ceilings.

D. PVC Conduit:

1. Schedule 40 for runs below grade in direct contact with earth.

2. Schedule 40 in concrete floors, walls or roofs.

E. Flexible Conduit (steel only permitted):

1. For connection to equipment subject to vibration, maximum length 18 inches. In wet locations use liquid-tight flexible conduit.

2. For connection to lighting fixtures above suspended ceilings. Lengths limited to 72 inches.

3. Install ground conductors in all flexible conduits.

F. Where 3/4-inch conduit runs are concealed in walls or ceilings and these runs are through wood studs and wood joists, flexible steel conduit may be used up to a maximum length of 6'0".

G. All risers shall be PVC coated RGS with bushings.

H. In concrete or below grade use conduit not smaller than 1 inch. Maximum size in concrete slab: 1 inch. Run larger sizes under slab.

I. Use long sweep elbows with minimum radius 10 times nominal conduit diameter for all telephone and communication runs.

3.02 INSTALLATION

A. Provide conduit support and bracing in accordance with the latest published SMACNA guidelines.

B. Perform excavating, trenching, backfilling, and compacting as specified in Division 2.

C. Minimum cover for runs below finished grade outside buildings: 24 inches except where noted or required by the serving utility. Minimum cover for conduit in concrete floors, walls or roof: 1/3 thickness of slab. Minimum cover under building slabs is 12-inches.

D. Minimum separation from uninsulated hot water pipes, steam pipes, heater flues or vents: 6 inches. Avoid running conduit directly under water lines.

E. Protect inside of conduit from dirt and rubbish during construction by capping all openings with plastic caps intended for the purpose.

F. Provide conduit bodies for exposed conduit runs at junctions, bends or offsets where required. Do not use elbows or bends around outside corners of beams, walls or equipment. Make conduit body covers accessible.

G. Make conduit field cuts square with saw and ream out to full size. Shoulder conduits in couplings.

H. Run a minimum of one 3/4-inch empty conduit for every three single pole spare circuit breakers, spaces or fraction thereof and not less than two 3/4-inch conduits from every flush mounted panel to an accessible space above the ceiling and below the floor.

I. Make conduit projections from covered areas to areas exposed to the weather watertight by proper flashing. Extend flashing a minimum of 6 inches in all directions from conduit.

J. Where conduit is to remain empty, install polypropylene or nylon pull-line 3/16" minimum diameter from end to end with tag at each end designating opposite terminations.

K. Run conduit parallel and at right angle to building lines, when visible in finished construction.

L. Cap conduits indicated to be stubbed-out underground using glued-on PVC caps intended for this purpose.

M. Install a coupling flush with the floor on all conduits stubbed up through floors on grade.

N. Make no bends with a radius less than 12 times the diameter of the cable it contains nor more than 90 degrees. Make field bends with tools designed for conduit bending. Heating of metallic conduit to facilitate bending is not permitted.

O. Where conduit installed in concrete or masonry extends across building construction joints, provide expansion fittings as manufactured by O.Z.; Crouse-Hinds; Appleton; or equal, with approved ground straps and clamps.

P. Concrete Wall or Slab Penetrations: All core drilling, sleeves, blockouts or other penetrations must be approved by the Structural Engineer prior to installation.

1. Space sleeves and core drills to insure a minimum dimension of 3 times the nominal trade diameter of the largest adjacent conduit between sleeves or core drills.

2. Use blockouts for concentrations of conduits in a confined area.

Q. Do not penetrate walls with flexible conduit where subject to physical damage. Use recessed box with extension ring for transition from interior to exterior of wall.

R. All homeruns shown shall be run to the panel indicated independently of all other homeruns. Provide pull points so as not to exceed total bends of 360 degrees between them unless otherwise indicated.

S. At switchboards, manholes and floor standing distribution panelboards, provide insulated throat bushings or bell ends on all non-metallic conduit entries and bushings on all metallic conduit entries.

T. Provide bushings on all conduit terminations sized 1" and larger.

U. Provide weatherproof boxes and connectors for all exposed parking structure raceways and boxes.

V. Provide bell ends on all conduits into pullboxes and manholes, seal all conduits after conductors are pulled.

W. Cap all unused conduits with end cap. Do not tape.

X. All Fire Alarm Conduits shall be painted red.

END OF SECTION

SECTION 26 0112

PLUG-IN STRIPS

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

A. Underwriter's Laboratories (U.L.) 5-85 Surface Metal Raceways.

PART 2 - PRODUCTS

2.01 GENERAL: Provide types as indicated below, with grounding type devices in plug-in strips, and spacings as shown on the drawings. Provide accessories required for a complete installation.

A. Finish: Gray on plug-in strips and visible accessories unless indicated otherwise.

B. Finish: Tan on plug-in strips and visible accessories unless indicated otherwise.

C. Finish: Factory applied prime coat on plug-in strips and visible accessories unless indicated otherwise.

D. Finish: Stainless steel type 302 with #3 finish for plug-in strips and visible accessories.

2.02 TYPE B: Field assembled 15 amp, 125 volt, 3 wire grounding, single receptacle with spacing and circuitry as shown on drawings. Wiremold Co. 2100 Series with 2127GA receptacle.

2.03 TYPE C: Field assembled 20 amp, 125 volt, 3 wire grounding, single receptacle with spacing and circuitry as shown on drawings. Wiremold Co. 2100 Series with 2127GA receptacle.

2.04 TYPE K: Field assembled 20 amp, 125 volt duplex receptacles and coverplates with spacing and circuitry as shown on drawings. Install in raceway divided into compartments for simultaneous high and low potential usage. Wiremold Co. G4000 Series; Walker Parkersburg 3400 Series.

2.05 ACCEPTABLE MANUFACTURERS: Wiremold, Walker.

PART 3 - EXECUTION

3.01 INSPECTION: Examine surfaces to receive plug-in strips to make certain they are straight, true, and dry. Report discrepancies and proceed when corrected.

3.02 INSTALLATION: Install plug-in strips level, centered in spaces and at heights indicated on drawings.

A. Coordinate final finishing of plug-in strips with trades involved. Manufacturer's special devices shall not be painted.

B. Install a #12 AWG green grounding conductor in field assembled plug-in strips and bond it at the service end to the concealed raceway system, or to the ground bus of the panel board serving the plug-in strip. Install a larger grounding conductor if required by the National Electrical Code.

C. Comply with the manufacturer's maximum wiring capacity recommendations.

D. Excluding special devices, wire adjacent devices of field assembled plug-in strips to alternate circuits unless indicated otherwise.

E. Install special devices at locations indicated. If manufacturer's oversize box is used to mount special devices, mount box straddling plug-in strip, if designed for the purpose. If manufacturer's box and plug-in strip used are not compatible, mount box above plug-in strip and nipple from box to plug-in strip with surface raceway and fittings suitable for the purpose.

F. When plug-in strips have two compartments, one for high and one for low potential wiring, install the high potential wiring in the upper compartment unless indicated otherwise.

END OF SECTION

SECTION 26 0114

LADDER CABLE TRAYS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cable tray; steel, complete with fittings and hangers.

1.02 SUBMITTALS

A. Submit in accord with Section 260010.

1.03 REFERENCE SPECIFICATIONS AND STANDARDS

A. NEMA VE-1-1991.

1.04 SUBMITTALS FOR CLOSEOUT

A. Project Record Documents: Record actual routing of cable tray and locations of supports.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.06 PRE-INSTALLATION MEETING

A. Coordination and Meetings: Pre-installation meeting.

B. Convene one week prior to commencing work of this section.

1.07 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Tray:

1. B-Line

2. P-W Western, Inc.

3. T.J. Cope.

2.02 MATERIAL AND FABRICATION

A. Ladder type with 6 in. rung spacing, full 3 in. inside depth or as indicated, width as indicated.

B. Straight sections and flanges of one piece construction. Fittings shall have same load carrying ability as straight sections.

C. Struts to have rounded edges and be folded down.

D. Tray and fittings to comply with NEMA Standards for Class 12 trays.

E. Provide full depth barrier strip in all trays for isolation of all high level audio cable from all other cables. High level audio cables include all speaker wire, cables from the high level cross connect cabinet to all sound break-out boxes and to all amplifier racks. Barrier strips shall be deleted from all "tee" and 4-way sections to facilitate cable cross-overs from one tray to another.

F. Provide covers where indicated.

2.03 WARNING SIGNS

A. Engraved Nameplates: 2 inch black letters on yellow laminated plastic nameplate, engraved with the following wording:

WARNING! DO NOT USE CABLE TRAY AS WALKWAY, LADDER, OR SUPPORT. USE ONLY AS MECHANICAL SUPPORT FOR CABLES AND TUBING!

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide 3/8 in. hanger rods and trapeze hangers or wall type mounting brackets at maximum 6 ft. intervals.

B. Section 01400: Quality Control: Manufacturer's instructions.

C. Install metallic cable tray in accordance with NEMA VE 1.

D. Support trays in accordance with Section 260190. Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports of 6 feet maximum.

E. Use expansion connectors where required.

F. Provide firestopping under provisions of the Submittal Section to sustain ratings when passing cable tray through fire-rated elements.

G. Ground and bond cable tray under provisions of Section 262450.

1. Provide continuity between tray components.

2. Use anti-oxidant compound to prepare aluminum contact surfaces before assembly.

3. Provide 2 AWG bare copper equipment grounding conductor through entire length of tray; bond to each component.

4. Connections to tray may be made using mechanical connectors.

H. Install warning signs at 50 feet centers along cable tray, located to be visible.

END OF SECTION

SECTION 26 0115

WIREWAYS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Wireways, sheet metal troughs with screw-on removable covers.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Hoffman Engineering Co.

B. General Electric Co.

C. Square D Co.

2.02 MATERIAL AND FABRICATION

A. Use sheet steel wireways with screw-on covers and corrosion resistant hardware. For dry locations coat with rust inhibitor and finish with gray baked enamel. For wet locations use hot-dipped galvanized material finished with gray baked enamel, provide gaskets for covers as required. Provide (permanent engraved (3/4" letters) labels on all covers to signify voltage, communications or telephone.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Wireways shall be securely fastened to the mounting surface. Use expansion type anchors in concrete. Suspended wireways shall be supported 4 feet on centers.

END OF SECTION

SECTION 26 0116
WIRE BASKET CABLE TRAYS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, tests and services to install complete wire basket support systems as shown on the drawings.

B. Wire basket support systems are defined to include, but are not limited to straight sections of continuous wire mesh, field formed horizontal and vertical bends, tees, drop outs, supports and accessories.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel

C. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process

D. ASTM A123 - Specification for Zinc (Hot Galvanized) Coatings on Iron and Steel

E. ASTM A510 - Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

F. NEMA VE 2-2000 - Cable Tray Installation Guidelines

1.03 DRAWINGS

A. The drawings, which constitute a part of these specifications, indicate the general route of the wire basket support systems. Data presented on these drawings is as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification of all dimensions, routing, etc., is required.

B. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.04 SUBMITTALS

A. Submittal Drawings: Submit drawings of wire basket and accessories including connector assemblies, clamp assemblies, brackets, splice plates, splice bars, grounding clamps and hold down plates showing accurately scaled components.

B. Product Data: Submit manufacturer's data on wire basket support system including, but not limited to, types, materials, finishes and inside depths.

1.05 QUALITY ASSURANCE

A. NEC Compliance: Comply with NEC, as applicable to construction and installation of cable tray and cable channel systems (Article 318, NEC).

B. NFPA Compliance Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable tray systems.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver wire basket support systems and components carefully to avoid breakage, bending and scoring finishes. Do not install damaged equipment.

B. Store wire basket and accessories in original cartons and in clean dry space; protect from weather and construction traffic.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with these specifications, wire basket support systems to be installed shall be as manufactured by Cooper B-Line, Inc. or engineer-approved equal.

2.02 WIRE BASKET SECTIONS AND COMPONENTS

A. General: Provide wire basket of types and sizes indicated; with connector assemblies, clamp assemblies, connector plates, splice plates and splice bars. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.

B. Materials and Finishes: Material and finish specifications for each wire basket type are as follows:

1. Yellow Zinc Dichromate: Straight sections shall be made from steel meeting the minimum mechanical properties of ASTM A510 and shall be electro-plated yellow zinc dichromate in accordance with ASTM B633 SC2.

2. Hot-Dip Galvanized After Fabrication: Straight sections shall be made from steel meeting the minimum mechanical properties of ASTM A510 and shall be coated after the wire basket runway has been fabricated in accordance with ASTM A123 (CSA Type 1). All hot-dip galvanized after fabrication runway sections must be returned to the point of manufacture after coating for inspection and removal of all icicles and excess zinc. Failure to do so may result in damage to cables and/or injury to installers.

3. Stainless Steel: Straight sections and accessories shall be made from AISI Type 304 Stainless Steel.

4. Paint: Straight sections shall be painted [Computer White][Flat Black][Telco Gray] over Yellow Zinc Dichromate.

5. Pre-Galvanized Zinc: Wall brackets and other pre-galvanized accessories shall be coated with zinc in accordance with ASTM A653.

6. Electro-Galvanized Zinc: Support accessories and miscellaneous hardware shall be coated in accordance with ASTM B633 SC3. All threaded components shall be coated in accordance with ASTM B633 SC1.

2.03 TYPE OF WIRE BASKET SUPPORT SYSTEM

A. All straight section longitudinal wires shall be straight (with no bends).

B. Wire basket shall be made of high strength steel wires and formed into a standard 2 inch by 4 inch wire mesh pattern with intersecting wires welded together. All wire ends along wire basket sides (flanges) shall be rounded during manufacturing for safety of cables and installers.

C. Wire basket sizes shall conform to the following nominal criteria:

1. Straight sections shall be furnished in standard 118 inch lengths.

2. Wire basket shall have a 4 inch usable loading depth by 12 inches wide.

D. All fittings shall be field formed as needed.

E. All splicing assemblies shall be the bolted type using serrated flange locknuts. Hardware shall be either yellow zinc dichromate in accordance with ASTM B633 SC2 or AISI Type 304 Stainless Steel.

F. Wire basket supports shall be trapeze hangers or wall brackets as manufactured by Cooper B-Line, Inc. or engineer approved equal.

G. Trapeze hangers or center support hangers shall be supported by 1/4 inch or 3/8 inch diameter rods.

H. Special accessories shall be furnished as required to protect, support and install a wire basket support system.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install wire basket as indicated; in accordance with recognized industry practices (NEMA VE-2 2000), to ensure that the cable tray equipment complies with requirements of NEC, and applicable portions of NFPA 70B and NECA's "Standards of Installation" pertaining to general electrical installation practices.

B. Coordinate wire basket with other trades as necessary to properly interface installation of wire basket runway with other work.

C. Provide sufficient space encompassing wire basket to permit access for installing and maintaining cables.

3.02 TESTING

A. Test wire basket support systems to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. See NFPA 70B, Chapter 18, for testing and test methods.

B. Manufacturer shall provide test reports witnessed by an independent testing laboratory of the "worst case" loading conditions outlined in this specification and performed in accordance with the latest revision of NEMA VE-1.

END OF SECTION

SECTION 26 0118

DUCT BANK

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Metal conduit.
2. Duct.
3. Manholes.

B. Related work:

1. Section 31 2000 Earthwork.
2. Section 31 2333 Trenching and Backfilling.
3. Section 03 3300 Cast-In-Place Concrete.
4. Section 22 0510 Plumbing Piping.

1.02 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Ductbank:

1. Basis of Measurement: By the lineal foot, for each configuration.
2. Basis of Payment: Includes purchase, delivery, and installation of duct, fittings, supports, and accessories, and for trenching, concrete encasement, and backfill.

B. Manhole:

1. Basis of Measurement: Per unit.
2. Basis of Payment: Includes purchase, delivery, and installation of manhole.

1.03 REFERENCES

A. Section 01 4500 - Quality Control: Requirements for references and standards.

B. ANSI C80.1 Rigid Steel Conduit, Zinc Coated.

C. ASTM A48 Gray Iron Castings.

D. ASTM C857 - Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.

E. ASTM C858 - Underground Precast Concrete Utility Structures.

F. ASTM C891 - Installation of Underground Precast Utility Structures.

G. ASTM C1037 - Inspection of Underground Precast Utility Structures.

H. IEEE C2 National Electrical Safety Code.

I. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

J. NEMA TC 2 Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80).

K. NEMA TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.

L. NEMA TC 6 PVC and ABS Plastic Utilities Duct for Underground Installation.

M. NEMA TC 9 Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.

N. NEMA TC 10 PVC and ABS Plastic Communications Duct and Fittings for Underground Installation.

O. NEMA TC 14 Filament Wound Reinforced Thermosetting Resin Conduit and Fittings.

P. NFPA 70 National Electrical Code.

Q. UL 651A - Type EB and A PVC Conduit and HDPE Conduit.

1.04 SUBMITTALS FOR REVIEW

A. Section 01 3300 - Submittals: Procedures for submittals.

B. Product Data: Provide for metallic conduit or nonmetallic conduit, all manhole accessories, fittings and supports.

C. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for precast manholes.

1.05 SUBMITTALS FOR INFORMATION

A. Section 01 3300 - Submittals: Submittals for information.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.06 SUBMITTALS FOR CLOSEOUT

A. Project Record Documents: Record actual routing and elevations of underground conduit and duct, and locations and sizes of manholes.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience, and with service facilities within 100 miles of Project.

1.08 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70 and IEEE C2.

B. Products: Listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated.

B. Verify routing and termination locations of duct bank prior to excavation for rough in.

C. Verify locations of manholes prior to excavating for installation.

D. Duct bank routing is shown in approximate locations unless dimensions are indicated. Route as required to complete duct system.

E. Manhole locations are shown in approximate locations unless dimensions are indicated. Locate as required to complete ductbank system.

PART 2 - PRODUCTS

2.01 RIGID STEEL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Fittings: NEMA FB 1, steel.

2.02 PLASTIC CONDUIT

A. Rigid Plastic Conduit: NEMA TC 2, Schedule 40 and 80 PVC, with fittings and conduit bodies to NEMA TC 3.

B. Rigid Plastic Underground Conduit: UL 651A, Type A PVC, High-density polyethylene, Schedule 40.

2.03 PLASTIC DUCT

A. Plastic Utilities Duct: NEMA TC 6; ABS Type DB.

B. Plastic Utility Duct Fittings: NEMA TC 9.

C. Plastic Communications Duct and Fittings: NEMA TC 10, Type DB.

2.04 PRECAST CONCRETE MANHOLES

A. Description: Precast manhole designed in accordance with ASTM C858,comprising modular, interlocking sections complete with accessories.

B. Loading: ASTM C857, Class A-16, A-12, A-8 or A-0.3 as required.

C. Shape: Square or Rectangular with truncated corners and as indicated.

D. Riser Casting: 12 inch, with manhole step cast into frame.

E. Frames and Covers: ASTM A48; Class 30B gray cast iron, 30 inch size, machine finished with flat bearing surfaces. Provide cover marked electric or telephone as appropriate.

F. Duct Entry Provisions: Window knockouts.

G. Duct Entry Locations: As indicated.

H. Duct Entry Size: As indicated.

I. Cable Pulling Irons: Use galvanized rod and hardware. Locate opposite each duct entry. Provide watertight seal.

J. Cable Rack Inserts: Minimum load rating of 800 pounds (365 kg). Locate at 3 feet on center.

K. Cable Rack Mounting Channel: 1 1/2 x 3/4 inches steel channel, 48 inch length. Provide cable rack arm mounting slots on 1 1/2 inch centers.

L. Cable Racks: Steel channel, 1 1/2 x 3/4 x 14 inches, with fastener to match mounting channel.

M. Cable Supports: Porcelain clamps and saddles.

N. Manhole Steps: Polypropylene plastic manhole step with 1/2 inch steel reinforcement. Cast steps at 12 inches on center vertically.

O. Ladder: Aluminum, rung, 2-foot length, with top hook to engage manhole step in riser casting. Provide one ladder for each manhole.

P. Sump Covers: ASTM A48; Class 30B gray cast iron.

Q. Source Quality Control: Inspect manholes in accordance with ASTM C1037.

2.05 ACCESSORIES

A. Underground Warning Tape: 4 inch wide plastic tape, detectable type, colored yellow with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3.01 DUCT BANK INSTALLATION

A. Quality Control Section: Manufacturer's instructions.

B. Install duct to locate top of ductbank at depths as indicated on drawings.

C. Install duct with minimum slope of 4 inches per 100 feet. Slope duct away from building entrances.

D. Cut duct square using saw or pipe cutter; de burr cut ends.

E. Insert duct to shoulder of fittings; fasten securely.

F. Join nonmetallic duct using adhesive as recommended by manufacturer.

G. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

H. Install no more than equivalent of three 90 degree bends between pull points; provide additional pull boxes as field conditions require.

I. Provide suitable fittings to accommodate expansion and deflection where required.

J. Terminate duct at manhole entries using end bell.

K. Stagger duct joints vertically in concrete encasement 6 inches minimum.

L. Use suitable separators and chairs installed not greater than 4 feet on centers.

M. Band ducts together with standard commercial racking before backfilling with sand slurry.

N. Securely anchor duct to prevent movement during concrete placement.

O. Place concrete under provisions of Section 03300. Use mineral pigment to color concrete red.

P. Provide minimum 3-inch concrete cover at bottom, top, and sides of ductbank.

Q. Provide two No. 4 steel reinforcing bars in top of bank under paved areas.

R. Connect to existing concrete encasement using dowels.

S. Connect to manhole wall using dowels.

T. Provide suitable pull string in each empty duct except sleeves and nipples.

U. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.

V. Backfill trenches under provisions of Section 31 2333.

W. Interface installation of underground warning tape with backfilling specified in backfill Section. Install tape 6 inches below finished surface.

3.02 PRE-CAST MANHOLE INSTALLATION

A. Quality Control Section: Manufacturer's instructions.

B. Excavate for manhole installation under the provisions of Section 02222.

C. Install and seal precast sections in accordance with ASTM C891.

D. Install manholes plumb.

E. Use precast neck and shaft sections to bring manhole cover to finished elevation.

F. Attach cable racks to inserts after manhole installation is complete.

G. Install drains in manholes and connect to site drainage system or if approved by engineer to 4 inch (DN100) pipe terminating in 1 cu yd crushed gravel bed.

H. Dampproof exterior surfaces, joints, and interruptions of manholes after concrete has cured 28 days.

I. Backfill manhole excavation under the provisions of backfill Section.

END OF SECTION

SECTION 26 0120

CONDUCTORS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Conductors; for power, lighting, sound, communication and control, including conductors for general wiring, flexible cords and cables, and ground conductors.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals: Section 260000.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Conductors for General Wiring: Thermoplastic insulated rated for 600V manufactured in accordance with UL 83.

1. Provide 3/4 hard drawn copper conductors. Provide solid conductor for #12 AWG and smaller. Provide stranded conductors for #10 AWG and larger.

B. Conductor Connectors for General Wiring:

1. Sizes No. 14 to No. 8: Splice with insulated spring wire connectors.

a. Ideal No. 451, 455 and 453.

b. Minnesota Mining: Types Y, R, G, and B.

c. Buchanan No. B1, B2 and B4.

2. Size No. 6 or Larger, Copper: Splice and terminate with compression or pressure type connectors and terminal lugs.

C. Provide connector sealing packs for all area lighting and exterior box splices which require complete protection from dampness and water.

1. Scotchlok No.'s 3576, 3577 and 3578, by 3M Company.

PART 3 - EXECUTION

3.01 USE

A. Conductors for General Wiring:

1. Minimum 75 degrees C temperature rated insulation on conductors, except use minimum 90 degrees C temperature rated insulation on conductors in conduits exposed on roof, or where required due to ambient temperature.

2. Stranded conductors at motors, audio video and other applications where subject to vibration.

3. Minimum size conductors for power and lighting #12 AWG, except where noted.

4. Minimum size conductors for control circuits #14 AWG stranded with THHN/THWN insulation.

B. Use flexible cords and cables for connection of special equipment as indicated. Length not to exceed 72 inches.

C. Ground Conductors:

1. Provide an insulated green ground conductor for all branch circuit wiring where indicated.

2. Bare copper conductor may be used.

a. Install ground conductors in all non-metallic conduits as required by code. Install ground conductors in all motor branch circuits and all feeders. Where ground conductor size is not indicated, provide size as required for an equipment ground conductor by the National Electrical Code.

b. Install ground conductors in all flexible metal conduits.

D. Install XHHW – 2, 90°C copper conductors for all underground installations unless noted otherwise on the plans.

E. Install for all dimmers, stranded THHN/THWN – 2 copper 90°C conductors with dedicated neutrals.

3.02 INSPECTION

A. Check conduit system for damage and loose connections, replace damaged sections.

B. Check for caps at conduit openings. Make sure that inside of conduit is free of dirt and moisture.

C. Pull mandrel, one size smaller than the conduit, through entire length of all underground conduits prior to conductor installation.

3.03 INSTALLATION

A. Conductors for General Wiring:

1. Color code conductors insulation as follows:

CONDUCTOR	SYSTEM 208Y/120	VOLTAGE 480Y/277
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow

2. For conductors #6 AWG or larger, permanent plastic colored tape may be used to mark conductor in lieu of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.

a. Provide color tape on each end and at all terminal points and splices on wire enclosed in conduit.

b. Provide color tape every 3 feet on wire not enclosed in a listed wireway.

3. When pulling conductors, do not exceed manufacturer's recommended values.

4. Use polypropylene or nylon ropes for pulling conductors.

B. Insulate splices with plastic electrical tape: Scotch No. 33+, Tomic No. 1T, or equal.

C. Terminate all control wires with terminal lugs on terminal boards not designed with pressure plates. If splices are needed, use same procedure, installing a terminal board in a junction box for protection.

D. All splices or connections shall be compression type Thomas & Betts or Burndy, no split bolt connections are allowed.

3.04 IDENTIFICATION

A. Feeders: Identify with the corresponding circuit designation at over-current device and load ends, at all splices and in pull boxes.

B. Branch Circuits: Identify with the corresponding circuit designation at the over-current device and at all splices and devices.

C. Control Wires: Identify with the indicated number and/or letter designation at all terminal points and connections.

D. Alarm and Detection Wires: Identify with the indicated wire and zone numbers at all connections, terminal points, and coiled conductors within cabinets.

E. Conductors Terminated By Others: Indicate location of opposite end of conductor, i.e., Pull Box-Room 101.

F. For identification of conductors, use heat shrinkable white marking sleeves such as Brady Permasleeve with type written identification.

G. Circuit designation is construed to mean panel designation and circuit number, i.e., LA-13.

END OF SECTION

SECTION 26 0122
MEDIUM VOLTAGE CABLES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide medium voltage cables as shown on the drawings and as specified.

1.02 QUALITY ASSURANCE

A. Provide the services of a qualified testing laboratory to perform the specified tasks. Notify the owner's representative 72 hours in advance of performance of work, requiring testing. Provide all material required for testing.

1.03 SUBMITTALS

A. Shop Drawings

1. Complete data sheet for cable construction, shielding, insulation material, thickness of insulation and jacket, cable stranding and voltage rating.

2. Certified test reports for insulation resistance, power factor corona level, AC dielectric.

B. Certified Factory Test Report including the results of the test plus cable identification, factory order number, cable length and all cable specifications. No cable shall be installed in any duct or conduit until the owner's representative has accepted test report.

C. Cable Pulling and Tension Calculations: No cable shall be installed until the calculations are approved.

D. Field Test Report

E. Qualifications of "Cable Splicers"

1. Submit a certification for the approval of the owner's representative containing the names and the qualifications of persons recommended to perform the splicing and termination of medium voltage cables approved for installation.

2. The certification shall indicate that persons who shall perform actual splicing and terminations have been adequately trained in the proper techniques and have had at least five years experience in the "cable splicer" classification and at least three years experience with this type of cable.

F. Submit 30" sample to show cable identification and date of manufacture.

1.04 TESTS

A. Factory Test: A complete test shall be done on each length of cable at the factory in accordance with ICEA S-68-516 and UL-1072. In addition a corona test shall be done per AEIC CS6-87, Section E.

B. Field Test

1. Visual and mechanical inspections of physical damage, shield grounding cable support, cable bend and termination.

2. DC High Potential Test shall be performed in accordance with Section K-2 of AEIC CS6-87 for each conductor.

3. Testing of cables shall be performed by an independent testing agency at the contractor's expense. The testing agency shall have a minimum of 5 years' experience. Each person engaged in the testing procedures should also meet the experience requirements. Provide to the owner's representative documentation, including references, of the testing agency and agency's personnel experience for approval.

4. Connect untested conductors in circuit to ground during test.

5. Apply test voltage in at least eight equal increments to maximum test voltage.

6. Record leakage current at each increment, allowing for charging current decay.

7. Hold maximum test voltage for fifteen minutes. Record current at 30 seconds and every 60 seconds thereafter. Plot results on X-Y axis.

8. Each insulated conductor provided under this section of the specifications shall be tested in accordance with Section F of AEIC CS6.

1.05 REFERENCES

A. ICEA S-68-516

B. AEIC CS6-96

C. UL 1072

D. IEEE 404-1986

E. ASTM B-496

F. Materials and/or installation shell meet or exceed the above referenced standards.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. 15kV ungrounded, shielded, single conductor cable, UL Listed Type MV-105, with ethylene-propylene-rubber (EPR) insulation, jacketed, triple tandem extruded. Manufactured within one (1) year of installation.

2. Suitable for installation in conduit, subject to alternately wet and dry conditions.

3. To operate satisfactorily both electrically and mechanically, at conductor temperatures not exceeding 105° C for normal loading, 140° C for

emergency loading, emergency of 36 hours, and 250° C for short circuit loading assuming a short circuit duration of two seconds. Emergency overload operation may occur for periods up to 100 hours per year and with as many as five (5) such 100-hour periods within the lifetime of the cable.

4. The cable shall be minimum 500,000 circular mils (500 kcmil), unless shown otherwise on the drawings.

B. Conductor: Conductor shall be soft, round, annealed uncoated copper, concentric compact round Class B stranded per ASTM B-496.

C. Strand Shielding: Stranding shielding shall be an extruded layer of semi-conducting ethylene-propylene rubber material over the conductors with thermal characteristics equal to or better than those of the insulation; chemically compatible with the insulation; firmly and continuously bonded to the overlaying insulation; easily removable; not less than 20 mils.

D. Insulation: Insulation shall be high quality, ethylene-propylene rubber (EPR) base, thermosetting compound of high dielectric strength with heat, moisture, ozone, and corona resistant properties, homogenous, sold, and applied with good workmanship. The ethylene content of the elastomer used in the insulation compound shall not exceed 72% by weight nor shall the insulation compound contain any polyethylene. The cable manufacturer shall compound the insulation in its own facility using a closed system to insure maximum cleanliness. Insulation thickness shall be 220 mils minimum average, and not less than 90% of the specified minimum average thickness at any point; 133% insulation level, 15kV class. The insulation shall be triple tandem extruded with the conductor and insulation shield to prevent interfacial contamination. The extrusion operation shall be performed by three separate in line extruder heads thereby permitting the measurement and accurate individual control of the wall thickness of each layer of compound as the cable is being manufactured.

E. Insulation Shielding: The insulation shielding shall be an extruded semiconducting layer of thermosetting EPR material directly over the insulation. The extruded shield shall be clean stripping and shall have a peel strength from the insulation between 4 to 24 lbs./0.5 inch width when tested per AEIC CS6. The thickness of the extruded shield shall be 32 mils min. point.

F. Metallic Shielding Tape: Metallic shielding tape shall be an uncoated copper tape, helically applied over insulation shield 5 mils thick with minimum 12 1/2% overlap.

G. Jacket: Jacket shall be 80 mils minimum average thickness, polyvinyl chloride jacketed extruded over the metallic shielding tape; smooth, of uniform composition and free of holes, cracks and imperfections. The minimum thickness at any point shall not be less than 80% of minimum average thickness.

H. Identification: Provide durable lifetime identification printed, embossed, or engraved on outer surface of the jacket including manufacturer, place of

manufacture, conductor type and size, insulation thickness in mils, jacket type, and the rated voltage.

I. Moisture Absorption: The mechanical moisture absorption of the insulation shall be not exceed 5 milligrams per square inch of exposed surface, when immersed in distilled water at 70 degrees C for seven (7) days.

J. Sealing: Seal ends of cable with mastic material and tight fitting plastic end cap to prevent entrance of moisture.

K. Manufacturer: The cable shall be manufactured by Okonite or equal.

L. Lubrication: Cable lubrication shall be made by American Polywater Corp., "Polywater J" or equal. The lubricant shall not affect the volume resistivity of semiconducting jacket or insulation shield present.

M. Lugs: Cable lugs and connectors shall be made of copper alloy and shall be high pressure indent type. Manufacturers: Burndy, Thomas & Betts or equal.

N. Cable Terminations

1. Cable terminations shall meet IEEE 48; Class 1, shrinkable rubber or polymetric cable termination in kit form with ground clamp, non-tracking skirts, moisture-blocked ground braid and auxiliary materials; rated for voltage class of cable being terminated. As manufactured by 3M, Raychem, Elastimold or equal.

2. Cable terminations shall be two-way 15kV molded rubber straight separable connectors.

O. Cable Splices: T-splices or any other cable taps shall not be permitted.

P. Arc and Fireproofing Tape Manufacturers shall be Bishop Model 43A, 3M Model700 or equal.

Q. Load Break Elbows by Josyln @ 15KV 600A are recommended for splice/terminating connections.

END OF SECTION

SECTION 26 0130

ELECTRICAL BOXES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Boxes; including:

1. Outlet boxes.
2. Pull and junction boxes.
3. Cabinets.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals: Section 260000.

B. Support Material: Section 260190.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Outlet Boxes:

1. Pressed Steel Boxes: Knockout type, hot-dipped or electro-plate galvanized.
2. Cast Iron Boxes: Hot-dipped or electro-plate galvanized with threaded hubs.
3. Cast Iron Conduit Bodies: Hot-dipped or electro-plate galvanized with threaded hubs.
4. Cast copper free aluminum conduit bodies with threaded hubs.
5. Covers for Pressed Steel Boxes: Hot dipped or electro-plate galvanized.
6. Outlet boxes manufactured in accordance with UL 514.

B. Pull and Junction Boxes:

1. Sheet steel, hot-dipped or electro-plate galvanized, or prime coated and a final coat of manufacturer's standard enamel or lacquer finish. Manufactured in accordance with UL 50.

a. Where exposed to weather, provide raintight hubs for conduits entering the boxes, top and sides only.

2. Floor Boxes:

a. Single gang, similar to Hubbell #B-2536.

b. Covers:

1) Combination, similar to Hubbell #S-2525.

2) Duplex receptacle, similar to Hubbell #S-3925.

c. Carpet flange, similar to Hubbell #S-3075 thru #S-3079.

d. Hubs: Provide hubs as required to suit the conduit arrangement.

3. Pre-Cast Concrete Pull Boxes: As manufactured by Jensen Pre-Cast or Utility Vault and shown on drawings.

4. High impact resistant PVC boxes: As manufactured by Carlon, Sedco, or R & G Sloan.

C. Cabinets: Sheet metal, prime coat and final coat of manufacturer's standard enamel or lacquer finish. Manufactured in accordance with UL 50.

1. Control Cabinet: NEMA 1 enclosure, door with butt hinges and flush handle latches.

a. Provide with removable steel back panel.

2. Terminal Cabinets: NEMA 1 enclosure, door with concealed hinges and spring catch type flush cylinder locks. Key locks alike, provide two keys with each lock.

3. Provide engraved plastic nameplates with 1/2" minimum height letters indicating designation of control and terminal cabinets as shown on the drawings.

a. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

PART 3 - EXECUTION

3.01 USE

A. Outlet Boxes:

1. Ceiling Outlet Boxes: Not less than 4" octagonal by 2" deep.

2. FDD cast iron or cast aluminum device boxes and conduit bodies with metal covers for exposed conduit installation. Provide gasket for covers in wet areas.

3. Intercom, Microphone and TV Outlet Boxes: Not less than 4-11/16" square x 2-1/8" deep.

4. Provide floor boxes with quantity of gangs as required for power, communication or control as indicated. Use boxes with barriers where required. Provide carpet flanges in carpeted areas.

B. Pull and Junction Boxes:

1. Use sheet steel boxes NEMA Type 1 for indoor and NEMA Type 3R for outdoor installation, except as follows.

2. Use pre-cast concrete boxes for boxes flush in finish grade where requiring a nominal capacity greater than 144 cubic inches, where located in vehicular traffic areas, or where indicated.

3. Use polyvinyl chloride (PVC) boxes flush in finish grade when the nominal internal volume is less than or equal to 144 cubic inches or where indicated.

4. Use cast iron boxes for boxes flush in slab on grade.

3.02 INSTALLATION

A. Provide 3/8" fixture studs in wall bracket and ceiling boxes.

B. Provide covers suitable for the fixtures or devices used.

C. Make outlet box covers flush with finished surfaces.

D. Close unused open knockouts with knockout seals.

E. Provide 1" deep plaster rings on recessed outlet boxes installed in areas where concrete will be exposed after construction is complete.

F. Where boxes are concealed in exposed concrete unit masonry, use square cornered types or boxes fitted with rings of sufficient depth for the box to be recessed completely within cavity of block or tile. Install box to insure that ring fits an opening sawed out of the masonry, so that no mortar is required to fill between ring and construction.

G. Provide a 6" base of compacted crushed rock under pre-cast concrete pull boxes.

H. Adjust floor boxes so they are level with top of finished floors.

I. Provide pull boxes and junction boxes in all branch circuit and feeder runs as indicated. Do not provide pull boxes unless they are indicated or required by the Electrical Code.

3.03 IDENTIFICATION

A. Junction Boxes: Use permanent black marker, 2" high lettering, and on each cover plate indicate the power source and circuits contained within that junction box.

END OF SECTION

SECTION 260140

WIRING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Wiring devices.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Identification: Section 260030.

B. Boxes: Section 260130.

1.03 Submittals

A. In accord with Section 260010.

1.04 DEFINITION

A. Wiring devices: This term includes all wall switches, pushbuttons, receptacles, and plates used for general purpose installation.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Wall switches:

1. Quiet toggle type, 20A – 120/277 VAC rated, with terminal screws to take up to No. 10 AWG conductors:

	SPST	DPST	3-WAY	SPST KEY SWITCH LOCK	4-WAY
Arrow-Hart	1991-I	1992-I	1993-I	1991-L	1994-I
Bryant	4901-I	4902-I	4903-I	4901-L	4904-I
General Electric	GE5951-2	GE5952-2	GE5953-2	GE5951-OL	GE5954-2
Hubbell	1221-I	1222-I	1223-I	1221-L	1224-I
Pass & Seymour/ Legrand	20AC1-I	20AC2-I	20AC3-I	20AC1-L	20AC4-I

2. Momentary contact type, 20A-120/277V, two-circuit, three-position, center off:

Arrow-Hart	1995-I
Bryant	4921-I
General Electric	GE5935-2
Hubbell	1557-I
Pass & Seymour/Legrand	1250-I

3. Passive infrared wall switch sensors: Ivory, 180° field of view, adjustable time out and ambient light, 1200 sq. ft. Coverage, 120 VAC, 60 Hz, 1500W. Maximum load, incandescent and fluorescent. As manufactured by Hubbell No. AT1201 or Owner- approved equivalent by Leviton or Pass & Seymour.

4. Fan speed controllers: AC unit rated 15A - 120V used to control up to twelve 56 in./52 in./48 in. ceiling fans or up to twenty 42 in. fans on a single circuit. Rinaudo's Reproductions No. 22394.

B. Passive infrared motion switching system:

1. Ceiling mount sensor, white, 500 sq. ft. coverage, requires control unit. Hubbell No. ATD500CRP.

2. Ceiling mount sensor, white, 2000 sq. ft. coverage, ceiling height dependent, requires control unit. Hubbell No. ATD2000CRP.

3. Ceiling or wall mount sensor, white, 1000 sq. ft. coverage, requires control unit. Hubbell No. ATD1000CRP.

4. Ceiling or wall mount hallway sensor, white, covers area 75 ft. long by 20 ft. wide, requires control unit. Hubbell No. PIR90HW1.

5. Low-voltage control unit, 120VAC, controls one to four sensors. Mount in 4 in. x 4in. enclosure. Hubbell No. CU120A.

6. Relay, 120VAC coil, used when load to be controlled exceeds capacity of a single circuit. Hubbell No. AAR

C. Receptacles, caps, and connectors:

1. 15A-125V, NEMA 5-15, parallel slot type with grounding pin:

	DUPLEX	SINGLE	GFI
Arrow-Hart	5252-I	5261-I	GF5242-I
Bryant	5252-I	5261-I	GFR52FT
General Electric	5252-2	5261-2	TGTR115F
Hubbell	5252-I	5251-I	GF5252-I
Pass & Seymour/Legrand	5252-I	5261-I	1591-SHG

2. 15A-250V, NEMA 6-15, straight blade grounding type:

	RECEPTACLE	CAP
Arrow-Hart	5661-I	6666
Bryant	5661-I	5666-N
General Electric	GE4069-2	GED0611
Hubbell	5661-I	5666-C
Pass & Seymour/Legrand	5662-I	5666-X

3. 15A-125V, NEMA L5-15, locking type with ground:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	4700	4721	4731
Bryant	4700	4721-NSY	4732-NSY
General Electric	GL4700	GLD0511	GLD0513
Hubbell	4700	4720-C	4729-C
Pass & Seymour/Legrand	4700	L515-P	L515-C

4. 20A-125V, NEMA 5-20, straight blade grounding type:

	RECEPTACLE	CAP
Arrow-Hart	5361-I	5362-I
Bryant	5361-I	5362-I
General Electric	GE4102-2	GE4108-2
Hubbell	5361-I	5362-I
Pass & Seymour/Legrand	5361-I	5362-I

5. 20A-125V, NEMA L5-20, two-pole, three-wire locking type, with ground:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6200	6202	6204
Bryant	70520-FR	70520-NP	70520-NC
General Electric	GL0520	GLD0521	GLD0523
Hubbell	2310-A	2311	2313
Pass & Seymour/Legrand	L520-R	L520-P	L520-C

6. 20A-125V, NEMA 5-20, two-pole, three-wire, straight blade isolated grounding type receptacle:

	DUPLEX	SINGLE
Arrow-Hart	IG5362	IG5361
Bryant	5362-IG	5361-IG
General Electric	GE8300-IG	GE8310-IG
Hubbell	IG-5362	IG-5361
Pass & Seymour/Legrand	IG-6300	IG-5361

7. 20A-125 VAC, two-pole, three-wire, NEMA 5-20, straight blade, specification grade, ivory color, ground fault circuit interrupter receptacle (GFCI), rated for feed-through wiring, with LED indicator light:

	GFCI RECEPTACLE
Hubbell	GF-5362I
Pass & Seymour	2091-S-L-I
Leviton	6898-I

8. 20A-125/250V, NEMA 14-20, three-pole, four-wire straight blade grounding type:

	RECEPTACLE	CAP
Arrow-Hart	5759	5757
Bryant	-	-
General Electric	GE1420	GED1421
Hubbell	8410	8411-C
Pass & Seymour/Legrand	L1420-R	L1420-P

9. 20A-250V, NEMA 6-20, two-pole, three-wire straight blade grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	8510	6866	6869
Bryant	5461	5466N	5469N
General Electric	GE4182	GED0621	GED0623
Hubbell	5461	HBL5466-C	HBL5469-C
Pass & Seymour/Legrand	5871	5466-X	5469-X

10. 20A-120/208V, NEMA L21-20, four-pole, five-wire locking and grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6470	6472	6474
Bryant	72120-FR	72120-NP	72120-NC
General Electric	GL2120	GLD2121	GLD2123
Hubbell	2510A	2511	2513
Pass & Seymour/Legrand	L2120R	L2120P	L2120C

11. 20A-250V, NEMA L6-20, two-pole, three-wire locking and grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6210	6212	6214
Bryant	70620FR	70620NP	70620NC
General Electric	GL0620	GLD0621	GLD0623
Hubbell	2320A	2321	2323
Pass & Seymour/Legrand	L620-R	L620-P	L620-C

12. 20A-480V, NEMA L16-20, three-pole, four-wire locking type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6430	6432	6434
Bryant	71620-FR	71620-NP	71620-NC
General Electric	GL1620	GLD1621	GLD1623
Hubbell	2430A	2431	2433
Pass & Seymour/Legrand	L1620-R	L1620-P	L1620-C

13. 30A-125V, NEMA 5-30, two-pole, three-wire straight blade grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	5716N	5717N	6716N
Bryant	9530-FR	9630-RP	-
General Electric	GE4138-3	GED0531	GED0533
Hubbell	9308	9309	-
Pass & Seymour/Legrand	3802	5921	-

14. 30A-125V, NEMA L5-30, two-pole, three-wire grounding and locking type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6330	6332	6334
Bryant	70530-FR	70530-NP	70530-NC
General Electric	GL0530	GLD0531	GLD0533
Hubbell	2610	2611	2613
Pass & Seymour/Legrand	L530-R	L530-P	L530-C

15. 30A-125/250V, NEMA 14-30, three-pole, four-wire straight blade grounding type:

	RECEPTACLE	CAP
Arrow-Hart	5744N	5746N
Bryant	9430-FR	5746
General Electric	GE4191-3	GED1431
Hubbell	9430	9431
Pass & Seymour/Legrand	5740	5741-AN

16. 30A-125/250V, NEMA L14-30, three-pole, four-wire grounding and locking type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6510	6512	6514
Bryant	71430-FR	71430-NP	71430-NC
General Electric	GL1430	GLD1431	GLD1433
Hubbell	2710-A	2711	2713
Pass & Seymour/Legrand	L1430-R	L1430-P	L1430-C

17. 30A-250V, NEMA L6-30, two-pole, three-wire locking blade grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6340	6342	6344
Bryant	70630-FR	70630-NP	70630-NC
General Electric	GL0630	GLD0631	GLD0633
Hubbell	2620-A	2621	2623
Pass & Seymour/Legrand	L630-R	L630-P	L630-C

18. 30A-250V, NEMA 6-30, two-pole, three-wire straight blade grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	5700N	5701N	6700N
Bryant	9630-FR	9630-ANP	-
General Electric	GE4139-3	GE4328-9	GE4373-9
Hubbell	9330	9331	-
Pass & Seymour/Legrand	3801	5931	-

19. 50A-208V (50A-600V), three-pole, four-wire locking type with ground:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	3769	3765	3764
Bryant	3769	3765	3764
General Electric	LD3769	LD3765	LD3764
Hubbell	3769	3765-C	3764-C
Pass & Seymour/Legrand	3769	3765	3764

20. 50A-125/250V, NEMA 15-50, three-pole, four-wire grounding straight blade type:

	RECEPTACLE	CAP
Arrow-Hart	5754N	5745N
Bryant	9450-FR	5745
General Electric	GE4181-3	GE4180-3
Hubbell	9450	9451
Pass & Seymour/Legrand	5750	5751-AN

21. 50A-125/250V, three-pole, four-wire grounding locking blade type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	CS6369	CS6365	CS6364
Bryant	CS6369	CS6365	CS6364
General Electric	-	-	-
Hubbell	CS6369	CS6365	CS6364
Pass & Seymour/Legrand	-	-	-

22. 50A-250V, NEMA 6-50, two-pole, three-wire grounding straight blade type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	5709N	5710N	6709N
Bryant	9650-FR	9650-RP	-
General Electric	GE4141-3	GED0651	GED0653
Hubbell	9367	9368	-
Pass & Seymour/Legrand	3804	3869	-

23. 60A-120/208V, three-phase, 60 Hz, five-pole, five-wire, watertight, with threaded cap:

	BOX	ANGLE ADAPTER	RECEPTACLE BODY	COMPLETE ASSEMBLY
Hubbell	26401	26404	26520	-
Crouse-Hinds	-	-	-	Area-6575
Russell Stoll	-	-	-	DS6516-FRAB-

24. 60A-480V, NEMA L16-20, three-pole, four-wire locking type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	-	-	-
Bryant	-	-	-
General Electric	-	-	-
Hubbell	HBL 26410	HBL 26402	HBL 26418
Pass & Seymour/Legrand	-	-	-

D. Safety receptacle: 15A-125V, NEMA 5-15, straight blade grounding safety receptacle, Hubbell No. SG-62H-1.

E. Door monitoring switches:

1. General: Provide magnetic door switches (one per leaf) and key switches at specific door locations as indicated on Drawings. Refer to Electrical Drawings details for schematic installation details of door switches.

2. Magnetic contact switches: Provide concealed magnetic SPDT switches with minimum 6-ft. wire leads, Sentrol No. 1076W-06 for hollow metal doors and frames. Where necessary, provide other similar Sentrol types to suit concealed installation conditions, as approved by Owner and compatible with Owner's ride control and/or existing security system equipment. Color of switches to closely match finish or paint color of door frame.

3. Key switches: Arrow-Hart No. 1191L.

F. Device cover plates:

1. Interior plates: Specification grade plastic, 0.1 in. thick, ivory in color, UL listed.

a. Plates in kitchens and restrooms to be polished stainless steel, 0.040 in. thick except in kitchens use double lift lid weatherproof gasketed plates for convenience receptacles.

b. MATV plate: RMS No. CA-4028.

2. Exterior plates: Choose type of exterior cover plate in accord with the device location and/or manner in which device will be used. Device cover plates shall be die-cast aluminum with hinged cover, rated for respective type of use specified below, or as indicated on Drawings.

a. Outlet box weatherproof hoods: NEMA 3R rating, gasketed, for unattended use with cover closed, padlockable latching cover to meet OSHA lockout/tagout requirements, large cord opening and UL listed. As manufactured by Hubbell, Intermatic or Leviton.

b. Low profile weatherproof cover: Gasketed, approved for use with cover open, self-closing hinged covers (two independent self-closing lids for duplex receptacles which are horizontally mounted), UL listed. As manufactured by Hubbell, Leviton or Pass & Seymour.

c. Communication outlet weatherproof hoods: NEMA 3R rating for unattended use with cover closed, two-cord openings and UL listed. As manufactured by Red Dot.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mount switches and receptacles in vertical position in building interiors.

B. Mount receptacles with weatherproof plates in horizontal position.

C. Install receptacles mounted vertically so that the ground contact falls on the top position, and horizontally-mounted receptacles with neutral pole in top position.

D. Use plastic blank plates on J-boxes in public areas.

E. Use mechanical type door switches for load control.

F. Install receptacles for plug in lighting fixtures within 36 in. of fixture location.

G. Use safety type receptacles with low profile weatherproof metal covers for all convenience outlets in guest accessible areas (i.e., queue lines, waiting areas, etc.).

H. All GFI type exterior receptacles shall be provided with weatherproof metal hoods.

I. GFI type receptacles shall not be fed-through wire.

END OF SECTION

SECTION 26 0142

NAMEPLATES AND WARNING SIGNS

PART 1 - GENERAL

Not Used.

PART 2 - PRODUCTS

2.01 NAMEPLATES

A. Nameplate shall be plastic laminate with 3/4" high letters in white on black background screwed onto equipment designations shall clearly state:

1. Equipment Enclosure Nameplates.

   a. Manufacturer's nameplate including equipment design rating of current, voltage, KVA, HP, bus bracing rating, or as applicable.

   b. Equipment nameplate designating system usage and purpose, system nominal voltage, equipment rating for KVA, amperes, HP and RPM as applicable. Designation data per drawings or to be supplied with shop drawings approval.

2. Device nameplates: Device usage, purpose, or circuit number; manufacturer and electrical characteristic ratings including the following:

   a. Circuit Breakers: Voltage, continuous current, maximum interrupting current and trip current.

   b. Switches: Voltage, continuous current, horsepower or maximum current switching. If fused, include nameplate stating "Fuses must be replaced with current limiting type of identical characteristics."

   c. Contactors: Voltage, continuous current, horsepower or interrupting current, and whether "mechanically-held" or "electrically-held".

   d. Motors: Rated voltage, full load amperes, frequency, phases, speed, horsepower, code letter rating, time rating, type of winding, class and temperature.

   e. Controllers: Voltage, current, horsepower and trip setting of motor running over current protection.

2.02 WARNING SIGNS

A. Warning signs shall be minimum 18 gauge steel, white porcelain enamel finish with red lettering. Lettering to read "DANGER - HIGH VOLTAGE" in 1" letters. Warning signs to be included on door or immediately above door of all electrical equipment rooms, vaults or closets containing equipment rooms, vaults or closets containing equipment energized above 150 volts to ground, except where such spaces are accessible from public areas.

2.03 WARNING SIGN DESIGNATION

A. Warning designation in 1" red letters shall be painted by stencil or pre-printed adhesive on each pull box, cabinet or 1-foot length of exposed conduit stating "DANGER" and giving voltage of enclosed conductors such as "DANGER - 480 VOLTS", for all systems over 150 volts to ground.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Nameplates shall be mounted by self-tapping or threaded screws and bolts or by rivets.

B. Signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.

END OF SECTION

SECTION 26 0163

DISTRIBUTION PANELBOARDS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Distribution panelboards.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals: Section 260000.

B. Overcurrent Protective Devices: Section 260180.

C. Disconnects: Section 260170.

D. Control Devices: Section 264901.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Provide distribution panelboards with molded case breakers or fused switches for mains and feeders as indicated. All equipment shall be listed to meet or exceed the available short circuit current.

B. Provide full length copper bussing including areas indicated as space only.

C. Provide full size neutral bus where neutral bus is indicated.

D. Provide copper ground bus adequate for number of grounded circuits.

E. Circuit Breaker Type: Square-D Co. I-Line, with alternate bid for General Electric type AV Line.

F. All circuit breakers shall be capable of being locked in the off position.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Secure panelboards to structures to withstand wire pulling strains.

B. Secure surface mounted panelboards to wood studs or channel material spanning metal studs.

C. Do not use toggle bolts to wall mount units.

D. Floor mounted units shall be on 4-inch concrete housekeeping pads.

E. Secure to structure per seismic requirements.

3.02 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates on all distribution panelboards shown on the single line diagram.

B. Provide panelboard and source feed designation on nameplates with minimum 3/8" lettering for the panel name and 3/4" height lettering for the source feed designation.

EXAMPLE: DLA

FED FROM: T-2

C. Provide engraved plastic nameplates with 1/4" minimum height letters at all branch overcurrent devices indicating the circuit designating and the load served.

D. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

END OF SECTION

SECTION 26 0164

BRANCH CIRCUIT PANELBOARDS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Branch circuit panelboards.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals: Section 260000.

B. Overcurrent Protective Devices: Section 260180.

C. Control Devices: Section 264901.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Provide factory assembled, enclosed panelboards in dead front cabinets, with doors, surface mounted or recessed as indicated, not less than 20" wide and 5-3/4" deep. Height will depend on the number of breakers and spaces.

B. Where a control compartment is indicated, provide an integral compartment with a separate hinged lockable door held with captive screws. Identify all internal control wiring with manufacturers wire numbering or control wire numbering when indicated, at all terminal points and connections.

C. Provide feeder terminal lugs for both main lugs only and main breakers rated for use with copper conductors.

D. Provide full length copper bussing including areas indicated as space only.

E. Provide full size neutral bus where neutral bus is indicated. Provide equipment ground bus and bolt-on circuit breakers.

F. Key all door locks alike.

G. 120/208V, 3 Phase, 4 Wire Panelboards: Square-D Co. Type NQOD or Powerlink G3 NF with programmable module where designated, alternate bid for General Electric type AQ.

H. 277/480V, 3 Phase, 4 Wire Panelboards: Square-D Co. Type NF, alternate bid for General Electric type CCB.

I. All equipment shall be listed to meet or exceed the available fault current by 10%.

J. Doors shall be hinged.

K. All placards are welded steel type.

L. Provide hinged deadfront doors to allow internal access to panel without totally rewiring cover panel.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Secure panelboards to building structure to withstand wire pulling strains.

B. Secure surface mounted panelboards to wood studs or channel material spanning metal studs.

C. Do not use toggle bolts.

D. Contractor shall program lighting control Powerlink panelboard per owner's requirements.

3.02 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates on all branch circuit panelboards shown on the single line diagram.

B. Provide panelboard and source feed designation on nameplates with 3/8" minimum height lettering for the panel name and 1/4" height lettering for the source feed designation.

EXAMPLE: LA

FED FROM: DLA

C. Secure nameplates with at least two spaces or rivets. Cementing and adhesive installation not acceptable.

D. Provide a typewritten directory for each branch circuit panelboard, showing each circuits and its use. Provide metal directory frame with plastic window.

END OF SECTION

SECTION 26 0170

DISCONNECTS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Disconnects: Switches, fused or unfused.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals: Section 260010.

B. Fuses: Section 260180.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D Company

B. General Electric

2.02 MATERIAL AND FABRICATION

A. Provide heavy duty type, quick-make, quick-break disconnects with cover interlocks.

B. Provide NEMA Type 1 enclosure for dry locations, provide the proper enclosure for other locations as indicated.

C. Provide motor rated toggle switches where indicated.

D. Provide fused disconnect for elevator drive motors.

E. Provide rejection clips on disconnects where rejection type fuses are to be installed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Securely fasten disconnects to structure to withstand wire pulling strains.

3.02 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates on individually mounted disconnects with minimum 1/4" height letters indicating the load served and the source feed designation.

EXAMPLE: LOAD: A/C-1

FED FROM: DHA-1

B. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

END OF SECTION

SECTION 26 0190

SUPPORT DEVICES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Support devices for conduit, boxes, lighting fixtures and equipment.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Hangers, Straps and Beam Clamps:

1. Efcor.
2. Raco, Inc.
3. Steel City.
4. O.Z./Gedney Co.
5. Caddy Fastening System by ERICO Products Inc.

B. Channels and Fittings:

1. Kindorf.
2. Unistrut Corp.

C. Anchors:

1. Acherman-Johnson Corp.
2. Phillips Drill Co.
3. Rawl Products Co.

2.02 MATERIAL AND FABRICATION

A. Hangers: Steel cadmium plated.

B. Straps: One-hole and two-hole malleable iron, hot-dipped galvanized or steel, cadmium or zinc plated.

C. Beam Clamps: Malleable iron, hot-dipped galvanized or cadmium plated.

D. Channels and Fittings:

1. Channels: Hot-dipped galvanized.

2. Fittings: Galvanized.

E. Anchors: Self drilling and expansion bolt types. No wood or fiber plugs or concrete nails are acceptable.

PART 3 - EXECUTION

3.01 USE

A. Use one-hole or two-hole straps for single conduit runs on walls or ceilings.

B. Use hangers with solid steel rods for hanging single conduits.

C. Use formed channel trapezes for groups of two or more conduits.

D. To fasten boxes and supports to:

1. Wood: Use wood screws or screw type nails of equal holding power.

2. Brick and Concrete: Use bolts and expansion shields.

3. Hollow Masonry Units: Use toggle bolts.

E. Support sheet metal boxes from building structure directly or by bar hangers.

F. Do not penetrate reinforced concrete beams with fastenings more than 1-1/2" or reinforced concrete joints with more than 3/4" fastenings to prevent contact with reinforcing steel.

END OF SECTION

SECTION 26 0585
HORIZONTAL BORING SYSTEM

PART 1 - GENERAL

1.01 General

A. The general contract provisions of Division 1 takes precedence over this section in case of conflict.

1.02 Work Included

A. Horizontal boring

B. Installation of conduit systems

C. Coring into existing structures

D. Proofing conduit systems

1.03 Related work elsewhere

A. Conduits 260111

B. Manholes/pull boxes

PART 2 - PRODUCTS

2.01 Materials & Methods - Contractor shall bore and install multiple 4" PVC or HDPE schedule 4'0" conduits with a Pit Launched horizontal directional drill machine. The drill machine shall contain a minimum of 27,000 lbs of push/pull and 4,000 lbs of rotary twist. The drill shall be a rack & pinion design drilling with 10 foot drill rods. The drill will be staged in the bore pit with pilot bit surveyed to centerline of the pipe to be installed.

2.02 Contractor shall be responsible for pit digging & excavation per OSHA & equipment requirements. All pit locations shall be coordinated with the owner's representative. Pits shall be returned to original conditions after boring site construction & operation is completed. The tracking system will be DigiTrak of Radio detection with a depth Sone (Locating Transmitter) good to 25' deep with a remote transmitter sending readings back to the Driller. The remote transmitter shall be located on the drill allowing the Driller to read the same information the Locator is reading. The Sone in calibrated in the Sone housing to allow the Locator and Driller to read the clock, pitch and depth. Steering adjustment shall be made at every 10 feet. The pilot hole shall be approximately 4" diameter and the final hole will be approximately 12" to 20" diameter. The pilot shall be shot making steering adjustments to maintain a proper bore path and minimize the number of bends or radius put on the pipe. After the pilot is out a reamer or hole opener shall be places on the drill rod to cut the bore hole. This process may be done in multiple steps, first cutting with an 8 inch reamer and then cutting with a 12 inch reamer. The final stage is pulling the pipe into the bore hole. The Bentonite mud used drilling the bore hole fills the annular space around the

PVC/HDPE conduit installed. Contractor to provide in Autocad 2007 format or newer the as built plans accurate within 1 foot in each direction x, y and z.

2.03 A 300 gallon drilling fluid (Mud-Bentonite) mixing system shall be used with a minimum 35 gallon per minute pump to facilitate the drill fluids to the drill. Bentonite shall be used to aid in the cutting of the spoils, help float the spoils out of the cut bore hole, seal the bore hole and facilitate the installation of the pipe. Viscosity shall be adjusted to soil conditions, but shall not exceed a viscosity of 80. Mud containment will be in entry and exit pits. The mud will be pumped to a vacuum truck and then can be placed on-site to dry. The college representative shall designate an area for this material to be spread out for drying on campus.

2.04 PVC pipe shall be Bore Guard PVC pipe with interlocking joints.

2.05 The bentonite – mud mixture shall be mixed with soil at the spoils location to prevent pooling. The spoils location shall be treated to avoid water drainage problems.

2.06 RECOMMENDED EQUIPMENT SPECIFICATIONS

2.07 Pit launched horizontal directional drill:

A. Make: Malcolm/IVE/Vermeer/Ditch Witch

B. Design: Pit launched rail surveyed to grade

C. Power: 27,000 push/pull – 4,000 rotary twist

D. Length: 19 feet

E. Width: 4.5 feet

F. Drill Rod: 10 feet long/2 5/8 inch diameter

G. Pilot Cutting Bit: 4" Jetting eagle claw

H. Reamers: Sabertooth style/Ripper packer (6" to 15" may be required)

I. Pit Diameter: Minimum 20 feet long / 7 feet wide/ 14" to 24" below centerline

2.08 Walk over locator:

A. Type: Radio Detection or Digitrak

B. Sone Transmitter: Minimum 50 deep

C. Grade Readings: .5%

D. Depth Readings: 5% of true depth

E. Remote Box at Drill: Required

2.09 Bentonite mud mixing system

A. Gallon: Minimum 250 gallon tank

B. Pump: 35 gallons per minute

2.10 Vacuum System

A. Vacuum: Minimum 500 gallon

PART 3 - EXECUTION

3.01 Contractor shall visit site and familiarize himself with all existing conditions.

3.02 Contractor shall at bid time, locate all pits for launching boring operations and submit with the bid form, size & locations of all pits.

3.03 Contractor shall provide 6 foot high temporary fencing around any pits per OSHA & VCCCD requirements during boring periods and until pit is filled.

3.04 Contractor shall provide a 3/16"metered pull string in all conduits.

3.05 Contractor shall provide documentation to insure all conduit systems are clean and usable. Contractor shall clean interiors of all conduits and pull a mandrel plug one size smaller than the conduit to proof the installation.

3.06 Contractor to provide conduit plugs on each conduit end. Pull string to connect to plug with each end uniquely labeled as to source & destination.

3.07 Contractor shall extend conduit system into structures unless noted to be stubbed out. Stubbed out conduits shall be capped.

3.08 Contractor to install locator tape in all bored conduit systems.

END OF SECTION

SECTION 26 2450

GROUNDING

PART 1 - GENERAL

1.01 REFERENCES

A. N.E.C.: Article 250 "Grounding".

B. Underwriter's Laboratories (U.L.). Standard A67 - "Grounding and Bonding Equipment". STD 869 - Grounding and Bonding.

C. ITEE - Standards 142 and 241.

1.02 DESCRIPTION OF SYSTEM:

A. A permanent grounding system with methods and materials in accordance with applicable Codes and Standards, able to conduct ground fault currents to the grounded neutral of electrical distribution systems, and limit potential differences between grounding conductors, raceways and enclosures.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's data on grounding systems and accessories.

B. Shop Drawings: Submit layout drawings of grounding systems and accessories including, but not limited to, ground wiring, copper braid and bus, ground rods, and plate electrodes.

1.04 QUALITY ASSURANCE:

A. Installer qualifies with at least 3 years of successful installation experience on projects with electrical grounding experience similar to that required for project.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Handle electrical grounding accessories and components carefully to avoid damage. Store in location that will protect from dirt and weather.

PART 2 - PRODUCTS

2.01 GROUND RODS:

A. Copper clad steel, unless indicated otherwise. Minimum dimension of 5/8" diameter by 8' long or larger if indicated and sectional rods with couplings where lengths

exceeding 12' are specified or indicated, or where added driving depth is required to achieve a specified minimum resistance.

2.02 GROUNDING ELECTRODE:

A. Bare stranded copper, 3/0 AWG unless indicated otherwise, for installation in soil or embedded in concrete and cable with type TW insulation when installed in raceway. Install without splice from connection to connection.

2.03 GROUNDING CONDUCTORS:

A. Type TW insulation, unless specified or indicated otherwise with a continuous green outer insulating jacket for size #6 AWG and smaller and with green tape banding for #4 AWG and larger, marked at each access point (e.g.: Junction boxes, Enclosures).

2.04 CLAMPS AND PRESSURE CONNECTORS:

A. Cast copper, copper alloy, or bronze alloy suitable for use with aluminum and copper. Double bolt type with formed shoe and "U" cable clamp for connection to pipe or conduit; Single bolt type with cable shoe and "U" clamp for connections to flat bar or metal; and double bolt, parallel conductor split clamp type for cable to cable connections.

2.05 WELDED CONNECTIONS:

A. Exothermic process (Cadweld or Thermoweld).

2.06 EQUIPMENT ROOM GROUND TERMINAL BAR:

A. Copper 1/4" X 2-1/2" X 24", unless otherwise indicated. Two rows of holes on 1-1/2" centers for 1/2" bolt, to receive cables from two directions.

PART 3 - EXECUTION

3.01 GENERAL:

A. Ground conductive raceways, cable trays and enclosures for electrical systems wiring. Make ground circuits complete to form permanent conductive paths. Solidly ground each low voltage electrical system unless indicated or specified as ungrounded, or grounded through an impedance of a specified value. Provide bare conductors when in open air or soil and provide 600 volt, green, insulated conductors when in raceway.

3.02 MAIN GROUNDING JUMPER:

A. Install a main grounding jumper between the system neutral and the enclosure ground bus (or directly to enclosure where ground bus is not present) at each location where system grounding is required. Main grounding jumper:

1. Formed bus in switchboards and panelboards.

2. Formed bus or copper cable in transformers not coupled in unitized assembly with distribution equipment.

3.03 GROUND CONNECTIONS:

A. Make grounding electrode connections electrically ahead of any overcurrent or disconnect device or tap connection such that disconnection of neutral load conductors does not interfere with or remove the system ground connection. Use separate lugs on the transformer neutral terminals for neutral and main grounding jumpers when cable is used for transformer connections.

3.04 SEPARATELY DERIVED SYSTEMS:

A. For each separately derived system, grounded or ungrounded, install a grounding electrode conductor between each system enclosure ground bus (or bolted connection to enclosure where ground bus is not present) and a cold water pipe or building structural steel of one (1) inch size or larger near the separately derived system ground connection. Make connections to water pipes or steel accessible for easy inspection. Provide a separate ground conductor for each audio, video, isolated panels and UPS as noted on the plans.

3.05 SERVICE GROUND:

A. For each low voltage service, install a grounding electrode conductor between the system enclosure ground bus and the water service entrance to the building and install bonding jumpers around insulating unions and removable fittings in the water pipe between the grounding electrode conductor connection to the water pipe and the water service entrance.

3.06 GROUNDING ELECTRODE SYSTEM:

A. Install a complete grounding electrode system with interconnecting cables and terminations at the equipment room ground terminal bar. Make connections to the grounding electrode system accessible. Install the following grounding electrode systems:

1. Metal frame of building.

2. Grounding electrode encased by at least two inches of concrete, within and near the bottom of the building foundation or footing of the type specified in

Part 2 - Products, at least 20 feet in length without splice from connection to connection.

3. Connection of other metal piping systems as required by National Electrical Code Article 250.

4. Driven ground rods.

5. Driven steel piles.

6. Connection to water service with bonding jumper around water meter.

3.07 GROUNDING ELECTRODE CONDUCTORS:

A. Install grounding electrode conductor in PVC or other non-conductive, non-metallic enclosure where a raceway system is indicated or necessary for conductor installation. Install grounding electrode conductors without splice from the enclosure ground bus to the connection at the grounding electrode system.

3.08 GROUND RODS:

A. Install a vertical position, full length below grade unless specified otherwise, and with conductor and top of rod 6" minimum below grade. Provide exotheric welds at all connections.

3.09 EQUIPMENT ROOM GROUND TERMINAL BAR:

A. Install in equipment rooms where indicated. Mount bar by anchors and bolts using 1-1/2" long segments of 1/2" rigid conduit as spacer between bar and wall. Use a minimum of two supports, 18" on center. Connect grounding electrode system conductors, system enclosure ground bus, and other indicated electrode systems to the terminal bar. Label permanently all ground conductors as to destination location, e.g. TR1, panel IPS, etcetera.

3.10 EQUIPMENT GROUND:

A. Form the equipment ground circuits with rigid metallic raceways (e.g., EMT, rigid steel conduit) unless indicated otherwise. Make all threaded coupling connections wrench tight. Install bonding jumpers for continuity around fittings and terminations where the conductive raceway is made non-continuous. Where indicated or specified, install ground conductors in raceways to augment the circuits formed by the metallic raceway system. Bond the conductors to boxes or enclosures in which access is possible. Size conductors as specified, indicated, or required by code, whichever is larger. Install grounding bushings and bonding jumpers to enclosures or ground bussing for the following: Service entrance feeder; each location where multiple ring knockouts are damaged during conduit installation; each location where

conduits are stubbed up into floor mounted and each conduit termination at a painted enclosure where paint is not removed before installation of raceway.

3.11 FLEXIBLE RACEWAY GROUNDING:

A. Install a ground conductor inside all flexible raceways (e.g., Flexible steel, liquid tight) regardless of length. Bond the conductor to the enclosure or ground bus in the nearest box or access on either side of the flexible section. Size conductor as specified, indicated, or required by code, whichever is larger.

3.12 NON-CONDUCTIVE RACEWAY:

A. Install a ground conductor in raceways of non-conductive materials. Bond conductor to conductive enclosures in which access is possible. Bond non-current carrying conductive equipment contained in a non-conductive enclosure. Install insulated or bare conductors, sized as specified, indicated, or required by code, whichever is larger.

3.13 SECTIONAL RACEWAY:

A. Install a ground conductor in sectional raceways with removable covers for access (e.g., Plug-in strips, surface raceway systems, and wireways) unless specified otherwise. Size conductor in accordance with the N.E.C. for the largest phase conductor size installed in raceway, or as indicated. Bond sections of the raceway to the ground conductor. Connect receptacle ground terminals in the raceway to the ground conductor, and make other ground connections indicated on the drawings.

3.14 CABLE SUPPORT SYSTEMS:

A. Ground elements of the cable support system to panelboards, cabinets and switchboards from which their circuits originate. Install a ground conductor sized as required by code, as indicated, or #12 AWG, whichever is larger.

3.15 MULTI-CONDUCTOR CABLE, METALLIC SHEATH:

A. Use multi-conductor cable with metallic sheath or armor approved for use as ground circuit conductor or install ground conductor(s). Size ground circuit conductor as required by code, as specified, or as indicated on the drawings, whichever is larger. Terminating devices for cable using the sheath or armor as the ground circuit conductor shall be approved for use as the connecting device between the cable and the enclosure. Terminate internal ground circuit conductors by lug to the interior of the enclosure or to the contained ground bus where present. Use bare or clearly identified internal grounding conductors.

3.16 MULTI-CONDUCTOR CABLE, NON-METALLIC SHEATHED:

A. Use only non-metallic sheathed multi-conductor cables having a ground circuit conductor enclosed in the sheath the same size as the ungrounded conductors. Use bare or clearly identified internal grounding conductors. Terminate ground circuit conductor by lug to the enclosure ground bus where present or to the interior of the enclosure.

3.17 GROUND CONDUCTOR BONDING:

A. Bond grounding conductors to boxes or enclosures at each access point. Do not use building steel as equipment grounding path. Use welded ground connections, at least where such are buried in soil, installed below slabs on grade, or embedded in concrete.

END OF SECTION

SECTION 26 2480

MOTOR STARTING EQUIPMENT AND WIRING

PART 1 - GENERAL

1.01 REFERENCES STANDARDS

A. National Electrical Manufacturer's Association (NEMA). STDS Pub. No. IC2.

B. Underwriter's Laboratories (U.L.). 508 "Electrical Industrial Control Equipment" 845 Installation.

C. American National Standards Institute (ANSI). Pub #MG1 "Motors and Generators."

D. National Electrical Manufacturers Association (NEMA) - ICS 2.3 83 Installation.

E. NFPA -70.

1.02 SUBMITTALS: Shop Drawings (SD) and Operating and Maintenance Manuals (OMM) indicating manufacturer, types, ratings, and accessories for all motor starting equipment used on project.

A. MOTOR INFORMATION: Included with the Operating and Maintenance Manuals for each motor:

Motor Designation

Motor Function

Motor Nameplate Voltage

Motor Nameplate Horsepower

Motor Nameplate Full Load Current

Motor Service Factor

Starter Manufacturer

Starter Heater Number

Heater Current Range

Manufacturer's Table of Heater Numbers with Current Range

1.03 QUALITY ASSURANCE: Installer qualified with at least 3 years of successful installation experience on projects with electrical work similar to that required for this project.

1.04 DELIVERY, STORAGE, AND HANDLING: Handle motor starting equipment accessories and components carefully to avoid damage; store in location to protect from dirt and weather.

PART 2 - PRODUCTS

2.01 MOTOR STARTING SWITCHES: Padlockable toggle type indicating "On", "Off", and "Trip" positions, and when specified in a circuit with an automatic device (e.g., a thermostat, or a "Hand-Off-Auto" selector switch).

2.02 MAGNETIC STARTERS: Unless indicated otherwise, minimum size 1, full voltage types with overload protection in all phases, low voltage release, external manual resets, and NEMA 1 enclosure. Equip each starter with a 120 volt coil, control transformer with fused secondary, auxiliary contacts, (and relay if required) and Hand-Off Automatic switch all sized for devices served.

2.03 COMBINATION MAGNETIC STARTER/SAFETY SWITCHES: Magnetic starters with rejection fuse clips sized for dual element fuses, defeatable cover interlocks, quick-make/quick-break switching mechanisms, and padlockable indicating handles.

2.04 COMBINATION MAGNETIC STARTER/CIRCUIT BREAKERS: Magnetic starters with thermal magnetic trip type circuit breakers having short-circuit interrupting ratings as described in Panelboards -Section 16164, defeatable cover interlocks, and padlockable handles.

2.05 COMBINATION MAGNETIC STARTER/MOTOR CIRCUIT PROTECTORS: Magnetic starters with adjustable magnetic trip type motor circuit protectors having minimum short-circuit interrupting ratings of 18,000 amperes RMS symmetrical, defeatable cover interlocks, and padlockable handles.

2.06 MULTI-SPEED STARTERS: Magnetic starters with time delay relays for controlled deceleration.

2.07 REDUCED VOLTAGE STARTERS: Part winding type reduced voltage magnetic starters unless indicated otherwise.

2.08 MISCELLANEOUS CONTROL CABINETS: NEMA 1 (unless indicated otherwise), U.L. listed, wall-mounted with door, sized as indicated on the drawings, Hoffman Engineering Co., or equal.

A. Enclosure: Manufactured of minimum 16 gauge steel, with grey prime paint.

B. Device mounting panel: Minimum 14 gauge enameled steel.

C. Door Hardware: Latch and continuous hinge. Use three-point latch on doors exceeding 35" in height.

D. Terminal blocks, cover-mounted devices, internal components: Conforming to the requirements (including manufacturer's accepted as listed) of this Section.

2.09 CONTROL DEVICES: Heavy duty, oil tight, single hole mounting, mounted in starter covers unless indicated otherwise.

A. Pilot lights: Indicating motor running with other pilot light colors and quantities as indicated.

B. Pushbutton stations: Labelled "Start", "Stop", and other designations as indicated.

C. Selector switches: Unless indicated otherwise, maintained position type, two position "On-Off" and three position "Hand-Off-Auto" when in a circuit with an automatic device (e.g., a thermostat).

2.10 MOTOR CONTROL CENTER (MCC): With NEMA IB wiring unless indicated otherwise.

A. Vertical Sections: 15" to 20" deep, approximately 90" high, rigid free-standing, joined together forming totally enclosed dead front assemblies.

B. Horizontal Wiring Troughs: Minimum 25 square inches, located at the top and at the bottom, front accessible through separate covers, and continuous through all sections.

C. Vertical Wiring Troughs: Full height with hinged door and cable supports provided for each section.

D. Starters: Compartmentized combination magnetic type, drawout through size #4, with pull-apart terminal blocks.

E. Bussing: Copper with full height vertical bussing through all available space. Provide provisions for future main bus extension.

1. Arrangement: A-B-C front to rear, top to bottom, and left to right then facing the front.

F. Bus Ratings:

1. Horizontal Bus - 600 amps. Vertical Bus - 300 amps.

2. Withstand Rating - 22,000 rms amperes symmetrical.

G. Fully equip unused spaces for future use with all necessary bussing and hardware.

H. Provide a full depth and height barrier between sections of motor control centers arranged in a single line-up when fed from two or more different services or feeders.

2.11 MOTOR STARTER PANELS: Wall mounted panelboards with vertical main bus, chassis mounted combination starters, and NEMA 1 B wiring.

2.12 ACCEPTABLE MANUFACTURERS: Square D or Allen-Bradley; alternate bid Cutler-Hammer; General Electric; Siemens-Allis.

2.13 MOTOR STARTER PANELS (MSP)

A. 600 volt group control centers with provisions for mounting up to four size <1= or size <2= full voltage starters, wiring troughs top and bottom, removable barriers between starter compartments, and approximate dimensions of 32" wide by 26" high by 7" deep.

B. Enclosures wall mounted with bolts, capable of being stacked vertically or lined up horizontally while being interconnected, and capable of conduit entry at top and bottom.

C. Acceptable manufacturers: Square D or Allen Bradley.

PART 3 - EXECUTION

3.01 GENERAL: Provide power connections to motors, controllers, and protective devices including items furnished by other divisions, unless otherwise indicated. Provide correct direction of rotation on motors, and leave equipment in proper working order.

3.02 OVERCURRENT AND OVERLOAD PROTECTION: Provide fuses specified and overload elements sized in accordance with the ambient temperature, the motor nameplate full load amperes, and service factor. Indicate the fuse type, voltage, amperage, and the overload element manufacturer, type, and amperage on adhesive labels attached to the inside of each cover.

3.03 CONTROL WIRING

A. By other Divisions when serving equipment by other Divisions, unless otherwise indicated.

B. Minimum #14 AWG copper; #12 AWG copper for circuits longer than 200 feet, or for 120 volt motors.

C. De-energized by motor disconnect (auxiliary switch, or load side control power transformer) or adjacent lockable control power switch.

D. Neatly grouped, tied, and terminated at labeled terminal strips.

3.04 CONTROL DEVICES: Installed in starter covers, unless indicated otherwise. Flush mount remote devices in finished areas, surface mount remote devices in unfinished areas.

3.05 "HAND-OFF-AUTO" SWITCHES: Bypass the automatic controls and energize the circuit when in the "HAND" position. Install H-O-A switches in series with safety devices, overload relays, smoke detector contacts, freezestats, etc.

3.06 MOUNTING BOARDS: 3/4" exterior grade, primed and painted plywood. Secure equipment to mounting boards on uninsulated exterior walls.

3.07 COORDINATE WITH OTHER WORK: Including motor and electrical wiring/cabling work, as necessary to interface with other work.

3.08 ADJUST AND CLEAN: Inspect operating mechanisms. Make necessary adjustments for free mechanical movement. Touch up scratched or marred surfaces to match original finish.

3.09 FIELD QUALITY CONTROL: Subsequent to final connections, energize motor starters and demonstrate functioning of equipment in accordance with requirements. Where necessary correct malfunctioning units.

END OF SECTION

SECTION 26 2510

LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Lighting fixtures, including lamps, accessories and support materials.

B. Related work:

1. Submittals: Section 01 3300.
2. Outlet and Junction Boxes: Section 26 0130.
3. Supporting Devices: Section 26 0190.
4. Contactors, Relays, Time Switches, Photocontrols, etc.: Section 26 4901.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Fixtures schedule lists one or more acceptable manufacturers for each fixture type.

B. Provide all lighting fixtures of each type from the same manufacturer.

C. Provide sockets for screw base lamps of plated steel, brass or bronze.

D. Lamps Acceptable Manufacturers:

1. General Electric.
2. Phillips.
3. Sylvania.
4. As indicated for specialty lamps.

E. Flexible metal conduit systems connecting individual tandem wired lighting fixtures.

1. Conductors carrying line voltage and current shall be sized in accordance with the overcurrent device protecting the circuit indicated.

2. Provide a #12 AWG minimum size ground conductor.

F. Provide electronic ballasts for all fluorescent and HID fixtures.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide a lighting fixture for each lighting outlet indicated.

B. Provide recessed and semi recessed fixtures with mounting frames compatible with the ceiling and wall systems employed and secure fixture mechanically to frame.

C. Align rows of suspended and surface mounted fluorescent fixtures to form straight lines at uniform elevations.

D. Provide swivel ball type hangers which will allow a minimum of 45 degrees angle for fixtures indicated as pendant mounted.

E. Make recessed fixture fit snugly against ceiling to prevent light leakage.

F. Support suspended and surface mounted LED fixtures as follows:

1. Fixtures not over 12 inches wide and not over 50 inches long, a minimum of two fastenings.

2. Fixtures not over 12 inches wide and over 50 inches long, a minimum of three fastenings.

3. Fixtures over 12 inches wide and not over 50 inches long, a minimum of four fastenings.

G. Support pendant mounted LED fixtures as follows:

1. Single fixtures not over 12 inches wide, a minimum of two single pendants.

2. Single fixtures over 12 inches wide, a minimum of two single pendants at each end or one double pendant at each end.

3. Continuous rows of fixtures not over 12 inches wide, a minimum of one single pendant for each fixture plus one for each row.

4. Continuous rows of fixtures over 12 inches wide, a minimum of two single pendants or one double pendant for each fixture plus one for each row.

5. Locate pendants for continuous row fixtures at each joint and each end of row.

6. Rigidly fasten continuous row fixtures together with fixtures manufacturer supplied joiner.

H. Provide each lighting fixture with the lamps indicated on the fixture schedule.

1. Provide self extinguishing lamps in open bottom or unshielded metal halide fixtures.

I. Clean and relamp existing fixtures to be reused.

J. EMT shall not be used to support suspended fixtures of any type. Suspension shall be by means of standard hangers, where available and applicable, by rigid threaded conduit and fittings, or by rods.

K. Where fixtures are to be mounted on, or suspended from concrete ceiling, provide cast in place inserts.

L. Fixtures shall not be supported by outlet box cover screws alone; provide a fixture stud or "hickey" for added support.

M. Provide a junction box at each exit light fixture indicated.

N. Provide weatherproof boxes and connectors and liquid tight flexible conduit to each light fixture.

O. All suspended fixtures will be installed with 1/8-inch safety cable and four Crosby clamps (two top and two bottom) to be used as a fixture support backup.

END OF SECTION

SECTION 26 4721

AUTOMATIC EMERGENCY VOICE EVACUATION FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This specification document provides the requirements for the Fire Alarm Systems throughout the facility. These systems shall include, but not be limited to, system terminal cabinets, signal power boosters, backboards, terminal strips, devices with termination, wire/cabling, testing and verification and other relevant components. The contractor shall include all costs for devices, wire, cable, panels, installation labor, tests, approvals and as-built documentation. Additionally, the contractor will be required to provide the necessary interfaces (control modules, etc.) to the monitoring system in which audio is incorporated. All conduits for the fire alarm systems and associated wiring shall be included. The fire alarm contractor shall provide "shop" drawing layouts to owner showing device locations mounting heights and conduit size requirements.

1.02 WORK INCLUDED

A. General Requirements:

1. The contractor shall furnish and install an automatic addressable fire amplifier alarm, signal booster panels, Manual Pull Stations, Smoke Detectors, Heat Detectors, system alarm connections, connection to building water flow, tamper and post indicator valves, Alarm Speakers, Alarm Strobes, Alarm Speakers/Strobes, Alarm Mini-Speakers as required by code and as specified herein.

2. Labeling: All system equipment shall be labeled with the manufacturer's name and logotype to assure the integrity of the complete system.

1.03 RELATED WORK DOCUMENTS – REFERENCE APPLICABLE SPEC SECTIONS: 014523, 078413, 029200.

A. Submittals.

B. Coordination

C. Electrical General Requirements

D. Electrical Raceway

E. Electrical Conduit

F. Electrical Outlet and Junction Boxes

G. Electrical Interior Pull boxes and wireways

H. Electrical Grounding systems

I. Fire Alarm Audio Evacuation Systems

J. Mechanical Plans (connections to heating and air conditioning units)

K. Plumbing Plans (sprinkler flow, tamper and Post Indicator Valve locations) 211313

L. Systems Plans (monitoring systems)

M. Electrical Plans

1.04 DESCRIPTION:

A. This section of the specification includes the furnishing, installation, and connection of the microprocessor controlled, intelligent reporting evac/fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of 2016 CBC/CFC NFPA 72 Standards for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

C. The FACP and peripheral initiation devices shall be manufactured 100% by a single manufacturer (or division thereof).

D. The installing company shall employ only factory-trained technicians on site to install and perform the final checkout and to ensure the systems integrity. No "parts & smarts" installation will be acceptable.

1.05 SCOPE

A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

B. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on a two wire Signaling Line Circuit (SLC).

2. Initiation Device Circuits (IDC) shall be a two-wire circuit.

3. Notification Appliance Circuits (NAC) shall be as manufacturers required cabling for speakers, amplifiers and related equipment as required by CBC/CFC 907.

4. Digitized electronic signals shall employ check digits or multiple polling.

5. A single ground or open on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

6. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

7. The Alarm System shall perform the following functions per CBC/CFC 907.5.2.2.2 thru 907.5.2.2.5.

   a. Provide automatic fire alarm detection in all building spaces as dictated by local code requirements.

   b. Provide evacuation signals as dictated by CBC/CFC 907 code requirements.

   c. Provide visible alarms per 907.5.2.3.1 thru 907.5.2.3.4.

   d. Provide exterior alarm notifications per CFC 907.

   e. Perform any added functions as specified or required by local codes or AHJ.

   f. Emergency voice/alarm communications system.

C. Basic System Functional Operation:

1. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

   a. The system alarm LED shall flash.

   b. A local piezo electric signal in the control panel shall sound.

   c. A backlit 80 character LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

d. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.

e. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed and the associated system outputs (alarm Notification appliances and/or relays) shall be activated.

1.06 SUBMITTALS

A. General:

1. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

2. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Software Modifications: Provide per NFPA 72, 7.5.7

1. Provide the services of a factory trained and certified authorized technician to perform all system software programming per NFPA 72, 7.5.7, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modification on site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

3. A copy of the site specific software shall be provided to the client after completion of programming including all passwords. A copy of this program shall be stored on site in non-volatile, non-erasable, non-rewritable memory.

C. Certifications: Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an

authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

D. Owner's designated representative shall approve all equipment submittals.

E. In addition to the General requirements, submit all materials for approval arranged in the same order as Specifications, Individually referenced to Specification paragraph and drawing number Submit number required In Division I plus three (3) copies of A4 material and 2 prints plus one reproducible of drawings in A0, minimum. Submit A4 items bound in volumes and A0 drawings in edgebound sets.

F. Progress Schedule: Include duration and milestones for the following:

1. All submittals specified.

2. Shipment to site.

3. Installation.

4. Field testing.

5. Training.

6. First beneficial use date.

G. Manufacturer's Product Data:

1. List of Materials: For each item, Include:

a. Manufacturer.

b. Model number.

c. Listing: CSFM.

d. Quantity.

2. Manufacturer's Product Data: In sequence of List of Materials, Data sheet for each item, including all accessories, marked for proposed product. Photo copies will not be accepted. Original manufacturer specifications sheets only.

H. Field/Shop Drawings:

1. Resubmit: for coordination reference complete with corrections from previous submittal:

a. List of Materials.

b. Manufacturer's Product Data.

2. Field (installation) Drawings: Collate in sequence:

a. Drawing Index/symbol sheet.

b. Floor plans. At scale of Contract Documents. Show:

(1) Devices with circuit number.

(2) Rough-in.

(3) Mounting height.

(4) Conduit size.

(5) Wire type.

(6) Wire fill.

c. Sections/Elevations. At scale of Contract Documents.

(1) Mounting location reference.

d. Enlarged Plans. At scale of Contract Documents or larger as required for trade coordination. Show:

(1) Refer to "floor plans".

(2) Architectural features.

(3) Clearances.

e. System conduit riser drawing, show:

(1) Terminal cabinets.

(2) Coordination with floor plans.

(3) Wire runs not shown on floor plans.

(4) Wire type.

(5) Wire fill.

f. Mounting details

(1) Stamped and signed by Engineer licensed in jurisdiction for work of this type.

(2) Show loads, strength of connections, etc.

(3) Show calculations - on drawings or in bound volume for review by authorities having jurisdiction.

(4) Provide details for:

(a) Racks/cabinets/panels

g. Installation details as required.

(1) Terminal cabinets: terminations.

h. Wire run sheets (if used) Show:

(1) Wire Number.

(2) Source.

(3) Designation

(4) Signal Type.

(5) Wire type.

(6) Operating level or voltage (if applies).

3. Shop (Fabrication) Drawings: Collate In sequence:

a. Drawing Index/symbol sheet (if separate set from Field Drawings).

b. System functional drawings. Submit separate drawing for each system/subsystem. Show:

(1) Equipment: Function, make, model.

(2) Wire number.

(3) Wire Type.

c. Fabrication details submit for:

(1) Receptacles.

(2) Panels.

(3) Special mounting provisions.

(4) Legends/engraving details. Half or full size:

(a) Receptacles.

(b) Panels.

(c) Equipment.

4. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

5. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

6. Show annunciator layout, configurations, and terminations.

I. Shop and Field Test Reports: Provide per CFC 901.2.1 provisions.

1. Schedule: Submit test reports In timely manner relative to Project schedule such that owner may conduct Verification of submitted Test Data at owner's option, without delay of progress.

a. Shop test report: Submit prior to shipping completed system to project site.

b. Per CFC 901.2.1. Statement of compliance. Before requesting final approval of the installation, where required by the fire code official, the installing contractor shall furnish a written statement to the fire code official that the subject fire protection system has been installed in accordance with approved plans and has been tested in accordance with the manufacturer's specifications and the appropriate installation standard. Any deviations from the design standards shall be noted and copies of the approvals for such deviations shall be attached to the written statem ent.

2. Test Reports: Include:

a. Time and date of test.

b. Personnel conducting test.

c. Test Object.

d. Procedure used.

e. Test equipment, Including serial and date of calibration.

f. Results of test - numerical or graphical presentation.

3. Verification of Submitted Test Data: owner may elect to verify some or all test data submitted. Contractor to provide statement of compliance per CFC 901.2.1 as required when requesting final test. Retest In presence of designated observer(s) at reasonable convenience of owner. Provide technician familiar with work of this Section. Provide all test equipment.

J. Reference Data for Operation, Maintenance and Repair

1. In addition to the requirements of Division 1, submit one (1) additional set. Submit in three post binders (not ring binder) with Tabs.

2. Index.

3. Systems operating Instructions.

4. Reduced set of system Record Drawings.

5. Key schedule.

6. Maintenance and spare parts schedules.

7. Shop and Field Test Reports.

8. Equipment manuals. Collate alphabetically by manufacturer. Provide manufacturer's original operation, Instruction and service manuals for each equipment item. For each set, provide manufacturer's original printed copies only. Photocopies not acceptable.

K. Record Drawings in AutoCAD R2014 format min.

1. Quantity:

a. Review sets: as for Shop and Field Drawings.

b. Record set:

(1) Three (3) blueline.

(2) One CD disk with applicable .DWG files

2. Content: All drawings required under "Field and Shop Drawings". Show "as Installed" condition.

L. Other than Specified Equipment

1. Equipment other than specified shall be considered for approval provided the following is submitted in writing by the contractor to the Consultant ten (3) days before the bid date:

2. Complete lists, descriptions and drawings of materials to be used.

3. A complete list of current drain requirements during normal supervisory conditions, trouble conditions, and alarm conditions

4. Battery standby calculations showing total standby power needed to meet the system requirements as specified

M. Substituted Equipment:

1. If equipment other than that specified is supplied, it shall be the contractor's obligation to submit the appropriate documentation and allow the specifying Consultant sufficient time to consider the equality of the substituted items.

N. Satisfying the Entire Intent of these Specifications

1. 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 Consultant and owner's representative.

2. All costs for removal, relocation, or replacement of a substituted item shall be at the risk of the contractor.

1.07 GUARANTEE/WARRANTY

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.08 POST CONTRACT MAINTENANCE:

A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

B. As part of the submittal, include a quote for a maintenance contract to provide all maintenance, test, and repair described below. Include also a quote of unscheduled maintenance/repair, including hourly rates for technicians trained on this equipment, and response travel costs. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor that shall describe the protocol for preventive maintenance. The schedule shall include:

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.

2. Each circuit in the fire alarm system shall be tested semiannually.

3. Each smoke detector shall be tested in accordance with the requirements of CFC 907.8.B;907.8.4 CSFM & NFPA Standards.

1.09 POST CONTRACT EXPANSIONS:

A. The contractor shall provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable control modules equal (list actual quantity of each type).

C. Quotation shall include installation and test labor and labor to reprogram the system for this 10% expansion. If additional FACP hardware would be required, include the material and labor necessary to install this hardware.

D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include cost of conventional peripherals or the cost of initiating devices or Notification appliances connected to the addressable monitor/control modules.

E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.10 APPLICABLE STANDARDS AND SPECIFICATIONS:

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards.

1. DSA Requirements including all IR documents. and GL2

2. County of Ventura Fire Code

3. All requirements of the Authority Having Jurisdiction (AHJ).

4. CFC

5. NFPA Fire Code

1.11 APPROVALS

A. The system shall have proper listing and/or approval from internationally recognized agencies.

B. The system shall be listed by the international agencies as suitable for extinguishing release applications.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIAL

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the Fire Alarm Code.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

C. All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.02 CONDUIT AND WIRE

A. Conduit:

1. Conduit shall be red & installed in accordance with the DSA & fire marshal requirements.

2. All wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

3. Cable must be separated from any open conductors of Power, or Class circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors.

4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same

conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.

6. Conduit shall be 3/4 inch (19.1 mm) minimum and red in color.

B. Wire:

1. All fire alarm system wiring shall be new.

2. Wiring shall be in accordance with DSA codes and approved by CSFM and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.

3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation.

5. Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. The system shall support up to 1,000 ft. of untwisted, unshielded wire. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.

6. All field wiring shall be completely supervised.

7. The Fire Alarm Control panel shall be capable of T-Tapping two wire type. Signaling Line Circuits (SLC's) Systems, which do not allow or have restrictions in, for example, the amount of T-Taps, length of T-Taps etc., are not acceptable.

8. All wire/cable used in underground or below grade, applications shall be rated by the manufacturer for the intended use and be gel filled.

C. Terminal Boxes, Junction Boxes and Cabinets:

1. All boxes and cabinets shall be DIN listed for their use and purpose.

D. Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

E. The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 16 amperes. This circuit shall be labeled at the Main Power Distribution Panel as FIRE ALARM. Fire Alarm Control Panel Primary Power wiring shall be 12 AWG. The Control Panel Cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.03 MAIN FIRE ALARM CONTROL PANEL

A. The FACP shall be an Edwards EST3 and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, printer, annunciators, and other system controlled devices.

B. System Capacity and General Operation:

1. The control panel shall provide, or be capable of expansion to 2000 intelligent/addressable devices.

2. The system shall include Form-C alarm and trouble relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include four Class B (Style Y) programmable Notification Appliance Circuits.

3. The system shall support programmable driven relays.

4. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.

5. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.

6. The FACP shall provide the following features:

a. Drift Compensation to extend detector accuracy over life.

b. Sensitivity Test

c. Maintenance Alert to warn of excessive smoke detector dirt or dust accumulation.

d. System Status Reports to display or printer.

e. Alarm Verification, with verification counters.

f. PAS presignal.

g. Rapid manual station reporting (under 2 seconds).

h. Non-Alarm points for general (non-fire) control.

i. Periodic Detector Test, conducted automatically by software.

j. Pre-alarm for advanced fire warning.

k. Cross Zoning with the capability of: counting two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.

l. March time and temporal coding options.

m. Walk Test, with check for two detectors set to same address.

n. Security Monitor Points.

o. Control-By-Time for non-fire operations, with holiday schedules.

p. Day/Night automatic adjustment of detector sensitivity.

q. Device Blink Control for sleeping areas.

C. Central Microprocessor:

1. The Microprocessor shall communicate with, monitor, and control all external interfaces with the control panel. It shall include EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.

2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory and shall not be lost even if system primary and secondary power failure occurs.

3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

D. Display:

1. The display shall provide all the controls and indicators used by the system operator and may be used to program all system operational parameters.

2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.

3. The display shall provide an 80-character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide Light-Emitting-Diodes (LEDs), that will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, SIGNAL SILENCED, SUPERVISORY, and PRE-ALARM.

4. The Display shall provide a key touch key-pad with control capability to command all system functions, entry of alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

5. The Display shall include the following operator functions: SIGNAL SILENCE, RESET, DRILL, and ACKNOWLEDGE.

E. Signaling Line Circuit (SLC):

1. The SLC interface shall provide power to and communicate with intelligent detectors (Ionization, Photoelectric, or Thermal) and intelligent modules (monitor or control). This shall be accomplished over a single SLC loop and shall be capable of Style 4 or Style 6 wiring.

2. The loop interface shall receive analog information from all intelligent detectors that shall be processed to determine whether normal, alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

3. The detector software shall meet all local VDE and VdS requirements and be certified by VdS as a calibrated sensitivity test instrument.

4. The detector software shall allow manual or automatic sensitivity adjustment.

F. Serial Interfaces:

1. An EIA-232 interface between the Fire Alarm Control Panel and Listed Electronic Data Processing (EDP) peripherals shall be provided.

2. The EIA-232 interface shall allow the use of printers, CRT monitors, and PC compatible computers.

3. The EIA-232 interface shall include special protocol methods that allow off-site monitoring of the FACP over standard dial-up phone lines. This ancillary capability shall allow remote readout of all status information, including analog values, and shall not interfere with or degrade FACP operations when used. It shall allow remote FACP Acknowledge, Reset, or Signal Silence in this mode. It shall also allow adjustment of detector sensitivity and readout of the history file.

4. An EIA-485 interface shall be available for the serial connection of remote annunciators and LCD displays.

5. The EIA-485 interface may be used for network connection to a Proprietary Receiving Unit.

G. Enclosures:

1. The control panel shall be housed in a DIN listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

2. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.

H. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients, consistent with DIN standards.

I. An optional module shall be available which provides Form-C relays rated at 5.0. The relays shall track programmable software zones.

J. Power Supply:

1. Per CBC/CFC 907.6.2 the primary Power Supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP and shall be a dedicated lock on breaker source.

2. It shall provide 5.0 amps of usable Notification appliance power, using a switching 24 VDC regulator. A 3.0 amp notification expansion power supply shall be available for the demanding requirements visual devices, for a total system capacity of 8 amps.

3. It shall provide a battery charger for 30 hours of standby using dual-rate charging techniques for fast battery recharge.

4. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.

5. It shall be power-limited.

6. It shall provide optional meters to indicate battery voltage and charging current.

K. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.

1. Provide per CFC 604.2.4 on emergency power source with back up power. 24 HR capacity

2. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 30 hour standby.

3. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.

4. The FCPS shall include an attractive surface mount backbox.

5. The Field Charging Power Supply shall include the ability to delay the AC fail delay requirements.

6. The FCPS include power limited circuitry.

L. Field Wiring Terminal Blocks:

1. For ease of service all panel I/O wiring terminal blocks shall be a removable, plug-in type and have sufficient capacity for 18 to 12 AWG wire. Terminal blocks, which are permanently fixed, are not acceptable.

M. Operators Controls:

1. Acknowledge Switch:

a. Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and Trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.

b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

2. Signal Silence Switch: Activation of the Signal silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

3. System Reset Switch: The system reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.

   a. Holding the system RESET switch shall perform a lamp test function.

4. Drill (Evacuate) Switch:

   a. The drill switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

N. Field Programming:

1. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.

2. All programming may be accomplished through the standard FACP keypad.

3. All field defined programs shall be stored in non-volatile memory.

4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.

5. Program edit shall not interfere with normal operation and fire protection. If a fire condition is detected during programming operation, the system shall exit programming and perform fire protection functions as programmed.

6. A special program check function shall be provided to detect common operator errors.

7. An Auto-Program (self-learn) function shall be provided to quickly install initial functions and make the system operational.

8. For flexibility, an off-line programming function, with batch upload/download, shall also be available.

O. Specific System Operations:

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the control panel. Sensitivity range shall be within the allowed window.

2. Alarm Verification: Each intelligent addressable smoke detector in the system shall be independently selected and enabled to be alarm verified. The alarm verification delay shall be programmable from 5 to 30 seconds. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

3. Point Disable: Any device in the system may be enabled or disabled through the system keypad.

4. Point Read: The system shall be able to display or print the following point status diagnostic functions:

   a. Device status.

   b. Device types.

   c. Custom device labels.

   d. View analog detector values.

   e. Device zone assignments.

   f. ll program Parameters.

5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing system status.

6. System History Recording and Reporting: The Fire Alarm Control Panel shall contain a History Buffer that will be capable of storing up to 800 system alarms/troubles/operator actions. Each of these activation's will be stored and time and date stamped with the actual time of the activation. The contents of the History Buffer may be manually reviewed, one event at a time, or printed in its entirety.

a. Although the foreground history buffer may be cleared for user convenience, a background, non-erasable buffer shall be maintained which provides the last 800 system events.

b. The History Buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable.

7. Automatic Detector Maintenance Alert: The Fire Alarm Control Panel shall automatically interrogate each intelligent smoke detector and shall analyze the detector responses over a period of time.

a. If any intelligent smoke detector in the system responds with a reading that is below or above normal limits, then the system will enter the Trouble Mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

8. Pre-alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

9. Software Zones: The FACP shall provide 99 software zones. All addressable devices may be field programmed to be grouped into software zones for control activation and annunciation purposes.

2.04 SYSTEM COMPONENTS

A. Signaling Devices:

1. STROBES shall be UL 1979 listed (as required by Code):

a. Strobes shall be provided as required and indicated on the contract drawings and shall have a flash rate not to exceed 60 times per minute.

b. The word "Fire" shall appear on the lens or lens plate.

c. Strobes shall be a 15cd, 1Hz minimum for restrooms and 75cd, 1Hz for large rooms (i.e., library, multi-use, meeting, etc.).

d. Strobes shall mount to 2 gang box, flush or surface as shown on drawings.

2. SPEAKERS (as required by Code & per CBC/CFC 907.5.2.2 & 907.5.2.2.2):

   a. Alarm Speakers shall be provided as required and as indicated on the contract drawings.

   b. Speakers shall mount to a 4 sq. box. for interior use and a cast weatherproof, gasketed box for exterior use.

   c. Speakers shall be red in color.

   d. Sound pressure level shall be 85dBA at 10 feet

   e. Screw terminals shall be provided for field connections.

   f. Unit may be configured with optional Strobe for interior Horn/Strobe applications.

3. SPEAKER/STROBES (as required by Code):

   a. Speaker/Strobe combination units shall be supplied as required and as indicated on the contract drawings.

   b. Strobes shall not to exceed 60 flashes per minute.

   c. The word "Fire" shall appear on the lens or lens plate.

   d. Strobes shall be a 15cd, 1Hz minimum restrooms and 75cd, 1Hz for large rooms (i.e., library, multi-use)

   e. Wiring for Strobes shall be separate from Speaker Circuits. Strobes shall mount to face of Speaker unit.

   f. Wiring for Speakers shall be separate from Strobe Circuits. Horns shall mount to a 4 sq. box. for interior use.

   g. Speakers shall be red in color.

   h. Sound pressure level shall be 85dBA at 10 feet

   i. Screw terminals shall be provided for field connections.

4. MINI-SPEAKERS (as required by Code):

   a. Mini-Speaker units shall be supplied as required and as indicated on the contract drawings.

   b. Speakers shall mount to a single gang or double gang box for interior use.

c. Mini-Speakers shall be red in color.

d. Sound pressure level shall be 90dBA at 10 feet

e. Screw terminals shall be provided for field connections.

B. Addressable Devices – General:

1. Addressable Devices shall provide an address-setting means using rotary decimal switches.

2. Addressable Devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches. Devices, which use a binary address setting method, such as a dip switch, are not an allowable substitute.

3. Detectors shall be intelligent and addressable, and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuits.

4. Addressable smoke and thermal detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.

5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall be automatically adjusted by the panel on a time-of-day basis.

6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by DIN, VDE and/or VdS as meeting the calibrated sensitivity test requirements.

7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. An optional base shall be available with a built-in (local) sounder rated at 85 DBA minimum.

8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

C. Addressable Pull Box (manual station as required by Code):

1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.

D. Intelligent Photoelectric Smoke Detector where noted on plans and as required per 907.2.24.3:

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

E. Intelligent Thermal Detectors:

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

F. Intelligent Duct Smoke Detector:

1. The in-duct smoke detector housing shall accommodate an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.

2. When sufficient smoke is sensed in the duct, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

G. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLC loops, per NFPA 72 Chapter 21 the emergency control functional interface (21.2.4) shall be located within 3 feet of sensor.

2. The monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.

3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch x 1-1/4 inch x 1/2 inch. This version need not include Style D or an LED.

H. Two Wire Detector Monitor Module:

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).

2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.

3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

I. Addressable Control Module:

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.

2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.

3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised listed remote power supply.

5. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

J. Waterflow Indicators:

1. Flow switches shall be integral, mechanical, non-coded, non-accumulative retard type.

2. Flow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30 Ä 45 seconds.

3. Flow switches shall be located a minimum of one (1) foot from a fitting that changes the direction of the flow and a minimum of three (3) feet from a valve.

K. Sprinkler and Standpipe Valve Supervisory Switches:

1. Each sprinkler system water supply control valve riser or zone control valve, and each standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.

2. Each Post Indicator Valve (PIV) or main gate valve shall be equipped with a supervisory switch.

3. Mount switch so as not to interfere with the normal operation of the valveand adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

4. The mechanism shall be contained in a weatherproof aluminum housing that shall provide a 3/4 inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.

5. Switch housing to be finished in red baked enamel.

6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.

7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

L. LCD Alphanumeric Display Annunciator:

1. The alphanumeric display annunciator shall be a supervised, back-lit LCD display containing a minimum of forty (40) characters for alarm annunciation in clear English text.

2. The LCD annunciator shall display all alarm and trouble conditions in the system.

3. Up to 32 LCD annunciators may be connected to an EIA 485 interface. LCD annunciators shall not reduce the annunciation or point capacity of the system. Each LCD shall include vital system wide functions such as, System Acknowledge, Silence and Reset.

4. LCD display annunciators shall mimic the main control panel 80 character display and shall not require special programming.

5. The LCD annunciator shall have switches that may be programmed for System control such as, Global Acknowledge, Global Signal Silence and Global System Reset. These switch inputs shall be capable of being disabled permanently or by a key lockout function on the front plate.

2.05 BATTERIES:

A. Shall be 12 volt, Gell-Cell type (two required) and per NFPA 72, 10.6.10.1.1 shall be noted 2017 November manufacturer date stamp.

B. Battery shall have sufficient capacity to power the fire alarm system for not less than thirty hours (30) plus thirty minutes (30) of alarm upon a normal AC power failure.

C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in accordance with the VDE, DIN, EN, VdS Standards, along with local codes, as shown on the drawings, and as recommended by the equipment manufacturer.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

PART 4 - GUARANTEE AND TEST

4.01 GENERAL

A. The contractor shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for one year from the date of final acceptance by consultant.

B. Acceptance shall consist of the following:

1. Per CFC 901.2.1. Statement of compliance. Before requesting final approval of the installation, where required by the fire code official, the installing contractor shall furnish a written statement to the fire code official that the subject fire protection system has been installed in accordance with approved plans and has been tested in accordance with the manufacturer's specifications and the appropriate installation standard. Any deviations from the design standards shall be noted and copies of the approvals for such deviations shall be attached to the written statement.

2. Burn-in period.

   a. The system shall be accepted for start of warranty upon successful completion and testing of AHJ and Consultant.

   b. Burn-In period shall be a 30 day time frame to allow the system to operate free of defects, grounds, programming faults, etc.

   c. The 30 day Burn-In shall begin the day of acceptance by AHJ.

   d. The Burn-In period shall be 30 days of continuous use without system trouble, false alarm, open, short or ground condition present.

   e. Should the system fail for any reason during the burn-in period, the contractor shall respond immediately upon notification by owner's personnel and correct said deficiencies.

   f. Upon correction and restoration, the "Burn-In" period shall be re-set to "0" and the 30 day count shall begin again.

   g. Start of Warranty shall commence upon day 31 of successful "Burn-In" period.

4.02 FINAL TEST (as applicable for project devices)

A. Per CFC 901.2.1. Statement of compliance. Before requesting final approval of the installation, where required by the fire code official, the installing contractor shall furnish a written statement to the fire code official that the subject fire protection system has been installed in accordance with approved plans and has been tested in accordance with the manufacturer's specifications and the appropriate installation standard. Any deviations from the design standards shall be noted and copies of the approvals for such deviations shall be attached to the written statement.

B. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with VDE, VdS and DIN Standards.

C. Part of burn in period to be done prior to final test complete items 1 thru 11.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

3. Verify activation of all flow switches.

4. Open initiating device circuits and verify that the trouble signal actuates.

5. Open and short signaling line circuits and verify that the trouble signal actuates.

6. Open and short Notification Appliance Circuits and verify that trouble signal actuates.

7. Ground all circuits and verify response of trouble signals.

8. Check presence and audibility of tone at all alarm notification devices.

9. Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.

10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

11. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures.

This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

D. Before the installation shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows:

1. The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, the inspector of record (IOR) and the fire department shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel.

2. Audibility tests shall be performed utilizing a calibrated Decibel Meter. The system shall be capable of supplying 15dB over ambient noise levels. Tests shall be conducted in the presence of the Consultant and AHJ at selected locations by Consultant/AHJ. Prior to acceptance, testing the contractor shall have verified signal levels in each area as to meeting the above criteria.

3. Where application of heat would destroy any detector, it may be manually activated.

4. The initiation circuits and the indicating appliance circuits shall be opened in at least two (2) locations per zone to check for the presence of correct supervisory circuitry.

5. When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the fire department.

6. The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance and successful burn in period.

7. Prior to final test, the fire department must be notified in accordance with local requirements.

8. Submit completed Certification form. The form shall be submitted in type written format. Hand written forms will not be accepted.

4.03 AS-BUILT DRAWINGS, TESTING, AND MAINTENANCE INSTRUCTIONS

A. Per CFC 901.5.2; 901.6.2.1, a complete set of reproducible "as-built" drawings in AutoCAD R2015 format (CDs and sheets) showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system acceptance. Records to be retained a minimum of 5 years on premises per Title 19.

B. Operating and Instruction Manuals:

1. Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to the owner upon completion.

2. The owner shall be furnished with all programming disks for each installation as well as hard copy printouts. Provide necessary training and/or schooling to designated owner personnel at no additional cost to owner. Training shall be at the owner's designated location, by factory trained personnel. Provide all necessary interconnection cables for remote programming via "laptop" computer.

C. Testing Frequency Instructions:

1. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble-shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to the owner upon completion of the system.

D. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

1. Instruction on replacing any components of the system, including internal parts.

2. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions

3. 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.

4. User operating instructions, shall be provided prominently displayed on a separate sheet located next to the control unit.

5. Administrative staff of the school shall be thoroughly instructed in the use of system by authorized distributor. Such service shall be provided in conjunction with the Fire Alarm equipment.

6. Staff of the Park as well as owner maintenance staff shall be thoroughly instructed in the use of the System. Training shall include a minimum of three (1) hour sessions, to be scheduled at the Owner's designated time.

7. Maintenance instruction shall be performed in the same manner as described above. Training shall include a minimum of three (1) hour sessions, to be scheduled at the owner's designated time.

END OF SECTION

SECTION 26 4745

NETWORKING & DATA COMMUNICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. SCOPE

1. This section outlines the requirements for the Local Area Networks system switches, system hubs, networking modules (transceivers) and connectivity at the MC/MDF and at the various IC/IDF's throughout the owner's facility.

2. Administrative Network

a. The Administrative Network distribution components will be located in telecom room MDF and in various communications rooms throughout the facility. The system is connected via CAT 5e or 6e cabling to various server and workstation locations throughout the building.

b. Administrative Network nodes are located throughout the building.

c. These are fed by fiber optic cabling to the MDF and distributed locally via UTP CAT 6 (as noted on the plans) cabling infrastructure. The Administrative Network will be a Fast-EtherNet design providing switched 100Mbit speed to various workgroups in the facility.

d. The contractor will be responsible to install, program, test and document the system as installed, verifying throughput rates.

e. The contractor will be required to work in close coordination with the owner's information systems director and staff.

1.02 WORK INCLUDED

A. Furnish and install all required system switches, system hubs, system 100/1000BASE-T modules, transceivers, patch cables and accessories for a complete system.

B. The installation shall include interconnect/patching equipment (fiber and copper), jumpers (optical fiber and twisted-pair copper), hub & switch equipment, optical fiber transceivers, routers, asynchronous controllers, optical fiber transceivers, and any other equipment enumerated within. In addition to material and equipment,

contractor shall provide labor and any incidental material required for installation. All active equipment shall be installed and connected to the cable system.

C. Configuration, programming and testing of the local area networks.

D. New local area network locations are listed on the drawings.

1.03 RELATED DOCUMENTS

A. SECTION 260000 - GENERAL ELECTRICAL CONDITIONS;

B. SECTION 264750 - CABLING & DISTRIBUTION SYSTEMS

1.04 FUNCTIONAL REQUIREMENTS

A. Transmission Media. The example LAN will use both twisted-pair and fiber optic cable plant to provide connectivity between user workstations located in offices and network resources located in the facility computer room(s).

B. Host/Server Access. The network will allow users to access all host/server resources, including future application servers, such as additional database servers. There should be full compatibility with existing initiatives (e.g., a new financial system, security system, and telephone and employee services database repository).

C. Outside Communications. The network will need to support future access to external networks through routers. These communications will use the Transport Control Protocol/Internet Protocol (TCP/IP) protocol.

D. Environment/Facility Considerations. The network architecture design must take into account existing space, power, and heat constraints.

E. Flexible Architecture. The design must have sufficient flexibility to permit grouping users into distinct "workgroups" for office automation services. Physical features, such as a layered distribution scheme, redundant patching, and real-time configuration and topology modifications, will be included in the design. The overall transition strategy should minimize downtime and denial of service.

F. Office Automation Services. The network will support a broad range of office automation services for DOS, Windows, and Macintosh workstations. The following services will be provided:

1. File storage and retrieval;

2. Network printing;

3. Support of commercial off-the-shelf (COTS) desktop applications (in the DOS, Windows and Macintosh environments), including electronic mail and calendaring; and fax services.

1.05 OPERATIONAL REQUIREMENTS

A. Network Management. The design will contain methods and tools for the efficient management and control of the network. The capability to monitor and manageboth network traffic and physical components of the network will be provided.

B. Fault Recovery. The design will include contingency or back-up plans should any element of the network fail.

1.06 PERFORMANCE REQUIREMENTS

A. Network Response. The servers and other components of the network must be sized to avoid unacceptable start-up delays when workstations are first activated, long login times, and slow response during normal network utilization (e.g., application startup and exit, file retrieval and save operations). Response times for network desktop applications should not be significantly greater than stand-alone usage.

B. Network Availability. The users must be able to access the network 24 hours a day, seven days a week unless specifically made unavailable at organization discretion(e.g., for administrative or maintenance activities).

1.07 NETWORK CAPACITY: Individual components of the network will be sized as indicated below:

A. The cable plant -- The cable plant will provide for approximately 150 cable drops distributed throughout the offices and facility.

B. User workstations -- Initially, service will be provided for approximately 50 local users. However, when fully operational, the network will be capable of supporting approximately 150+ local users (150+ Windows-based PCs and servers).

C. Intelligent hub equipment -- All hub equipment will be sized to support all ports plus 25% spare ports for growth.

1.08 REFERENCES AND STANDARDS INCORPORATED

A. Published specifications, standards, tests or recommended methods of trade, industry or government organizations apply to work of this section where cited by abbreviation noted below:

1. EIA Electrical Industries Association

2. IEEE Institution of Electrical and Electronics Engineers
3. ISO International Standards Organization
4. ITU International Telecommunications Union
5. CCITT Consultative Committee of International Telegraph and Telephone
6. ANSI American National Standards Institute
7. TIA Telecommunications Industry Association
8. ASTM American Society for Testing and Materials
9. NEC National Electric Code
10. FCC Federal Communications Commission
11. CEA Insulated Cable Engineers Association, Inc.
12. IEC International Electrotechnical Commission
13. NEMA National Electrical Manufacturers Association
14. UL Underwriters' Laboratories, Inc.
15. IPC The Institute for Interconnecting and Packaging Electronic Circuits
16. NFPA National Fire Protection Association
17. BICSI Building Industry Consulting Service International

B. Nothing in the drawings, details, or specifications shall be construed to permit work not conforming to applicable laws, ordinances, rules, or regulations and standard industry IEEE 802 Ethernet standards.

C. It is not the intent of the drawings, details, or specifications to repeat requirements of codes except where necessary for completeness or clarity.

1.09 SUBMITTALS

A. Submit manufacturer's data literature for each item used describing each product, including specification, installation instructions and general recommendations.

B. Submit manufacture's data literature on system hubs, switches, 100/1000BASE-T modules, 100/1000BASE-FB modules, 100/1000Base2 modules, power supplies and accessories.

C. As per section 260000 - General drawings, submittals and shop drawings.

D. In addition to the requirements of Division 1, submit all materials for approval, arranged in same order as specifications, individually referenced to specification paragraph and drawing number. Submit number required in Division 1 plus three (3) copies of 8 1/2" x 11" material and 2 prints and one reproducible of drawings in 24" X 26" size, minimum. Submit 8 1/2" x 11" items bound in volumes and 24" X 36" drawings in edgebound sets.

E. Progress Schedule: Include duration and milestones for the following:

1. All submittals specified.
2. Completion of equipment buyout.
3. Completion of equipment receipt at fabrication shop.
4. Shop fabrication.
5. Shop testing.
6. Shipment to site.
7. Installation.
8. Field testing.
9. Training.
10. First use date.

F. Manufacturer's Product Data:

1. List of Materials: For each item include:
   a. Manufacturer.
   b. Model number.
   c. Listing: UL, City Lab or none.
   d. Quantity.
2. Manufacturer's Product Data: In sequence of list of materials, data sheet for each item, including all accessories, marked for proposed product.

G. Field and Shop Drawings:

1. Resubmit: for coordination reference complete with corrections from previous submittal:

a. List of Materials.

b. Manufacturer's Product Data.

2. Field (installation) Drawings: collate in sequence:

a. Drawing index/symbol sheet.

b. Floor plans. At scale of contract documents. Show:

(1) Devices with circuit number.

(2) Rough-in.

(3) Mounting height.

(4) Conduit size.

(5) Wire type.

(6) Wire fill.

c. Sections/Elevations. At scale of contract documents.

(1) Mounting Location Reference

d. Enlarged Plans. At scale of contract documents or larger as required for trade coordination. Show:

(1) Refer to floor plans.

(2) Architectural features.

(3) Rack cabinets.

(4) System furniture.

(5) Clearances.

e. System conduit riser drawing, show:

(1) Terminal cabinets.

(2) Coordination with floor plans.

(3) Wire runs not shown on floor plans.

(4) Wire type.

(5) Wire fill.

f. Mounting details

(1) Stamped and signed by engineer licensed in jurisdiction for work of this type.

(2) Show loads, strength of connections, etc.

(3) Show calculations - on drawings or in bound volume forreview by authorities having jurisdiction.

(4) Provide details for:

(a) Racks.

(5) Installation details as required.

(6) Terminal cabinets: terminations.

g. Wire run sheets (if used) show:

(1) Wire number.

(2) Source.

(3) Designation.

(4) Signal type.

(5) Wire type.

(6) Operating level or voltage (if applies).

h. Shop and Field Test Reports

3. Schedule: Submit test reports in timely manner relative to project schedule such that owner may conduct verification of submitted test data at owner's option, without delay of progress.

a. Shop test report: Submit prior to shipping completed system to project site.

b. Field test report: Submit following system completion and prior to and as condition precedent to owner's acceptance of the work of this section.

4. Test Reports: Include:

a. Time and date of test.

b. Personnel conducting test.

c. Test object.

d. Procedure used.

e. Test equipment, including serial and date of calibration.

f. Results of test - numerical or graphical presentation.

5. Verification of submitted test data: Owner may elect to verify some or all test data submitted. Retest in presence of designated observer(s) at reasonable convenience of owner. Provide technician familiar with work of this section. Provide all test equipment.

H. Reference Data for Operation, Maintenance and Repair

1. In addition to the requirements of Division 1, submit 3 sets. Submit in three post binders (not ring binder) with tabs.

a. Index.

b. Systems operating instructions.

c. Reduced set of system record drawings.

d. Key schedule.

e. Maintenance and spare pans schedules.

f. Shop and Field Test Reports.

g. Equipment manuals. Collate alphabetically by manufacturer. Provide manufacturer's original operation, instruction and service manuals for each equipment item. For each set, provide manufacturer's original printed copies only. Photocopies not acceptable.

I. Record Drawings in AutoCAD R2010 format

1. Quantity:

a. Review sets: as for shop and field drawings.

b. Record set:

(1) Three (3) bluelines.

(2) One CD with applicable .DWG files as full scale

c. Content: All drawings required under "Field and Shop Drawings". Show as installed condition.

PART 2 - PRODUCTS

2.01 GENERAL

A. Quality of Products: Material and equipment specified herein have been selected as the basis of acceptable and desired quality of performance and have been coordinated to function as components of the specified system. Where a particular material, device, piece of equipment of system is specified directly, the current manufacturer's specification for the same shall be considered to be part of these specifications, as if completely contained herein in every detail. Each material, device, or piece of equipment provided hereunder shall comply with all of the manufacturer's published specifications for that item.

B. Quantity: Provide quantity as shown on contract drawings, the schedule or as otherwise defined herein.

C. Preference: Owner desires system to be furnished and installed as specified herein.

D. Substitutions: Comply with SECTION 16010 -GENERAL CONDITIONS.

E. Provide complete: Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the work of this section at, if specified in full herein.

F. Provide new: All materials provided under the work of this section shall be new, shall be the manufacturer's latest design/model, and shall be permanently labeled with the manufacturer's name, model number and serial number.

G. Similar: Similar devices shall be of the same manufacturer, unless specifically noted otherwise in these specifications.

H. Continuous Use: All active circuitry shall be solid state and shall be rated for continuous use. All circuit components shall be operated in full compliance with the manufacturer's recommendations and shall contain sufficient permanent identification to facilitate replacement.

2.02 MANUFACTURERS

A. NETWORKING HARDWARE

1. System design is based on products as manufactured by Cisco, 3Com or BayNetworks Substitutions must be pre-approved according to Sectin 16010 and general conditions.

B. SYSTEM SPECIFICATIONS

1. LOCAL AREA NETWORK

a. The Local Area Network shall be based on and support IEEE802.3 functional standards for EtherNet Local Area Networking. This shall include IEEE 802.3 100/1000BASE-T and 100/1000BASE-T for station microcomputers, and IEEE 802.3 100/1000BASE-F or 100/1000BASE-F (FIORL) synchronous technology for fiber optic repeater interconnection.

b. The main distribution frame (MDF) and all intermediate distribution frames (IDF's) shall support one EtherNet segment per network.

c. System shall be sufficient to support use at full capacity without user-perceptible delays in network response time.

d. System shall be sufficient to support any combination of system features at full capacity. System shall allow reconfiguration of backbone to allow Customer maximum flexibility and implementation of options in case of need when future services are identified and added.

C. LAN CONFIGURATION

1. System hubs are required in DESIGNATED zones so that every data drop on site can be serviced by a hub.

2. Each system hub shall allow for growth, without the need to add an additional hubs to 125% of the current data drop count for the area of the campus that it serves even though all those drops will not be connected at initial installation.

3. Each designated location shall utilize a system hub as per the specification.

4. Each hub location shall utilize fiber optic transceiver module for connection to the fiber optic backbone or horizontal distribution (where fiber is utilized as the backbone or horizontal media).

5. Each hub location shall utilize 100/1000BASE-T(RJ45), 100/1000BASE-T (RJ45), unshielded twisted pair ports for connection to the UTP CAT 6 LAN cable plant or 100/1000BASE-2 ports for connection to the ThinLAN cable plant. The quantity of initially installed 100/1000BASE-T/100/1000BASE-2 ports shall be per the needs indicated and requirements of this specification and contract drawings.

6. The initially active 100/1000BASE-T, 100/1000BASE-T locations shall be connected to the system Hubs via CAT 6 UTP patch cords and patch panels. If Telco style 100/1000BASE-T modules are utilized in the system

Hub then CAT 6, Telco-to RJ45 patch panels shall be installed with the appropriate cable to the hub for full connectivity.

2.03 MATERIALS AND EQUIPMENT

A. SYSTEM HUBS

1. The Local Area Network shall be created from a family of intelligent, or "smart," switches, hubs and related products. The product family shall consist of various hubs; numerous plug-in EtherNet, FDDI, and internetworking modules for these hubs, and network management software. These products shall enable the customer to create a large-scale facility network that is flexible, reliable, and manageable.

2. The System shall have port switching technology that shall offer remote network configuration and management capabilities.

3. The System's network management shall support network analysis, identify specific network problems, and correct or self-heal problems dynamically. The system's network management shall not be a passive traffic monitoring tool.

4. System hubs shall have the following parameters and features:

   a. Modular Multi-Media Chassis.

   b. Supports SNMP Based Network Management System.

   c. Supports Inband and Out of Band Network Management.

5. Specific EtherNet features required:

   a. Supports Shielded/Unshielded Twisted Pair, Coax, AUI & Synchronous Fiber.

   b. Supports Internal EtherNet Terminal Servers for TCP/IP.

   c. Supports Fiber Links Up to 2.0 Kilometers.

6. System hub shall be provided in 12, 24, or 48 port versions. The system hub shall be able to be mounted in a rack and installed from the front.

7. Transceiver slots for connection of twisted pair 100/1000Base-T, Thin LAN or fiber optic FIORL.

8. The unit shall include and Intel I960 RISC-based processor, 1 Mbytes of RAM and 256Kbytes of flash EEPROM.

9. Complete workgroup security including: intruder prevention, auto port disabling, network management alarm, leaves drop prevention, authorized managers list and password protection.

10. Provisions for added SNMP management module.

11. Intelligent error monitoring, intelligent segmentation recovery, auto-segmentation, fault isolation and integrity.

12. Support for SNMP/IP and IPX multi-vendor management with SNMP browsers.

13. The unit shall be UL rated and meet FCC Part 15 Class A emissionsstandards.

14. The unit shall be provided with a lifetime limited, 5 year on site warranty.

15. The system hub must be capable of implementation to include all of the following features:

    a. A single-port FOIRL module shall be available to provide FOIRL-based EtherNet connections through the system hub. The module shall comply with the IEEE FOIRL and 100/1000BASE-FL and 100/1000BASE-FL standards which ensures interoperability with other vendors' FOIRL-compliant devices. In addition, users in a FOIRL environment shall be able to take advantage of the system hub benefits such as multi-channel architecture, port redundancy, and fault tolerance.

    b. The FOIRL module shall achieve point-to-point connections longer than the 1 kilometer specified by the IEEE FOIRL specification by use of high power optics.

    c. A FOIRL transceiver shall be available to link a network station to EtherNet 100/1000BASE-FL LANs using fiber-optic cable. The FOIRL transceiver shall attach directly to the AUI port on the network station eliminating the need for an AUI cable.

        (1) The FOIRL transceiver shall comply with the IEEE 802.3 100/1000BASE-FL draft standard and offers low-light level detection for error-free transmission.

16. An EtherNet transceiver module shall be available to provide AUI connectivity to the system hubs.

17. An EtherNet BNC module shall be available to provide a single connection to thin-wire EtherNet segments up to 185 meters in length.

a. The BNC module shall be fully compliant with the IEEE 100/1000BASE-2 standard. All thin wire segments shall be able to be terminated either internally or externally.

B. Approved Suppliers

1. The following vendors have been pre-approved to supply product under this contract:

a. Cisco

b. 3Com

c. Bay Networks

d. Others submit in accordance with substitution requirements.

PART 3 - EXECUTION

3.01 GENERAL

A. Provide installation logs supporting building infrastructure.

B. Configure and cross connect all ports as required for complete end to end system.

3.02 DRAWING DETAILS (Shop Drawings)

A. Show wall elevation and wire details on shop drawings. Show equipment function, make and model and wire routing and terminations within rack or cabinet.

B. Show as-built location of all devices on shop drawings.

C. Provide 3 sets of bound operation and maintenance manuals, including submittal materials, and record of field changes. Provide complete as-built wiring diagrams in AutoCAD2000 format. Provide CD files and original tracings (E size) in format of construction drawings. Input all cabling information into ACS system and provide a detailed printed report with as-builts.

3.03 QUALITY CONTROL

A. Evidence of Experience and Qualifications

1. Show that the contractor who will perform the work has a minimum of 5 years experience successfully installing system of the same type and design as specified herein. Include the names, locations, and points of contact of at least two similar installations of the same type and design as

specified herein where the installer has installed such systems. Indicate the type of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 12 months.

2. Show that the instructor, who will train staff, operating and maintenance personnel, has received a minimum of a CNE/MCE training from a factory training center, and 2 years experience in the installation of systems of the type specified. Submit training certification in equipment submittals, title section training and certifications.

3.04 TESTING

A. GENERAL

1. Testing shall be performed in the presence of the owner.

a. Testing shall include verification of:

(1) Server operation and configuration

(2) NOS installation, configuration and operation

(3) HUB insulation and operation

(4) Cable Plant

2. All test equipment shall bear current calibration stickers or dated certificates.

3. Printed test results along with as-built drawings shall be assembled into a 3 ring project binder and delivered to the consultant for verification and final acceptance prior to start of warranty.

3.05 COMMISSIONING

A. General

1. The contractor shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for one year from the date of final acceptance by owner.

2. Acceptance shall consist of the following:

a. Burn-in period.

(1) The system shall be accepted for start of warranty upon successful completion and testing of the system.

(2) Burn-in period shall be a 30 day time frame to allow the system to operate free of defects, grounds, programming faults, etcetera.

(3) The 30-day burn-in shall begin the day of acceptance by owner.

(4) The burn-in period shall be 30 days of continuous use without system trouble, false alarm, open, short or ground condition present.

(5) Should the system fail for any reason during the burn-in period, the contractor shall respond immediately upon notification by owner's personnel and correct said deficiencies.

(6) Upon correction and restoration, the burn-in period shall be re-set to "0" and the 30 day count shall begin again.

(7) Warranty shall commence upon day 31 of successful burn-in period.

b. Final Test

(1) Before the installation shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows:

(a) The contractor's job foreman, in the presence of a representative of the manufacturer, and a representative of the owner shall operate every network device to ensure proper operation and correct configuration at the file server location.

(b) When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner.

(c) The contractor shall leave the data network system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance by the consultant.

B. As Built Drawings, Testing, and Maintenance Instructions

1. A complete set of reproducible as-built drawings in AutoCAD R2000 format (CDs and sheets) showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific

interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system acceptance.

2. Operating and Instruction Manuals

   a. Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to the owner upon completion.

   b. Provide necessary training and/or schooling to designated owner personnel at no additional cost to owner. Training shall be on site.

C. Testing Frequency Instructions

1. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble-shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to the owner upon completion of the system.

2. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

   a. Instructions on replacing any components of the system, including internal parts.

   b. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions

   c. 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.

   d. User operating instructions shall be provided, prominently displayed on a separate sheet located next to the control.

END OF SECTION

SECTION 26 4750

CABLING AND DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide a complete, tested, Cable Distribution system for Data Processing and Networking systems (local area network), Telecommunications (voice), Audio (paging), Entry Access Control and Monitoring (security) and Closed Circuit Video Surveillance systems (CCTV) as follows:

1. The data distribution system shall include fully terminated fiber optic backbone and CAT-6 STP station cables and specialty data distribution cables and terminations as shown in the contract drawings. All fiber optic trunk cabling will be installed into utility conduit loops around the park in fiber inner-duct. Station cabling will be installed in conduits and office furniture provided by others. This work includes all backbone, horizontal distribution, station cabling and specialty stations/horizontal distribution cabling for the Administration, Point of Sale, Audio, Security, Irrigation and CCTV systems. The contractor shall be responsible to provide and install all cabling, wiring, cabinets, racks, data frames, cable tray, wire management, power distribution, blank panels, structural bracing, inner ducting, termination panels (fiber and UTP), complete testing and certification, along with all as built documentation as set for in these specifications.

2. The voice distribution shall include fully terminated multi pair trunk cablingand CAT-6 STP station cabling along with specialty outdoor cabling and terminations for food carts and retail carts as indicated on the contract drawings. Contractor shall be responsible to provide and install all cabling, wire management, backboards, equipment cabinets, ladder racking, station cabling, specialty cabling, boxes, outlet terminations, splicing (as needed). All voice cabling underground shall use a rated OSP cable. All above ground cabling in conduit may use a CMP rated cable. Conduits and pathways will be installed by others and will be in place prior to the start of wire/cable installation. Complete testing and certification, along with all as built documentation as set for in these specifications.

3. The entry access control and monitoring will utilize a segment of the fiber optic backbone, feeding terminal controllers and I/O boards (FBO) monitoring various security and equipment functions throughout the project. Distribution cabling from controllers and I/O boards are copper cables (coordinate requirements with security contractor) which will

provide monitoring to point sensors, motion sensors, equipment, fire protection systems and alarm monitoring. Cabling will be installed into existing underground and above ground conduits. The contractor will be required to provide and install all cabling, terminations, connections, wire management and incidentals for a complete cabled system. Cabling underground shall utilize an OSP rated cable. Cabling above ground shall use a CMP or CL2 or plenum/tray rated cable depending on the application. Complete testing and certification, along with all as built documentation as set for in these specifications.

4. Fiber Optic Riser Cables: Individual 6-fiber, 8-fiber, 12-fiber, 18-fiber, 24-fiber or 48-fiber optical cables shall be installed from the termination enclosure in the new IT Room to fiber optic termination enclosures in each new DATA IC Communications Closets at each cluster attraction area as shown on the plans.

B. Provide system design services (development of specific details consistent with the contract documents) as required to complete shop drawings for data cable systems including detailed documentation for owner's review and detailed documentation of as-built conditions.

C. Data concentrators, local area network controllers, and data terminal equipment will be furnished by others under separate contract. The contractor shall coordinate with other system vendors where appropriate to facilitate equipment backboard installation, scheduling, protection of equipment, and access to the project site in order to provide owner a complete project in a timely manner.

D. The successful cabling contractor shall attend a mandatory pre-construction meeting with individuals deemed necessary by owner prior to the start of work.

E. Raceway Systems Specifications required for voice, data, audio, video systems cables may be found in Electrical Specifications.

F. The successful bidder will not be determined by price alone, but by a rating system to include a combination of price, qualifications, training procedures and proposed documentation package.

G. All unused conduits or interducts shall have metered pull strings.

1.02 DESIGN

A. Floor Plans: Furnish floor plans for review showing outlet locations with an indication of outlet type and proposed label. Floor plans shall be coordinated with architectural and electrical power plans and shall be produced at the same scale as the contract documents (see part 1.4, Submittals).

B. Terminal Elevations: Furnish details showing terminal block and backboard elevations including all cable terminals, spaces for equipment, equipment racks,

and station cable routing. Communications equipment closets (intermediate distribution frames - MC) shall be arranged to maximize the utility and growth potential available in spaces shown on the floor plans. Terminal elevations shall be based on detail elevations included in the contract documents and shall show additional detail as indicated herein.

C. Outlet Locations: Provide as shown.

D. Terminal Schedules: Furnish terminal outlet schedules showing terminal block position for all station cabling. Terminal outlet schedules shall show proposed labels for all 4-pair STP horizontal cables at station outlets along with patch or 110 frame locations.

1.03 LOCAL AREA NETWORK (overview, electronics FBO – REFERENCE ONLY)

A. The Local Area Network shall be based on and support IEEE 802.3 functional standards for Ethernet Local Area Networking. This shall include IEEE 802.3 10/100BASE-T for station microcomputers, and IEEE 802.3 10/100BASE-FX(FIORL) synchronous technology for fiber optic repeater interconnection.

B. The main distribution frame (MDF) and all intermediate distribution frames (IDF's) shall support up to 12 Ethernet segments (Administrative Network, POS, Security, Audio, Irrigation and Lighting).

C. System Switches (FBO) shall be sufficient to support use at full capacity without the need to add Switch chassis. System shall be sufficient to support use at full capacity without user-perceptible delays in network response time.

D. System shall be sufficient to support any combination of system features at full capacity. System shall allow reconfiguration of backbone to allow Customer maximum flexibility and implementation of options in case of need when future services are identified and added.

E. LAN CONFIGURATION

1. Each building or group of buildings supports an IDF that is a switch location. System Switches are required in DESIGNATED locations so that a switch can service every data drop.

2. Each system switch shall allow for growth, without the need to add an additional switch, to 150% of the current data drop count for the area that it serves even though all those drops will not be connected at initial installation.

3. Each designated location shall utilize a system switch as per the specification.

4. Each switch location shall utilize Fiber Optic-Transceiver module for connection to the Fiber Optic backbone (where fiber is utilized as the backbone media).

5. Each switch location shall utilize, 10/100BASE-T (RJ45) shielded twisted pair ports for connection to the UTP Category 5 LAN cable plant. The quantity of initially installed 100BASE-T ports shall be per the needs indicated and requirements of this specification.

6. The initially active 10/100BASE-T locations shall be connected to the system switches via Category 5 STP patch cords and patch panels.

1.04 SUBMITTALS

A. Project Initiation: Within fourteen (14) days of Notice to proceed, the Low Voltage Contractor shall furnish the following in a single consolidated submittal:

1. The name of the person who will act as the low voltage Contractor's official contact with the Contractor/Consultant.

2. Electrical Permits. The Contractor shall obtain all required permits and provide copies to Consultant.

3. Complete manufacturer's product literature for all cable, cross-connect blocks, cable supports, cable labels, outlet devices and other products to be used in the installation. In addition, whenever substitutions for recommended products are made (pre-approved prior to bid by Consultant), samples and the manufacturer's supporting documentation demonstrating compatibility with other related products should be included.

4. A time sealed Construction Schedule using PERT/CPM indicating general project deadlines and specific dates relating to the installation of the cable distribution system. At a minimum, this Construction Schedule shall include the following milestones:

   a. Start of Communications space construction.

   b. Start of Fiber Optic cable terminations.

   c. Start of 4- pair STP and related termination hardware station cable installation.

   d. Start of Level 5e or 6e STP and Fiber Optic backbone cable testing.

   e. Start of Audio Cabling and related termination hardware and testing.

f. Start of Security and CCTV Cabling and related hardware and testing.

g. Final inspection.

B. Shop Drawings (within twenty-eight (28) days of notice to proceed).

1.05 SUBMITTALS

A. In addition to the requirements of Division 1, submit all materials for approval arranged in same order as Specifications, individually referenced to Specification paragraph and drawing number. Submit number required in Division 1 plus three (3) copies of 8 1/2" x 11" material and 2 prints plus one reproducible of drawings in 30" x 42" size, minimum. Submit 8 1/2" x 11" items bound in volumes and 30" x 42" drawings in edge-bound sets.

B. Progress Schedule: Include duration and milestones for the following:

1. All submittals specified.

2. Completion of equipment buyout.

3. Completion of equipment receipt at fabrication shop.

4. Shop fabrication.

5. Shop testing.

6. Shipment to site.

7. Installation.

8. Field testing.

9. Training.

10. First event date.

C. Manufacturer's Product Data:

1. List of Materials: For each item, include:

a. Manufacturer.

b. Model number.

c. Listing: UL, City Lab or none.

d. Quantity.

2. Manufacturer's Product Data: in sequence of List of Materials, Data sheet for each item, including all accessories, marked for proposed product.

D. Field and Shop Drawings:

1. Resubmit: for coordination reference complete with corrections from previous submittal.

a. List of Materials.

b. Manufacturer's Product Data.

2. Field (installation) Drawings: Collate in sequence:

a. Drawing index/symbol sheet.

b. Floor plans. At scale of Contract Documents. Show:

(1) Devices with circuit number.

(2) Rough-in.

(3) Mounting height.

(4) Conduit size.

(5) Wire type.

(6) Wire fill.

c. Sections/Elevations. At scale of Contract Documents.

(1) Mounting Location Reference

d. Enlarged Plans. At scale of Contract Documents or larger as required for trade coordination. Show:

(1) Refer to 'floor plans".

(2) Architectural features.

(3) Rack cabinets.

(4) System furniture.

(5) Clearances.

e. System conduit riser drawing, show:

(1) Terminal cabinets.

(2) Coordination with floor plans.

(3) Wire runs not shown on floor plans.

(4) Wire type.

(5) Wire fill.

f. Mounting details

(1) Stamped and signed by consultant licensed in jurisdiction for work of this type.

(2) Show loads, strength of connections, etc.

(3) Show calculations - on drawings or in bound volume for review by authorities having jurisdiction.

(4) Provide details for:

(a) Racks.

(b) Ladder racking

(c) Mounting/attachment

g. Installation details as required.

(1) Terminal cabinets: terminations.

h. Wire run sheets (if used) Show:

(1) Wire Number.

(2) Source.

(3) Designation.

(4) Signal Type.

(5) Wire type.

(6) Operating level or voltage (if applies).

3. Shop (Fabrication) Drawings: Collate in sequence:

a. Drawing Index/symbol sheet (if separate set from Field Drawings).

b. System functional drawings. Submit separate drawing for each system/subsystem. Show:

(1) Equipment: Function, make, model.

(2) Wire number.

(3) Wire Type.

(4) Shield condition at both ends (float, ground, location of ground).

(5) Connector wiring details, each type.

(6) Audio: Polarity, operating level.

(7) Provide drawings for the following systems:

(a) Control.

(b) Audio.

(c) Coordinated grounding scheme.

c. Equipment rack elevations. All racks scaled at one-inch equals one foot (1" = 1' 0"), or larger. Show:

(1) Power strip: receptacles, circuiting.

d. Rack wiring drawings for, each rack:

(1) Power strip: receptacles, circuiting.

(2) Equipment.

(3) Grounding.

(4) Wiring, all systems.

(5) Wiring harness scheme.

e. Fabrication details submit for:

(1) Receptacles.

(2) Panels.

(3) Special mounting provisions.

(4) Custom enclosures, indicate:

(a) Construction and bracing

(5) Legends/engraving details. Half or full size:

(a) Receptacles.

(b) Panels.

(c) Equipment.

(6) Jackfield, terminations and cross connect details, Front elevation, full size.

(a) Layout.

(b) Text of designations.

E. Samples: Samples for approval by owner

1. Of all finishes/materials which will be visible to the public, including:

a. Receptacles and controls with associated trim plate

b. Each type of information outlet, faceplate, etc.

2. For other items, provide at least two of each as a sample.

F. Shop and Field Test Reports

1. Schedule: Submit test reports in timely manner relative to project schedule such that owner may conduct verification of submitted test data at owner's option, without delay of progress.

a. Shop test report: Submit prior to shipping completed system to project site.

b. Field test report: Submit following system completion and prior to and as condition precedent to owner's acceptance of the work of this section.

2. Test Reports: include:

a. Time and date of test.

b. Personnel conducting test.

c. Test Object.

d. Procedure used.

e. Test equipment, including serial and date of calibration.

f. Results of test - numerical or graphical presentation.

3. Verification of Submitted Test Data: owner may elect to verify some or all test data submitted. Retest in presence of designated observer(s) at reasonable convenience of owner. Provide technician familiar with work of this section. Provide all test equipment.

G. Reference Data for Operation, Maintenance and Repair

1. In addition to the requirements of Division 1, submit one (1) additional set.

2. Submit in three post binders (not ring binder) with tabs.

3. Index.

4. Systems operating instructions.

5. Reduced set of system Record Drawings.

6. Key schedule.

7. Maintenance and spare pans schedules.

8. Shop and Field Test Reports.

9. Equipment manuals. Collate alphabetically by manufacturer. Provide manufacturer's original operation, instruction and service manuals for each equipment item. For each set, provide manufacturer's original printed copies only. Photocopies not acceptable.

H. Record Drawings in AutoCAD R2000 format

1. Quantity:

   a. Review sets: as for Shop and Field Drawings.

   b. Record set:

      (1) Three (3) bluelines.

      (2) One (1) mylar.

      (3) CD with applicable .dwg files

2. Format: Record Set.

   a. Pencil, permanent ink or permanent photographic process.

   b. Front face only of Mylar at least 3.0 mils thick.

   c. Appliqué film or lettering prohibited.

   d. Suitable for microfilming.

3. Content: All drawings required under "Field and Shop Drawings". Show "as installed" condition.

I. Shop Drawings. The contractor shall submit scaled drawings of all IC/MC backboard layouts showing hardware 110 frame placements prior to new installations. The name of the building, room #, title of room IC/MC, shall be included. The contractor must show dimensions for LAN network equipment backboard space. Coordinate with owner/consultant on any backboard discrepancies.

J. Proposed Contractor Category 5e or 6e STP, and fiber optic cable test result forms.

K. As a condition for project acceptance, the contractor shall submit the following for review and approval:

1. Complete manufacturer's product literature and samples (if requested) for all pre-approved substitutions to the recommended products made during the course of the Project.

2. An exceptions list of deviations (in materials, construction and workmanship) from those specified in this section and shown on the Project Drawings. Owner will review this list and declare each item as either an approved exception, or as one the contractor must correct.

3. Inspection and Test Reports: During the course of the project the contractor shall maintain an adequate inspection system and shall perform such inspections to insure that the materials supplied and the work performed conform to contract requirements. The contractor shall provide written documentation, which indicates materials acceptance testing was conducted as outlined in Part 3 below. The contractor shall also provide documentation, which indicates that all cable termination testing was completed and that all irregularities were corrected prior to job completion for owner/consultant analysis.

1.06 SYSTEM INSTALLATION REQUIREMENTS

A. System installer must have a BICSI RCDD on staff. Copy of certification must be submitted at time of bid.

B. The data cable system installer shall be a firm normally employed in the low voltage cabling industry with a reference list of five (5) projects and contact names to confirm successful Category 5e or 6e STP and Fiber Optic cable plant projects.

C. Owner reserves the right to exercise its discretion to require the Contractor to remove from the project any such employee of owner's to be deemed incompetent, careless or insubordinate.

D. A fifteen (15) year manufacturer warranty shall be provided by the selected low voltage installer. This warranty shall include defects in material and workmanship. The warranty period shall begin at the date of owner's acceptance of the work. Quality and workmanship evaluation shall be made solely by owner/consultant and designated representatives.

E. The selected low voltage installer must be licensed and bonded.

F. All clean up activity related to work performed will be the responsibility of the Low Voltage Communication Contractor and must be completed daily before leaving the facility.

1.07 REGULATORY REQUIREMENTS

A. All work shall be performed in accordance with the latest revisions of the following standards and codes:

1. Uniform International Conference of Building Officials

2. Building Code (ICBO); Regional Office

3. BICSI

B. Other References:

1. TIA/EIA- 569 Commercial Building Standard for Telecommunication

2. Pathways and Spaces.

3. TIA/EIA-568-A Commercial Building Wiring Standard

4. EIA-455-171-D Standard Test Procedures for Fiber Optic Cables

5. TIA/EIA-4750000-B Generic Specification for Fiber Optic Connectors

6. TIA/EIA-475E000 Sectional Specification for Fiber Optic Connectors Type

7. BFOC/2.5

8. TIA/EIA-604-X Fiber Optic Connector Intermateability Standards (FOCIS)

9. Leviton Telcom Category Compliant Design Criteria dated 1995 or Later

10. Leviton Telcom CCS Installation Training dated 1995 or later

C. Governing Codes and Conflicts: If the requirements of this section or the Project Drawings exceed those of the governing codes and regulations, then the

requirements of this section and the Drawings shall be construed to permit work not conforming with all governing codes and regulations.

1.08 ABBREVIATIONS and DEFINITIONS

A. MC - Main Cross-connect often co-located in the building Entrance Facility (E) and/or Equipment Room (ER) and consisting of riser cable terminals, utility service cable terminals, PBX terminals, and various other equipment.

B. IC - Intermediate Cross-connect usually residing in a Telecommunications

C. Closet (TC) and consisting of station wire terminals, riser cable terminals, and various equipment. Used to connect the first and second level backbone cables in a two-tier star wiring topology.

D. HC - Horizontal Cross-connect usually residing in a telecommunications closet and consisting of station wire terminals, riser cable terminals, and various equipment. Used to connect the first or second level backbone cables to the horizontal or work area cables.

E. PBX - Private Branch Exchange, a telephone switch.

F. PDS - Premises Distribution System, a common term used for the cable, terminals, and miscellaneous equipment comprising telephone and data transmission systems.

G. STP - Shielded Twisted Pair (telecommunications/data station cables)

PART 2 - PRODUCTS

2.01 GENERAL WIRING

A. The inside/outside wiring plant shall be installed per requirements of these specifications utilizing materials meeting all applicable TIA/EIA standards.

B. Materials shall be as listed or shall be equivalent products of other manufacturers meeting the intent and quality level of the TIA/EIA568 specification. In some cases specific materials are called out to maintain a uniformity of application across all installations. The Contractor shall maintain the same material uniformity for all buildings.

C. All installed wire shall be tested and labeled 100% good after installation by the installer.

D. All products shall be new, and brought to the job site in original manufacturer's packaging. Electrical components (including innerduct) shall bear the Underwriter's Laboratories label. All communications cable shall bear flammability testing ratings as follows:

1. Communications Cable.

2. Plenum rated Communications Cable.

3. Riser rated Communications Cable.

E. Initial Cable Inspection: The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of proper gauge, containing the correct number of pairs, etc. Note any buckling of the jacket, which would indicate possible problems. Damaged cable, or any other components failing to meet specifications shall not be used in the installation.

F. Quantity: Provide quantity as shown on Contract Drawings, the Schedule or as otherwise defined herein.

G. Preference: Owner desires system to be furnished and installed as specified herein.

H. Substitutions: Comply with GENERAL CONDITIONS.

I. Provide Complete: Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the Work of this Section at, if specified in full herein.

J. Provide New: All materials provided under the Work of this Section shall be new, shall be the manufacturer's latest design / model, and shall be permanently labeled with the manufacturer's name, model number and serial number.

K. Similar: Similar devices shall be of the same manufacturer, unless specifically noted otherwise in these specifications.

L. Continuous Use: All active circuitry shall be solid state and shall be rated for continuous use. All circuit components shall be operated in full compliance with the manufacturer's recommendations and shall contain sufficient permanent identification to facilitate replacement.

M. CABLE PLANT REQUIREMENTS

1. The cable plant shall be a star configured, unshielded twisted pair system capable of supporting data rates of 1Ghz.

2. The drop cable shall run from intermediate wiring closets (IDF's) to each office, work station, attraction, food service and retail location as well as other miscellaneous locations as shown on the prints.

3. The trunk fiber optic cable shall run between the main distribution frame (MDF) and each switch (IDF) location as indicated on the project drawings.

4. The cable plant shall meet EIA/TIA-568 "Commercial Building Telecommunications Wiring Standard" and the maximum length of any STP data drop shall NOT exceed 100 meters including patch cables and future jumper cables at each information outlet location.

5. Every switch location shall have one 24 strand multi-mode/single (12mm, 12sm) mode hybrid fiber optic cable (dedicated) from the MDF for LAN service, UON.

N. CABLE PLANT SUPPLIERS

1. The wire provided for all voice trunk runs shall be UTP Category 5e cable UON (OSP rated for below grade use)

   a. Recommended suppliers: Berk-Tek, Essex, Belden, Lucent, Avaya.

2. The wire provided for all data and voice outlets shall be one four pair STP Category 5e or 6e cable per jack, UON (OSP rated for below grade use).

   a. Recommended suppliers: Berk-Tek, Essex, Belden, Lucent

3. The wire provided for all security monitoring sensors shall be 2 pair #22 for point sensors and 4 pair #22 plus 1 pair #20 for powered motion sensors.

   a. Recommended suppliers: West Penn, Belden, Atlas, Mohawk

4. The wire provided for all security camera locations shall be RG58/U coaxial cable with 100% shield or fiber optic cabling. power cabling for cameras shall be #18 Ga. min. cabled constriction. All cabling below grade shall be rated for the application.

   a. Recommended suppliers: West Penn, Belden, Atlas, Mohawk

2.02 CABLING SPECIFICATION

A. STATION WIRING-DATA

1. The wire provided for all data outlets shall be one 4-pair STP Category 5e cable per jack, UON.

   a. The Category 5e or 6e, 4-pair UTP cable, must be Performance Level Tested. Each 1000' spool must be individually tested with test results affixed.

B. DROP CABLE SPECIFICATION

1. All data drop cabling shall be EIA/TIA 568, 569 and TSB-36 Category 6 certified.

2. All data drop cabling shall be 4-pair shielded twisted pair, PVC rated (OSP rated for underground use), Category 6e certified cable. Untwisted cable shall not be used. This includes even short pieces of flat cable for jumpers, etc.

3. All data drop cabling shall also be guaranteed by the cable manufacturer to support data rates to 1Ghz. The bidder must include in writing in the form of press release, newsletter, or cut sheet verification of cable capabilities.

C. STATION WIRING- VOICE

1. The wire provided for all voice outlets shall be one 4-pair STP Category 6e cable per jack, UON.

   a. The Category 6e, 4-pair UTP cable, must be Performance Level Tested. Each 1000' spool must be individually tested with test results affixed.

2. DROP CABLE SPECIFICATION

   a. All voice drop cabling shall be EIA/TIA 568, 569 and TSB-36 Category 6e certified.

   b. All voice drop cabling shall be 4-pair shielded twisted pair, PVC rated (OSP rated for underground use), Category 6e certified cable. Untwisted cable shall not be used. This includes even short pieces of flat cable for jumpers, etc.

   c. All voice drop cabling shall be 24 AWG shielded twisted pair cable. All cabling for a single copper conductor shall have a maximum DC resistance of 28.6 ohms per 1000 feet at 20 degrees Celsius. All cabling shall have a maximum DC resistance unbalanced of 5 percent. All cabling will have a maximum mutual capacitance of a pair of 17 picofarads per foot. All cabling shall have a maximum pair-to-ground capacitance unbalanced of 1000 picofarads per 1000 feet.

   d. All voice drop cabling shall have an impedance (ohms) of the following values:

0.064	125±15%
0.128	115±15%
0.256	110±15%
722 kHz	102 + 15%
1.0-100.0 MHz	100 + 15%

e. All voice drop cabling shall have a maximum attenuation (dB per 1000 feet at 20 degrees Celsius) of the following values:

1.0 MHz	2.0
4.0 MHz	4.1
8.0 MHz	5.8
10.0 MHz	6.5
16.0 MHz	8.2
20.0 MHz	9.3
25.0 MHz	10.4
31.25 MHz	11.7
62.5 MHz	17.0
100.0 MHz	22.0
155.0 MHz	28.1
200.0 MHz	32.4
310.0 MHz	41.8
350.0 MHz	44.9

f. All voice drop cabling shall have a minimum Near-End Crosstalk coupling loss for any pair combination at 20 degrees Celsius shall be greater than the value determined by using the following formula for all frequencies in the range of:

0.772 MHz to 100MHz for a length of 1000 feet:
NEXT (F) > NEXT (0.772) - 15 log (F/O.772)

g. All voice drop cabling shall also be guaranteed by the cable manufacturer to support data rates to 350Mhz. The bidder must include in writing in the form of press release, newsletter, or cut sheet verification of cable capabilities.

h. Provide components consistent with the quality of KRONE part number TN5ETR-BLRB (blue) or approved equal, UL Subject 444, (UL)-C(UL) Type MPR/CMR/CMG, ICEA S-90-661, NEC 800 Type CMR TIA/EIA-568-A Cat 5 Horizontal Cable Requirements, ISO/IEC 11801 Category 5, TIA/EIA-568-A-5 Cat 5e Enhanced Horizontal Cable Requirements certified.

2.03 STATION HARDWARE-DATA

A. Flush mount jacks shall be high quality Category 6e, 8-position modular jack with twisted lead-frame construction and 110 style terminations terminated with a high impact 110 termination tool. Jacks shall provide dual color code to allow both T568A and T568B wiring on the same jack, and shall provide a cutting ledge to automatically trim wires during termination. Jacks shall meet TIA/EIA-568-A requirements for Category 6e connecting hardware as manufactured by KRONE or Avaya.

B. Faceplates shall match manufacturer for 8-position modular jack outlets at all locations.

C. All data connecting hardware shall be EIA/TIA TSB-40 Category 6e certified.

D. All data connecting hardware shall be modular jack panels with RJ45 jacks on the front and 110 style insulation displacement connectors (IDC) for termination of drop cable on the back.

E. All modular jacks shall be eight position jacks with pin/pair assignments utilizing EIA/TIA T568B.

F. All modular jacks shall be made continuous to the B-pin modular jack via a printed wiring board interconnection.

G. The connecting blocks shall be KRONE IDC style or approved equal.

H. The outlets faceplates shall be KRONE or approved equal in 4-6-8 port configurations. Supply 1 - 8 conductor modular data jacks and cables as a minimum per location.

2.04 STATION HARDWARE-VOICE

A. Flush mount jacks shall be high quality Category 6e, 8-position modular jack with twisted leadframe construction and 110 style terminations terminated with a high impact 110 termination tool. Jacks shall provide dual color code to allow both T568A and T568B wiring on the same jack, and shall provide a cutting ledge to automatically trim wires during termination. Jacks shall meet TIA/EIA-568-A requirements for Category 6e connecting hardware as manufactured by KRONE.

B. Faceplates shall match manufacturer for 8-position modular jack outlets at all locations.

C. All voice connecting hardware shall be EIA/TIA TSB-40 Category 6e certified.

D. All wiring voice connecting hardware shall be modular jack panels with RJ45 jacks on the front and 110 style insulation displacement connectors (IDC) for termination of drop cable on the back.

E. All modular jacks shall be eight position jacks with pin/pair assignments utilizing EIA/TIA T568B.

F. All modular jacks shall have a maximum attenuation corresponding with the table below. They shall approximate value of an equivalent of a 2 meter cable of the same category or any pair within a connector of the following values:

1.0Mhz	0.1
4.0	0.1
8.0	0.1
10.0	0.1
16	0.2
20	0.2
25	0.2
31.25	0.2
62.5	0.3
100	0.4

G. All modular jacks shall have a maximum NEXT corresponding with the table below:

1.0Mhz	>65
4.0	>65
8.0	62
10.0	60
16	56
20	54
25	52
31.25	50
62.5	44
100	40

H. The connecting blocks shall be KRONE IDC style or approved equal.

I. The outlets faceplates shall be KRONE or approved equal in 4-6-8 port configurations. Supply 1 - 8 conductor modular data jacks and cables as a minimum per location.

2.05 MC(MDF) /IC (IDF) /HC STATIoN TERMINATION HARDWARE-data & VOICE

A. Patch Panels

1. Category 6e STP Termination Hardware. The Category 5e data station cable shall be terminated on Category 5e STP, 8-position modular jack patchpanels with circuit board construction in all IC/MC locations. The panels will have rolled upper and lower edges for rigidity and will provide front and rear side labeling visible after the cables and cords are installed. The 8-position modular jack patch panels shall be either wall mounted or rack mounted with cable management panels per communication detail sheets. The contractor is responsible for all wall brackets, patch panels, and cable management panels for all IC/MC/HC layouts and equipment rack configurations.

2. Products: Category 5e STP patch panels (T568B wired, TIA/EIA-568).

3. Cable management brackets must be provided at each rear section of the patch panel to facilitate cable routing and maintain proper bend radius of cables leading to the termination point.

   a. Recommended Product: Krone

4. Cord or Patch Cable Manager: The cord manager shall have five (5) rings and provide the capability to organize and contain up to forty-eight (48) patch cords on the front of the panel. The front of the panel shall provide five (5) high capacity 1.5" x 4" horizontal distribution rings to reduce stress on stored cables to retain optimal cable geometry. All distribution rings shall have radiused edges to protect cables from nicks and tears. The cable manager shall be a minimum of two (2) RU high, and shall fit a standard 19" EIA rack rails.

5. Provide patch panels as required to terminate all indicated station outlets as shown on the project drawings.

6. Patch panels shall be provided at all EER locations indicated.

7. Supply patch panels in rack mount versions with a minimum of 24-32\ports.

8. The patch panels shall exhibit the following minimum characteristics:

   a. EIA 19" rack mountable

   b. 110 rear termination

   c. Modular jacks are circuit board mounted

   d. supports 568A and 568 wiring

   e. removable front labels

   f. requires 3.0" rack space. min.

9. The patch panel shall meet TSB-40 standards.

10. Supply patch panel with full compliment of CAT-6e data patch cables. CAT-6e patch cables shall be configured as follows:

    a. Color: Yellow

    b. 24,36,48,60 & 72" in length

    c. RJ45 each end with strain relief boots

    d. stranded copper wire

11. Acceptable vendors for patch panels which are pre-approved for this project are:

    a. KRONE

2.06 MC(MDF) /IC (IDF) /HC TERMINATION HARDWARE-VOICE TRUNK CABLING

A. Main Cross Connect Base

1. The cross-connect shall provide Category 5e compliant 110 termination capable of supporting voice, security, and Category 5e data applications, including high megabit and shared-sheath applications when used with Power Sum rated cabling. The 110 panels shall mount to walls or backboards in a mounting-frame style unit, which provides additional cable access and horizontal cord management. The units shall be UL listed, CSA certified, TIA/EIA-568-A and Category 5e compliant, and made in the USA. The mounting frames shall support up to three 100-pair wiring bases, with the capability to accept extension units to create higher densities of up to 900 pairs per tower. The mounting frames shall be made of 16 gauge steel; wiring bases and blocks shall be made of fire-retardant plastic rated UL 94V-0, with provision for TIA/EIA-606 compliant labeling. A one-year limited product warranty and a 15-year performance guarantee shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

B. Main Cross Connect Extension

1. The cross-connect shall provide Category 5e compliant 110 termination capable of supporting voice, security, and Category 5e data applications, including high megabit and shared-sheath applications when used with Power Sum rated cabling. The 110 panels shall mount to walls or backboards in a mounting-frame style unit, which provides additional cable access and horizontal cord management. The units shall be UL listed, CSA certified, TIA/EIA-568-A and Category 5e compliant, and made in the USA. The mounting frames shall support up to three 100-pair wiring bases, with the capability to accept extension units to create higher densities of up to 900 pairs per tower. The mounting frames shall be made of 16 gauge steel; wiring bases and blocks shall be made of fire-retardant plastic rated UL 94V-0, with provision for TIA/EIA-606 compliant labeling. A one-year limited product warranty and a 15-year performance guarantee shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

C. 100 Pair IDC 110 Terminations

1. The cross-connect shall provide Category 5e compliant 110 termination capable of supporting voice, security, and Category 5e data applications, including high megabit and shared-sheath applications when used with Power Sum rated cabling. The 110 panels shall mount to 19" distribution frame or hinged wall mount bracket. They shall be UL listed, CSA certified, TIA/EIA-568-A and Category 5e compliant, and made in the USA. Panels shall support 100, 200 or 300 pair densities with provision for TIA/EIA-606 compliant labeling, and be made of 16 gauge steel, with bases and blocks made of fire-retardant plastic rated UL 94V-0. A one-year limited product warranty and a 15-year performance guarantee shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

D. Horizontal Cord Manager

1. The horizontal 110 cord managers shall mount to a wall or backboard, or onto 300 pair mounting-frame basic or extension units, providing the capability to organize and contain patch cords between rack mount 110 wiring bases. The cord managers shall comply with TIA/EIA-568-A and -606 requirements, and be made of fire-retardant plastic rated UL 94V-0. A one-year limited product warranty and a 15-year performance guarantee shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

E. 110 Connector Blocks

1. The 110 connector blocks shall support termination for voice, security, and Category 5 data applications, including high megabit and shared-sheath applications when used with Power Sum rated cabling. The blocks shall be Category 5 compliant, UL listed, CSA certified, and TIA/EIA-568-A compliant. They shall be made of fire-retardant UL 94V 0 plastic with solder-plated insulation displacement connectors, and must securely seat wires on 110 wiring bases, providing a gas-tight IDC connection that can withstand 200 reterminations. A one-year limited product warranty and a 15-year performance guarantee shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

F. 110 Patch Cords and Plug Assemblies

1. Provide 110 Patch Cord and Plug Assemblies and patching cables as needed to cross connect all cabled stations/ports in system. Supply compliment of various length cables to cross connect as required.

2. Provide spares as follows:

   a. 10 - 36"

   b. 10 - 48"

   c. 10 - 60"

   d. 10 - 72"

   e. 10 - 84"

2.07 DATA DISTRIBUTION EQUIPMENT RACK

A. Provide equipment racks and/or frames in locations indicated on the drawings. Racks shall be equipped as detailed on the drawings and as hereafter specified.

B. MC/IC/HC locations provide IMRAK 7' tall equipment racks (or as indicated), or equivalent.

C. FREE STANDING CABINETS:

1. Provide 19" or 24" EIA floor mount cabinets with bracing brackets and floor mounting accessories as required to support cabling infrastructure with 19" EIA patch panels, data switches and light interface guides along with ancillary equipment.

2. Provide IMRAK 1400 or ZERO XA series as manufactured by VERO ELECTRONICS or pre-approved equal.

3. The cabinet shall incorporate a Plexiglas, locking front door assembly and solid rear door with lock.

4. Provide with required horizontal and vertical cable management for all racks/cabinets, panels and hardware as required to facilitate complete installation.

D. Jumper Management Panels

1. The rack mount hardware shall incorporate in-rack and interbay jumper management techniques. One or both methods may be used as required. In-rack management panels shall be available to provide jumper storage and routing to the connector housings and electronic switches. Additionally, in-rack panels are required for installations where interbay storage methods are not feasible (i.e. already installed lineup where footprints are already specified). Interbay storage is recommended for large slack storage requirements and multiple out of bay patching.

2. In-Rack jumper management panels shall be available in 1-RMS, 2-RMS and 3-RMS sizes and shall have removable front covers to conceal and protect the jumpers when installation is complete. The front of the jumper management panel cover shall be flush with the front door of the connector housing.

3. Jumper management panels shall be designed to maintain a 1.5 inch minimum bend radius when transitioning between routing panels and frame verticals or connector housings and shall be finished with a wrinkled black powder coat for durability. All fasteners shall be black chromated to match the housing.

4. The vertical jumper routing area shall have vertically adjustable cable retaining rings. The adjustable routing rings shall include a swing out door for ease in jumper routing. The sides of the adjustable routing rings shall have radius guides to provide minimum bend radius control. The rear side of the vertical routing area shall also provide cable retaining rings that hold data and power cables close to the rack to eliminate accidental snags from maintenance personnel.

5. Slack storage spools shall be provided when jumper slack storage is required in-rack.

6. Slack storage shall be available using both in frame and interbay storage panels. The storage panels shall be functional both individually and combined.

7. The Interbay Storage panel shall provide both front and rear jumper routing distribution and storage. The interbay storage panel shall be designed to integrate with an EIA standard 7 foot tall equipment rack. The interbay panel shall have a footprint of 6 inches in width and shall have a removable cover that is flush with the front doors of the connector housings when installed. The panel shall be finished with a wrinkled black powder coat for durability. All fasteners shall be black chromated to match the housings.

8. Wall-mountable hardware shall have a means to transition between the connector housing and cable trough or tray.

E. Distribution Rack Grounding: Provide grounding kit similar to IBM Part # 4716804 for each IC and MC. Rack shall be grounded using stranded # 6 AWG insulated copper conductor. Provide all required bonding material and hardware and bond to building grounding electrode subsystem at building electrical service entrance.

2.08 UNDERGROUND VOICE TRUNK CABLING

A. GENERAL

1. Underground voice trunk cabling shall be installed as indicated on the contract drawings and as called for in these specifications.

2. All UTP voice trunk cabling shall be installed in underground conduit and manhole infrastructure without splicing.

3. The trunk cabling shall be installed free of defects and in accordance with AT&T outside plant installation manuals.

4. The cabling shall exhibit the following properties:

   a. 6,12,25,50,100,200 pair configurations

   b. PIC ALPETH Filled FOAM SKIN "DEPIC"

   c. RE-89 Listed

   d. FlexGel filling compound

   e. Electrical properties:

      (1) Mutual Capacitance - nF per mile = 83 +/-4

      (2) Unbalanced Capacitance - pF per 1000' = 100

      (3) Pair to Ground Capacitance - pF per 1000' = 800

      (4) DC Conductor Resistance - ohms per 1000' = 27.5

      (5) Resistance Unbalance - 1.5 ohms

      (6) Min. Dielectric Strength (kV) = 3.0

      (7) Insulation Resistance - megohm per mile = 10,000

      (8) Nominal Attenuation - dB per mile = 13.4

      (9) Far End Crosstalk - dB per 1000' = 73

      (10) Near End Crosstalk - dB per 1000' – 66

2.09 FIBER OPTIC CABLE SPECIFICATIONS

A. BACKBONE CABLING FIBER OPTIC CABLE PLANT

1. Outdoor Tight Buffered Hybrid Fiber Optic Cable

   a. Outdoor Cable is designed for backbone interbuilding (outside plant) applications. The cable shall be designed for use outdoors and provide excellent protection from the elements.

b. The cable shall meet the requirements of the National Electrical Code, Article 770, TIA/EIA 568A "Commercial Building Telecommunications Wiring Standard", ICEA-83-596-1988 Insulated Cable Engineers Association Standard for Fiber Optic Premises Distribution Cable Publication S-83-596, December 1988, ANSI X3.166-1990 Fiber Data Distributed Interface (FDDI), Token Ring Physical Layer Medium Dependent (PMD), and a combination of Bellcore Generic Requirements for Optical Fiber and Fiber Optic Cable (GR-20-CORE)

c. A tight buffered construction shall be used. The cable shall be constructed Core Locked indoor/outdoor PVC out jacket. The fillers, if used, shall be combined and covered with a medium density jacket to provide excellent environmental protection.

2. Multimode Fibers (24 per cable)

a. Multimode fibers in the cable shall contain 50 micron graded index multimode fibers. These fibers are located inside the buffer tubes. Multimode fibers shall meet the specifications defined by the Multimode Optical Fiber Specifications.

b. Fiber Identification

(1) The fibers within each buffer tube shall be distinguishable from each other by means of color coding. The color coding sequence shall be blue, orange, green, brown, slate, white, red, black, yellow, violet, rose and aqua.

c. Stranding member using a reverse oscillating lay (SZ) stranding method with counter helically applied non-hydroscopic binder tapes.

3. Single Mode Fibers (12 per cable)

a. Single Mode Fibers in the cable shall contain 9 micron graded index multimode fibers. These fibers are located inside the buffer tubes. Single mode fibers shall meet the specifications defined by the Single Mode Optical Fiber Specifications.

b. Fiber Identification

(1) The fibers within each buffer tube shall be distinguishable from each other by means of color coding. The color coding sequence shall be blue, orange, green, brown, slate, white, red, black, yellow, violet, rose and aqua.

c. Stranding member using a reverse oscillating lay (SZ) stranding method with counter helically applied non-hydroscopic binder tapes.

4. Strength Member

a. The primary strength member shall consist of aramid yarns applied around the fibers.

5. Cable Jacket

a. A black jacket made of medium density polyethylene (MDPE) shall be extruded around the cable core and aramid yarn. The jacket shall have two co-extruded tracer stripes located 180° apart for identification. The tracers shall be MDPE jacket material.

b. The cable jacket shall be designed for easy removal, with readily available tools. The design shall permit jacket removal without damage to the optical fibers.

c. The cable jacket shall be printed with manufacturer name, sequential length marking, the number and type of fiber and the appropriate cable type marking according to NEC Section 770.

6. Minimum Bend Radius

a. The minimum static bend radius shall be 10 times the cable outside diameter. The minimum dynamic bend radius shall be 20 times the cable outside diameter.

b. The average increase in attenuation shall not be greater than specified by GR 20-CORE depending on the type of fiber used, single-mode or multimode. No mechanical damage shall occur to the cable jacket.

7. Impact Resistance

a. The average increase in attenuation shall not be greater than specified by GR-20-CORE depending on the type of fiber used, single-mode or multimode. No mechanical damage shall occur to the cable jacket.

b. Testing shall be done in accordance with EIA-455-25A (Impact Testing of Fiber Optic Cables and Cable Assemblies). Optical Attenuation chances shall be measured following the procedures of EIA-455-20 (Measurement of Change in Optical Transmittance). The cable specimen shall be subjected to 25 impacts of 4.3 N.M.

8. Compressive Strength

a. A representative sample of the cable shall withstand a minimum compressive load of 440 N/mm (250 lbf/in) for armored cable, and 220 N/cm (125 lbf/in) for nonarmored cable applied uniformly over the length to the compression plate.

b. The average increase in attenuation shall not be greater than specified by GR- 20-CORE depending on the type of fiber used, single-mode or multimode.

c. Testing shall be done in accordance with EIA-455-41 (Compressive Loading Resistance of Fiber Optic Cable).

9. Tensile Strength

a. The average increase in attenuation at the rated tensile load of the cable shall not exceed than specified by GR-20-CORE depending on the type of fiber used, single-mode or multimode.

b. The maximum dynamic (short term) tensile load rating will be 600 lbs. (2700 Newton's). The maximum static (long term) tensile load rating shall be 135 lbs. (600 Newton's).

c. Testing shall be done in accordance with EIA-455-33A (Fiber Optic Cable Tensile Loading and Bending Test).

10. Cable Twist

a. The average increase in attenuation shall not be greater than specified by GR 20-CORE depending on the type of fiber used, single-mode or multimode. No mechanical damage shall occur to the cable jacket.

b. Testing shall be done in accordance with EIA-455-85 (Fiber Optic Cable Twist Test). The test length (L) shall be a maximum of 4 meters.

11. Cable Cycling Flexing

a. The average increase in attenuation shall not be greater than specified by GR 20-CORE depending on the type of fiber used, single-mode or multimode. No mechanical damage shall occur to the cable jacket.

b. Testing shall be performed in accordance with EIA-455-104 (Fiber Optic Cable Cyclic Test). The cable shall be flexed for 25 cycles at 30 cycles/minute.

12. Outer Jacket Yield Strength

a. The yield strength and ultimate elongation of the outer cable jacket shall be tested in accordance with EIA-455-89A (Fiber Optic Cable Jacket Elongation and Tensile Strength).

13. Jacket Shrinkage

a. The maximum cable jacket shrink back shall be less than 5%.

b. Testing shall be done in accordance with EIA-455-86 (Fiber Optic Cable Jacket Shrinkage).

14. Temperature

a. The cable shall maintain optical and mechanical integrity over the following temperature ranges:

(1) Operation:-40° C to +85° C

(2) Installation-40° C to +70° C

(3) Storage:-40° C to +75° C

15. Cable Reels

a. The cable shall be shipped on non-returnable wooden reels designed to prevent damage to the cable during shipment and installation. Wooden lagging boards will be fastened across the reel flanges.

b. Each reel should be clearly marked to indicate the direction in which it should be unrolled to prevent loosening of the cable on the reel.

16. Reel Covering

a. A covering shall be placed between the flanges over the exposed cable. The covering shall be weather resistance and shall limit solar heating of the cable.

b. The cable ends shall be securely fastened. The end attachments shall prevent the escape of any filling compound and shall prevent the entry of moisture.

17. Reel Identification

a. Each reel of cable shall be stenciled or have a data sheet attached (Packaged in a waterproof wrapping) containing the following information:

(1) Reel identification number

(2) Measured attenuation of cable

(3) Length of Cable

18. Quality Control

a. Each master reel shall be tested to ensure fiber integrity, attenuation, and cable length. Multimode fibers shall be tested at both 850 and 1300 NM. Single mode fibers shall be tested at both 1300 and 550 NM. Each master reel will be given a unique identification and the test results documented. The manufacturer shall maintain documentation such that the cable history may be traced to the individual fibers used in construction of the cable.

19. Test Report

a. A test report shall be included with each reel of cable. This test report will include the cable description, unique reel identification, measured length of the cable in meters and feet, attenuation measurements at wavelengths tested and the manufacturer name and address.

20. Provide components consistent with the quality of Optical Cable Corporation DX Series certified.

2.10 FIBER OPTIC CABLE TERMINATIONS

A. Fiber Optic Cable shall be installed in innerduct. Outside gel filled fiber cable shall be installed in conduit or UL approved plenum innerduct. Non-riser rated gel filled cable must be terminated within 50' of building entrance per BICSI Standards.

B. Terminations shall be performed by a manufacturer trained and certified technician for optical fiber connections.

C. Fiber Optic connectors shall be:

1. SC connectors for all single mode terminations.

2. ST connectors for all multimode terminations.

D. Fiber Optic couplings shall be as provided by on in fiber patch panels and shall be either multi-mode or single mode ST as required for the application.

E. Terminations shall be made in a controlled environment. The contractor may choose to have the cables assembled off-site, although testing must be completed with the cable in its final installed condition.

2.11 DATA-MC/DATA-IC/DATA-HC FIBER OPTIC CABLE TERMINATIONS

A. Optical Fiber Connectors.

1. Products: 3M Corporation, AMP or Lucent ST connectors.

2. Optical Fiber Termination Enclosures used in the DATA-MC/DATA-IC/DATA-HC rooms shall provide termination panels for ST or SC type connectors and be of sufficient size and capacity to terminate 100% of the fiber count of the inside or outside fiber optic cables. Patch panels must be wall or 19" rack mountable depending on IC/MC/HC applications. Provide all termination accessories, enclosures, and testing for a complete fiber optic distribution system.

a. Products: KRONE 36 port panels

B. Optical Fiber Patch Panels

1. The patch panel shall provide 36 fiber couplings in 3.0" of vertical rack space. These couplings shall be pre-installed in a single bulkhead. The patch panel shall have removable front and rear doors as well as a removable lid. There shall be vertical and horizontal ingress/egress features in the form of slots in the top, bottom and sides of the panel, both front and rear. All ingress/egress slots shall be covered with a self-adhesive UL 94V-0 rated grommet material. All ingress/egress slots shall have a strain relief post with a slot capable of holding a tie wrap. The panel shall provide strain relief in the form of a grounding lug and multiple tie-wrap points. The panel must have mounting ears that allow mounting on 19" or 23" hole centers in either a mid- or flush-mount configuration. The panel shall have dual, adjustable plastic cable management rings made of high impact UL 94V-0 rated self-extinguishing plastic. The patch panel shall be capable of having a slide feature attached to it to allow the entire box to be moved in and out of the rack. A port identification label/card shall be provided. The panel shall be made of 16 gauge steel, painted black. A one-year limited warranty shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

2. Approved Supplier: KRONE

PART 3 – EXECUTION

3.01 GENERAL

A. The contractor shall avoid penetration of fire-rated walls. Sleeving shall be installed for access where necessary.

B. Any penetration through fire rated walls (including those in sleeves) will be resealed with an Underwriter Laboratories (UL) approved sealant. Use 3M Firestop material. Contractor shall also seal all floor, ceiling, and wall penetrations in fire or smoke barriers and in the MC, IC's and wiring closets.

C. Cable Lubricants: Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue.

1. Recommended Products:

a. Twisted-pair cable: Dyna-Blue, American Polywater.

b. Optical fiber cable: Optic-Lube, Ideal

D. Pull Strings: Provide pull strings in all new conduits, including all conduits with cable installed as part of this contract. Pull test is not to exceed 200 lbs.

E. The Contractor shall replace any damaged ceiling tiles that are broken during cable installation.

F. The Contractor shall replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, over-tightened bindings, loosely twisted and over twisted pairs at terminals, and sheath removed too far (over 2").

G. All cable shall be continuous and splice-free for the entire length of run between designated MDF, IDF, pull boxes or terminations.

H. Terminate all cable in designated MDF,IDF,Jacks and/or designated equipment backboards. No terminations or splices shall be permitted in pull boxes, underground or any non-designated termination point.

I. Provide service loop of cables at all junction and termination cabinets or boxes and backboards.

J. Maintain consistent absolute signal polarity at all connectors, patch points and connection points accessible in the system.

K. Provide identification labels on each cable ends, backboard, wall jack and installation log in accordance with EIA/TIA 606. Cable labels shall be imprinted or type written style and shall be attached in a manner as to allow easy viewing along the length of the wire/cable. Acceptable systems are PANDUIT, BURNDY or approved equal. Submit to Consultant for approval of method.

L. Provide installation logs supporting building infrastructure.

M. Dress or harness all wire and cable to prevent mechanical stress of electrical connectors. No wire or cable shall be supported by a connection point. Provide service loops where harnesses of different classes cross, or where hinged panels are to be interconnected.

N. Configure and cross connect all ports as required for complete end to end system.

O. Strap or secure cables every 5 feet. Do not strap to lighting, ceiling grid, etc.

P. Cables shall be routed in corridors whenever possible to avoid unencumbered access to cables.

Q. Cables shall be placed as a minimum of 12" from 208-240VAC power and 18" from 480 power.

R. Maintain 18" clearance between light fixtures incorporating ballast operation.

S. Cables shall be installed to preclude damage and not come in contact with sharp edges of building, wireways or casework/furniture.

T. Maintain minimum bend radius per drawing details.

U. Cables shall be a minimum of 30" from heating, steam valves etc.

V. All conduits shall have bushings in place prior to cable installation.

W. All installation shall be coordinated with Consultant for Milestone verification.

3.02 LABELS

A. The labeling plan shall be developed by the Contractor and approved by owner.The Contractor will label all outlets following the detailed shop drawing design, using permanent/legible typed or machine engraved labels approved by owner. Terminals in the HC's/IC's/MC's shall be labeled by the contractor using designation strips designed for 110 hardware or as applicable to terminal hardware. All copper/fiber terminal for riser cables in the HC and/or IC shall correspond to terminal numbering in the MC.

B. The labels on HC/IC station terminal blocks shall be numerically sequential. Outlets shall be labeled to match the labels on the corresponding terminal block position. Labels shall include a room number component and a sequential extension. The room number component shall reflect the numbering system utilized for existing door labels or room numbers as selected by owner. For example, the third outlet in room 25 (starting on the left side of the door and working clockwise around the room) is labeled: "25.3."

C. A floor plan clearly labeled with all outlet jack numbers shall be included in the as-built plans.

D. All labels shall correspond to as-built and to final test reports.

3.03 STATION WIRING INSTALLATION

A. The low voltage Contractor's RCDD shall supervise the installation of communications cable. All Category 5e and Fiber Optic cable shall be installed by individuals trained in low voltage data cable system installation. All Category 5e (4) pair STP cable must be handled with care during installation so as not to change performance specifications. The Contractor shall not over-tighten tie wraps or over-bend the Category 5e STP cable.

B. Exposed station wire will only be run with owner approval. Approval will be granted only when no other option exists. When station wire must be run surface to a single outlet, surface raceway shall be used to cover the cable.

C. All wiring and associated hardware shall be placed so as to make efficient use of available space in coordination with other uses. All wiring and associated hardware shall be placed so as not to impair the use or capacity of other building systems, equipment, or hardware placed by others (or existing). All wiring, and associated support structures and hardware shall be placed so as not to impair owner's efficient use of their full capacity.

D. All wiring placed in ceiling areas must be tied or clamped. When wire is placed in ceiling areas or other non-exposed areas, fasteners shall be placed at intervals no greater than 60" and preferably on 48" centers. Cable sag between supports shall not exceed 12". Attaching wire to pipes or other mechanical items is not permitted. At all runs of twenty or more cables, provide rings at 60" (maximum) centers to hang cable. Communications cable shall be routed to avoid light fixtures (18" minimum spacing), sources of heat (12" minimum spacing) and power feeder conduits (12" minimum spacing). Communications cabling must be spaced a minimum of 120" (10') from bus duct.

3.04 STATION HARDWARE

A. Eight (8)-position modular jack pin assignments:

B. Pin connections for data station 8-position modular jacks and patch panels shall match TIA/EIA-568-A modular jack recommendation T568B that is both 10/100BaseT compatible.

C. Pin connections at data jack panels shall match pin connections at outlets with straight through wiring.

D. Terminations at telephone terminal blocks (where required to maintain existing station cable) shall match following pair sequence for T568B:

1. Pair 1, Pins 5 and 4, White-Blue, Blue (/White).

2. Pair 2, Pins 1 and 2, White-Orange, Orange (/White).

3. Pair 3, Pins 3 and 6, White-Green, Green (/White).

4. Pair 4, Pins 7 and 8, White-Brown, Brown (/White).

3.05 BACKBOARD CABLING/EQUIPMENT RACK CONFIGURATION

A. Cable installation in the Entrance Room and Communications Closet must conform to the Project Drawings. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation mixing boxes, network equipment mounting access hatches to air filters, switches or electrical panels, and lighting fixtures. Avoid crossing areas horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings. Provide a minimum of 36" for a service loop to the patch panel.

B. Cable shall be routed as close as possible to the ceiling, floor, or corners to insure that adequate wall or backboard space is available for current and future equipment and for cable terminations. Cables shall not be tie-wrapped to existing electrical conduit or other equipment. Minimum bend radius shall be observed.

C. Lay cables via the shortest route directly to the nearest edge of the backboard from the mounted equipment or block. Lace or tie-clamp all similarly routed cables together, and attach by means of clamps screwed to the outside edge(s) of the backboard vertically and/or horizontally, then route via "square" corners over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables.

D. Do not over-tighten cable ties or binding on Category 5e station cable. Observe Category 5e cable bend radius.

3.06 PROTECTION OF WORK SPACE AND AREA - SITE SAFETY

A. SIGNS, BARRICADES, MARKING TAPE

1. Always protect open and confined spaces with standard construction guards and warning devices.

2. Place approved warning lights or reflector signs near areas where work is performed below grade in vaults or manholes. Area shall be barricaded to prevent staff access to work area. Warning lights, barricades and signs shall be placed:

a. One-half hour before sunset or anytime vision is impaired by fog, haze, etc.

b. Signs and lights must remain in place until the work is completed.

c. When below grade work is being performed and work area is left uncovered and unattended, the contractor shall place warning signs with flags, boundary warning tape and cones in the direction of approaching pedestrian or vehicle traffic.

d. When work is located near a curve in walkway/roadway or near a top of hill, place additional warning devices to give sufficient warning to approaching pedestrian or vehicular traffic.

e. Work located in public or private intersections, on public or private surface streets or where traffic is heavy additional precautions shall be deemed necessary and the contractor is to provide for public and staff safety at all times.

3. Materials, tools, vehicles and equipment shall be placed and positioned to cause minimal interference with traffic. Materials, tools, vehicles and equipment shall be configured and arranged on the site and in the work area to minimize hazards to traffic, staff or personnel.

4. Provide protection around all pull lines and/or cable.

5. When equipment, vehicles, tools, materials must be left at the site, unattended, it shall not be secured to posts, poles, furniture, buildings, fencing, or fire hydrants.

B. WORK SPACE BELOW GRADE

1. Confined spaces below grade (manholes, handholes, vaults, tunnels, etc.) are required to be tested for hazardous gas prior to entering. Confined spaces shall not be entered until LOCAL SAFETY procedures have been followed to entering below grade work space.

2. If a hazardous substance is detected in the confined work space, the contractor shall immediately notify owner and consultant and the appropriate gas utility company.

3. Report all trapped or unconscious victims to 9-1-1 and owner.

4. Open flame of any type is not allowed into below grade or confined work spaces.

5. Below grade work spaces shall be ventilated in accordance with LOCAL SAFETY guidelines prior to commencement of work.

6. Use only approved lighting in below grade/confined work spaces.

7. Contractor shall take extreme caution and care while working in existing below guard confined spaces to prevent damage to existing lines, wires, cables, circuits, etc.

C. WORK SPACE ABOVE GRADE

1. Contractor shall protect work area as defined in SIGNS, BARRICADES and MARKING TAPE.

3.07 INSPECTION

A. Conformance to the installer practices covered above are to be verified when completed. In some cases, the customer may inspect before acceptance. The following points are to be examined:

1. Is the design documentation complete?

2. Have all terminated cables been tested per the specifications?

3. Is the cable type suitable for its pathway?

4. Have the pathway manufacturer's guidelines been followed?

5. Have the installers avoided excessive cable bending?

6. Have potential EMI sources been considered?

7. Is cable fill correct?

8. Are hanging supports within 60" (5')?

9. Does hanging cable exhibit some sag?

10. Are telecommunications closet terminations compatible with applications equipment?

11. Have station jack instructions been followed?

a. Jacket removal point.

b. Termination positions.

c. Pair terminations tight with minimal pair distortions.

d. Twists maintained up to termination.

12. Have patch panel instructions been followed?

a. Cable dressing first.

b. Jackets remain up to the connecting block.

c. Pair terminations tight and undistorted.

d. Twists maintained up to the connecting block.

13. Are the correct outlet connectors used (568B)?

14. Is the jacket stripped back only as much as is needed, not to exceed 2" from the connection?

3.08 QUALITY CONTROL

A. Evidence of Experience and Qualifications

1. Show that the installer who will perform the work has a minimum of 5 years experience successfully installing system of the same type and design as specified herein. Include the names, locations, and points of contact of at least two similar installations of the same type and design as specified herein where the installer has installed such systems. Indicate the type of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 12 months.

2. Show that the instructor, who will train staff, operating and maintenance personnel, has received a minimum of a CNE/MCE training from a factory training center, and 2 years experience in the installation of systems of the type specified. Submit training certification in equipment submittals, title section training and certifications.

3.09 INSTALLATION TESTING

A. SYSTEM TESTING REQUIREMENTS-STATION

1. Owner/Consultant shall be notified one week prior to any testing so that the testing may be witnessed.

2. Before requesting a final inspection, the Contractor shall perform a series of end-to-end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms, and timetable for fiber optic and all copper plant wiring.

3. Acceptance of the simple test procedures discussed below is predicated on the Contractor's use of the recommended products (including but not limited to twisted pair cable, cross-connect blocks, and outlet devices specified in the Products paragraph) and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation will be evaluated in the context of each of these factors.

4. At a minimum, the Contractor shall test:

a. All station drop cable pairs from HC/IC/MC termination patch panels to outlet device 8-position modular jacks.

b. Each wire/pair shall be tested at both ends for the following (utilizing the attached test results forms):

(1) Termination order.

(2) Polarity (pair reversals).

(3) Continuity.

(4) Shorts.

(5) Grounds.

(6) NEXT (near end crosstalk) from both directions.

(7) Cable length (record all length).

(8) Wire Map

(9) Length

(10) Impedance

(11) Resistance

(12) Capacitance

(13) Attenuation

(14) Active ACR

(15) INJ NEXT Loss

(16) INJ Active ACR

c. Testing shall be made utilizing a hand cable tester as manufactured by Fluke, Microtest or Wavetek.

d. All test equipment shall bear current calibration stickers or dated certificates.

e. Printed test results along with as-built drawings shall be assembled into a 3-ring project binder and delivered to the Consultant for verification and acceptance.

5. When errors are found, the source of each error shall be determined, corrected, and the cable re-tested. All defective components shall be replaced and retested. Defective components not corrected shall be reported to owner/consultant with explanations of the corrective actions attempted.

6. Test records shall be maintained using the test results forms outlined below. The form shall record closet number, riser pair number or outlet ID, outcome of test, indication of errors found (e.g., a, b, c, d, or e) cable length, re-test results after problem resolution and signature of the technician completing the tests. See Appendix to electrical specifications for testing form.

7. Test results for each 4- pair, Category 5e or 6e, STP cable must be submitted with identification to match labels on all patch panel ports and 8-position modular jacks, and identification to match as-builts associated with that cable.

8. Owner will observe and verify the accuracy of test results submitted.

B. SYSTEM TESTING REQUIREMENTS - CABLE PLANT

1. All data drop cables shall be tested for continuity and polarity between station jack, IDF and MDF.

2. All data trunk cables shall be tested for continuity and polarity between

3. IDF and MDF, using a portable handheld Analyzer. Certify tests in writing.

4. All testing shall be performed in accordance with EIA/TIA building standards and shall be done in the presence of the Consultant.

5. Transmission measurements shall be taken at random to ensure overall system compliance. Tests shall be conducted as follows:

   a. Using a network analyzer, coax cables, baluns, UTP test leads and impedance matching terminations perform the following;

      (1) refer to TIA/EIA/TSB-40

   b. Log all tests in acceptance testing manual. Record and document the following for each cable and circuit.

      (1) Continuity

      (2) Polarity

6. All testing equipment shall have current calibration stickers firmly affixed to the testing equipment. All calibrations shall be traceable to the National Standards Bureau.

7. Provide printed test data for CAT-5e certification for LAN service.

8. Testing shall be performed in the presence of owner and consultant.

9. Testing shall include verification of:

a. Cable Plant

3.10 FIBER OPTIC TESTING SPECIFICATIONS

A. All testing shall be performed by trained personnel.

B. For all installed fiber optic cable EIA 455-171 Method D procedures will be adhered to. (Bi-directional).

C. Connector loss shall not exceed .5 dB per termination.

D. The fiber optic cable shall not exceed 1.5 db per kilometer tested at 1300 nm and 1500 nm for single mode cable.

E. The fiber optic cable shall not exceed 4 db per kilometer tested at 850 nm and 2 db per kilometer tested at 1300 nm for multimode 62.5/125 fiber.

F. The Contractor is responsible for obtaining minimum loss in fiber connections and polishing per manufacturer's specifications.

PART 4 - WARRANTY SERVICE & CLOSE OUT

4.01 MINIMUM WARRANTY

A. The cabling system shall meet the performance requirements of the ANSI/TIA/EIA-568-A standard (Annex E) and TIA/EIA Telecommunications Systems Bulletin 67. The warranty on the material, services, and operation of the cabling system to this specification must be for a period of at least 15 years. The connecting hardware shall have a lifetime extended warranty against defects in material and workmanship.

B. The warranty must include the following statements regarding the cabling system:

1. "Will support and conform to TIA/EIA-568-A specifications covering ANY CURRENT OR FUTURE APPLICATION which supports transmission over a properly constructed horizontal cabling system premises network which meets the channel and/or basic link performance as described in TIA/EIA-568-A AnnexE and TIA/EIA-TSB-67."

2. "Will be free from defects in material or faulty workmanship"

3. The contractor shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for one year from the date of final acceptance by Consultant.

4.02 COMMISSIONING

A. General

1. Acceptance shall consist of the following:

a. Burn-in period.

(1) The system shall be accepted for start of warranty upon successful completion and testing of the Consultant.

(2) Burn-in period shall be a 30-day time frame to allow the system to operate free of defects, grounds, programming faults, etc.

(3) The 30-day burn-in shall begin the day of acceptance by Consultant.

(4) The burn-in period shall be 30 days of continuous use without system trouble, false alarm, open, short or ground condition present.

(5) Should the system fail for any reason during the burn-in period, the contractor shall respond immediately upon notification by owner's personnel and correct said deficiencies.

(6) Upon correction and restoration, the burn-in period shall be re-set to "0" and the 30 day count shall begin again.

(7) Warranty shall commence upon day 31 of successful burn-in period.

b. Final Test

(1) Before the installation shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows:

(2) The contractor's job foreman, in the presence of a representative of the manufacturer, and a representative of the owner shall operate every network device to ensure proper operation and correct configuration at the file server location.

(3) When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to owner.

(4) The contractor shall leave the data network system in proper working order, and, without additional expense to owner, shall replace any defective materials or equipment

provided by him under this contract within one year (365 days) from the date of final acceptance by the Consultant.

4.03 PROJECT CLOSE OUT

A. Operating and Instruction Manuals

1. Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to owner upon completion.

2. Provide necessary training and/or schooling to designated owner's personnel at no additional cost to owner. Training shall be at owner's designated location, by factory-trained personnel.

B. Testing Frequency Instructions

1. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble-shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to owner upon completion of the system.

2. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

a. Instruction on replacing any components of the system, including internal parts.

b. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions

c. 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.

d. User operating instructions, shall be provided prominently displayed on a separate sheet located next to the control.

3. Owner shall be furnished with all programming disks for each installation as well as hard copy printouts. Provide necessary training and/or schooling to designated owner's personnel at no additional cost to owner. Training shall be at owner's designated location, by factory-trained personnel.

4. Staff of owner maintenance shall be thoroughly instructed in the use of the System. Training shall include a minimum of three (1) hour sessions, to be scheduled at owner's designated time.

5. Maintenance instruction shall be performed in the same manner as described above. Training shall include a minimum of three (1) hour sessions, to be scheduled at owner's designated time.

4.04 DRAWING DETAILS (AS-BUILTS)

A. Show wall elevation and wire details on shop drawings. Show equipment function, make and model and wire routing and terminations within rack or cabinet.

B. Show as-built location of all devices on as-built drawings.

1. Provide 3 sets of bound operation and maintenance manuals, including submittal materials, and record of field changes. Provide complete as-built wiring diagrams in AutoCAD R2000 format. Provide disk files and original tracings (E size) in format of construction drawings.

C. As-Built Drawings, Testing, and Maintenance Instructions

1. A complete set of reproducible as-built drawings in AutoCAD R2000 format (CDs and sheets) showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to owner upon completion of system acceptance.

END OF SECTION

SECTION 26 4901

GENERAL CONTROL DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Pushbutton and selector switches.
2. Control stations.
3. Relays.
4. Time delay relays.
5. Control power transformers.
6. Control panels.

B. Related work:

1. Control Cabinets: Section 260130.

1.02 REFERENCES

A. NEMA ICS 1 General Standards for Industrial Control Systems.

B. NEMA ICS 2 Standards for Industrial Control Devices, Controllers and Assemblies.

C. NEMA ICS 6 Enclosures for Industrial Controls and Systems.

D. NEMA ST 1 Standard for Specialty Transformers (Except General Purpose Type).

E. NFPA 70 - National Electrical Code.

1.03 SUBMITTALS

A. Submit under provisions of Section 010000.

B. Shop Drawings: Submit to NEMA ICS 1 indicating control panel layouts, wiring connections and diagrams, dimensions, support points.

C. Product Data: Provide for each component showing electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.04 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of project.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Contactors:

1. Mechanically and Electrically Held Contactors: Open type, 120V coil, number of poles and ampere rating as indicated. Factory wired and installed in lighting panelboard compartment.

2. Square D Co. Class 8903.

B. Time Switch:

1. Intermatic time switch as shown on the drawings.

C. Photo Control With Time Delay:

1. Rated for 1000W load or 1800 VA, sp st, in weatherproof enclosure.

2. General Electric Co. Cat. No. CR174H651, or equal.

D. Control Relays:

1. 120 VAC coil, 10A rated contacts with number of poles indicated. Square D Co. Class 8501 Type X.

2. 48 VDC coil, 10A rated contacts. Square D Co. Class 8501 Type KDP 12.

3. 24 VDC coil, 10A rated contacts, plug in Type 3PDT. Square D Co. Class 8501 Type KDP 13 with NR62 socket.

4. Pneumatic Time Delay Relay: Square D Co. Class 9050 Type B.

E. Control Units, Such as Push Buttons, Pilot Lights, Selector Switches: Heavy duty, oil tight - Square D Co. Class 9001.

1. Push buttons, standard, full guard. Red for stop, green for start.

2. Pilot lights, transformer type, with color caps as indicated.

3. Selector switches, 3 position (Hand Off Automatic) manual return.

4. Legend Plates: Standard, with legends as indicated.

2.02 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates with 1/4 inch minimum height letters indicating circuit designation of panel or device controlled on controls which are individually enclosed.

B. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

END OF SECTION

SECTION 26 4920

MOTOR CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Motor control; including molded case circuit breakers or fusible disconnects, magnetic starters and other control devices.

B. Related work:

1. Motor Rated Switches: Section 26 0170.

2. Control Units: Section 26 4901.

1.02 SUBMITTALS

A. Submit in accordance with Section 01 3300.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Motor Control Centers:

1. Provide factory assembled motor control centers consisting of one or more, minimum: 19 inch wide by 16 inch deep, dead front, dead rear, vertical sections bolted together.

2. Full voltage, non reversing starter, unless otherwise indicated.

3. Conform with NEMA Class 1, Type B wiring for starter unit control.

4. Provide two normally open and one normally closed auxiliary contacts on each except where more contacts are indicated.

5. Provide full length copper bussing including areas indicated as space only.

6. Provide a horizontal copper ground bus drilled and tapped every 10 inches for 1/4 20 machine screws.

7. Provide an individual control transformer with the secondary fused and grounded for each starter. Size as required for the control devices indicated plus 25% spare capacity minimum.

8. Provide a 3 position selector switch (hand off auto), manual return, for each starter unless otherwise indicated.

9. Provide a transformer type push to test green pilot light energized by an auxiliary contact.

10. Provide approved pull apart terminal blocks or control circuit disconnect switch for all external wiring connections.

11. Identify all internal control wiring with manufacturers wire numbering or control wire numbering when indicated, at all terminal points and connections.

12. Allen-Bradley, GE or Square D Co.

B. Combination Motor Starters:

1. Full voltage, non reversing starters unless otherwise noted and magnetic trip only circuit breakers, or fusible disconnects in NEMA 1 enclosure for dry areas and NEMA 3R where indicated weatherproof, sized as indicated. Provide current limiters where indicated.

2. Provide two normally open and one normally closed auxiliary contacts on each starter, except where contacts are indicated.

3. Provide an individual control transformer with the secondary fused and grounded for each starter. Size as required for the control devices indicated plus 25% spare capacity minimum.

4. Provide a 3 position selector switch (hand off auto), manual return, for each starter unless otherwise indicated.

5. Provide a transformer type push to test green pilot light energized by an auxiliary contact.

6. Identify all internal control wiring with manufacturers wire numbering or control wire numbering when indicated, at all terminal points and connections.

7. Combination Starter and Circuit Breaker: Square D Co. Class 8539, GE or Allen-Bradley.

8. Combination Starter and Disconnect: Square D Co. Class 8538, GE or Allen-Bradley.

C. Motor Manual Starters:

1. Single Phase:

a. For fractional HP motors, single unit with toggle operator, in NEMA 1 enclosure for dry areas and NEMA 3R where indicated weatherproof.

b. Number of poles as indicated.

c. Provide overload protection.

d. Square D Co. Class 2510, GE or Allen-Bradley.

2. Three Phase:

a. For integral horsepower motors, single unit 3 pole with toggle operator in NEMA 1 enclosure for dry areas and NEMA 3R where indicated weatherproof.

b. Square D Co. Class 2510, GE or Allen-Bradley.

D. Magnetic Motor Starters (Individually Mounted):

1. Non reversing, in NEMA 1 enclosure for dry areas and a NEMA 3R enclosure where indicated weatherproof.

2. Provide start stop push button on door otherwise indicated.

3. Square D Co. Class 8536, GE or Allen-Bradley.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Bolt all sections of the control centers together tightly and secure to floor with anchor bolts after setting assembly plumb and level.

B. Secure units to structures to withstand wire-pulling strains.

C. Use motor nameplates data for selection of heater elements in motor starters, except where power factor correction is used. Size heater elements accordingly.

3.02 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates on all electrical distribution equipment shown on the single line diagram.

B. Provide motor control center and source feed designation on nameplates with 3/8" minimum lettering for the motor control center name and 1/4" height lettering for the source feed designation.

EXAMPLE: MCC A

FED FROM: DHA 1

C. Provide engraved plastic nameplates with 1/4 inch minimum height letters indicating circuit designation at branch overcurrent devices in motor control centers.

1. Circuit designation and load served at branch overcurrent devices in motor control centers and combination starters.

2. Circuit designation and load served at manual motor starters and individually mounted magnetic motor starters.

D. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation is not acceptable.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section requires the selective removal and subsequent off-site disposal of the following:

1. Removal and disposal of all abandoned pipe and conduit except for pipe or conduit indicated specifically on plans for abandonment in place.

2. Removal and offsite disposal of grass and root mat.

3. Demolition of asphalt concrete and pavements as indicated on the drawings to straight, neatly saw cut surface.

4. All other removals which may or may not been shown on plans as required for the project construction.

1.02 SITE CONDITIONS

A. Protections: Contractor shall provide temporary barricades and other forms of protection to protect general public from injury due to demolition work.

B. Traffic: Conduct demolition operations and debris removal to ensure minimum interference with roads, streets, walks, bike paths, and other adjacent occupied or used facilities. Access must be coordinated with District's Representative.

C. Utility Services: Maintain all existing utilities to remain in service and protect them against damage during demolition operations.

D. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations and County Air Pollution Control District pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions such as flooding and pollution.

1.03 REFERENCES

A. Standard Specifications for Public Works Construction (Green Book), latest edition.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.01 DEMOLITION

A. General: Perform demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with governing regulations.

B. Provide services for effective air and water pollution controls as required by County Air Pollution Control District regulations.

C. Prior to commencing grading operations, soil containing debris, organics, pavement, or other unsuitable materials, shall be stripped from the foundation and pavement areas. Demolition areas shall be cleared of old foundations, slabs, abandoned utilities, tree roots, and soil disturbed during the demolition process. Depressions or disturbed areas left from the removal of such material shall be replaced with compacted fill.

D. Concrete sidewalks will be removed to the nearest construction or expansion joint to the limits of removal as shown on the plans. Exact locations will be determined in the field by the District's Representative.

3.02 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from Project site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose of off site.

B. If hazardous materials are encountered during demolition operations, contact District's Representative.

C. Burning of removed materials is not permitted on project site.

3.03 HAZARDOUS MATERIALS

A. Except as otherwise specified, in the event Contractor encounters on the Project site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or other hazardous materials which have not been rendered harmless, Contractor shall immediately stop Work in the area affected and report the condition to the District's Representative in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Contractor if in fact the material is asbestos, PCB, or other hazardous materials and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos, PCB, or other hazardous materials, or when such materials have been rendered harmless.

B. Construction involving asbestos cement (transite) pipe shall be performed by qualified personnel in accordance with the standards and specifications set forth by American

Water Works Association (AWWA), the Occupational Safety and Health Act (OSHA) and the Environmental Protection Agency (EPA), as well as location jurisdictional codes.

3.04 CLEANUP AND REPAIR

A. General: Upon completion of demolition work, remove tools, equipment and demolished materials from site.

1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to existing condition prior to start of operations. Repair adjacent construction or surfaces soiled or damaged by demolition work.

END OF SECTION

SECTION 31 20 00

EARTHWORK

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes: Excavation, Compaction and Fill.

1.02 REFERENCE

A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork in compliance with applicable requirements of governing authorities having jurisdiction.

1. Standard Specifications for Public Works Construction (SSPWC), latest edition.

2. CAL/OSHA Construction Safety Order Requirements.

B. Soil Testing Service

1. The District will engage a soil testing service to include testing soil materials proposed for use in the Work and for quality control testing during grading operations.

2. Samples of materials shall be furnished to the testing service by the Contractor at least one week before their anticipated use.

3. Work for this Section includes smoothing out areas for density tests and otherwise facilitate testing work, as directed.

1.04 PROJECT CONDITIONS

A. The Contractor shall visit the site and familiarize himself with existing site conditions.

B. Additional test borings and other exploratory operations may be made by the Contractor at no cost or liability to the District.

C. Existing Utilities:

1. Where uncharted or incorrectly charted piping or other utilities are encountered during excavation, consult District 's Representative immediately for directions.

Cooperate with the District's Representative in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the District's Representative at no cost to the District. Disturbed trench sections shall be replaced in kind.

2. Contractor to coordinate with the City of Moorpark to obtain all required permits and schedule inspections.

D. Protection of Subgrade: Do not allow equipment to pump, rut, or disturb subgrade, stripped areas, or other areas prepared for Project.

E. Contractor shall implement measures to prevent soil erosion, and where possible, sediment shall be retained onsite.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.01 SITE PREPARATION

A. General:

1. Remove vegetation, improvements, or obstructions interfering with installation of new construction. Transport and legally dispose of off site. Contractor shall utilize the best construction method to minimize the erosive effect from the removal of site vegetation.

2. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction. Paint cuts over one inch in size with tree pruning compound. Care shall be taken so as not to scar any area of the tree's bark.

3. In order to protect from sediment transfer or contamination from urban run-off during construction, the following grading and erosion control practices shall be followed:

   a. If grading occurs during the rainy season (November through April), sediment traps, barriers, covers or other methods shall be used to reduce erosion and sedimentation.

   b. Excavated materials shall not be deposited or stored where the material can be washed away by high water or storm run-off.

c. Grading operations on site shall be conducted so as to prevent damaging effects of sediment production and dust on the site and on adjoining properties.

d. When vegetation has to be removed on site, the methods shall be one that minimizes the erosive effects from the removal.

e. Exposure of soil to erosion by removing vegetation shall be limited to the area required for construction operations. The construction area shall be fenced to define the project.

f. Temporary mulching, seeding, or other suitable stabilization shall be used to protect areas during construction or other land disturbance activities on site.

g. Topsoil, removed from the surface in preparation for grading and construction activities on Campus is to be stored on or near the site and protected from erosion while grading operations are underway, provided that such storage may not be located where it would cause suffocation of root systems of trees to be preserved. After completion of such grading, topsoil is to be restored to exposed cut and fill embankments of building pads so as to provide a suitable base of seeding and planting.

h. Sediment basins, sediment traps, or similar control measures shall be installed before extensive clearing and grading operations begin for site development.

i. Water or dust palliatives shall be applied to exposed earth services as necessary to control dust emissions.

j. Revegetation or stabilization of exposed earth surfaces shall take place as soon as possible.

B. Removals

1. Clear the site of trees, shrubs, and other vegetation, which is indicated to be removed.

2. Completely remove stumps, roots, and other debris to avoid problems with future utilities.

3. Use only hand methods for grubbing inside the drip line of trees indicated to be left standing.

4. Existing fills, soil containing debris, organics, pavement, or other unsuitable materials shall be excavated and removed prior to commencing grading

operations. Demolition areas shall be cleared of old foundations, slabs, abandoned utilities, landscaping, and soils disturbed during the demolition process. Depressions or disturbed areas left from the removal of such material shall be replaced with compacted fill.

5. The limits and depths for removal of existing fill materials shall be evaluated by project soils engineer during grading.

6. Revegetation or stabilization of exposed earth surface shall take place as soon as possible.

C. Removal of Improvements

1. Remove above-grade and below-grade improvements necessary to permit construction and other work as indicated.

2. Remove from site and legally dispose of off-site, existing fill materials, soil debris, or other unsuitable materials prior to commencing grading operations.

3.02 EXCAVATION

A. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown, within a tolerance of plus or minus 0.04 foot.

B. Excavation for Planting Areas: Conform to cross-sections, elevations and dimensions shown, within a tolerance of plus or minus 0.10 foot.

3.03 COMPACTION

A. General: Fill materials to be compacted to at least 95 percent relative compaction, based on the maximum dry density from ASTM D1557.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the percentages of maximum dry density specified in accordance with ASTM D1557-91 method of compaction.

C. Moisture Control:

1. When moisture content of exposed scarified soil and/or full material is below that sufficient to achieve recommended compaction, water shall be added to the soil and/or fill. While water is being added, soil shall be bladed and mixed to provide relatively uniform moisture content throughout the material.

2. When moisture content of exposed scarified soil and/or fill material is excessive, material shall be aerated by blading or other methods. Fill placed in pavement

areas shall be compacted at near optimum moisture content. Jetting is not permitted for compaction.

3.04 FILL

A. In all excavations, use satisfactory excavated or borrow material sampled and tested by the District 's Testing Laboratory.

B. Fill excavations as promptly as Work permits, but not until completion of the following:

1. Acceptance by District's Representative of construction below finish grade including, where applicable, waterproofing, damp-proofing, and drainage pipe.

2. Examination, testing, approval and recording locations of underground utilities.

3. Removal of concrete formwork.

4. Removal of shoring and bracing and backfilling of voids with satisfactory materials.

5. Removal of trash and debris.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

7. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

C. Continual dust control, as required by the District, and in accordance with County Air Pollution Control District's Standards shall be required for the project construction.

3.05 GRADING

A. General: To provide support for building floor slabs, all existing fill and unsuitable natural soils shall be excavated and replaced as properly compacted fill.

B. Compaction: After grading, compact subgrade surfaces to the depth and percentage of compaction for each area classification.

C. Fill placement and grading operations shall be performed only under the observation of the District 's Testing Laboratory.

D. The exterior grades around building areas shall be sloped to drain away from the buildings to prevent ponding of water adjacent to foundations.

E. Grading operation shall be conducted so as to prevent damaging effects of sediment product and dust on the site and adjoining properties.

3.06 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Transport excess excavated material and legally dispose of off site.

3.07 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: District 's Testing Laboratory will observe, test and approve subgrades and fill layers before further construction Work can be performed. The District's Representative will determine the frequency of tests. Subgrade: Allow at least one field density test of subgrade to be made for every 2000 sq. ft. of paved area, but in no case less than 3 tests.

B. Field examination and testing will be performed by the District 's Testing Laboratory. The Contractor shall cooperate with such testing and shall give the District's Representative advance notice of grading scheduling.

C. Frequency of Tests for Trenching: As determined by the District's Representative.

D. If in the opinion of the District's Representative, based on observations, subgrades or fills which have been placed are below specified density, provide corrective work as specified at no additional expense to the District, and pay for retesting of the soil.

3.08 PROTECTION

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work as specified, with retesting, prior to further construction.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SUMMARY

A. Excavating trenches for construction of utilities.

B. Trench backfill materials.

C. Backfilling and compacting requirements.

1.02 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

1.03 SUBMITTALS

A. Materials source.

B. Sand equivalent test reports per ASTM D2419.

C. Certificates.

D. Drawings for shoring, bracing, sloping, or other provisions for worker protection for any excavation shall conform to the requirements of the CAL/OSHA Construction Safety Orders Requirements.

1.04 EXISTING UTILITIES

A. Drawings show existing major underground utilities from reference drawings. Prior to excavation, the Contractor shall notify the District's Representative to obtain any additional information which may be applicable to the Work.

B. Any incident of a utility being inadvertently damaged by the Contractor shall be immediately shutoff and then be immediately repaired by the Contractor at no cost to the District.

C. Contractor to pothole all utility connections and verify exact size, location and material prior to beginning construction and notify engineer of any discrepancies.

PART 2 - MATERIALS

2.01 APPROVALS

A. Imported material shall be approved by the District's Representative prior to being brought to the site. Provide a sample of the material in sufficient quantity for the District's Representative's use in evaluating the material.

2.02 TRENCH BACKFILL MATERIAL

A. Sand bedding shall have a sand equivalent (SE) of 30 or greater. The SE shall be evaluated during grading. Materials shall conform to section 306-1.2.1 of the standard specifications for public works construction and meet local governing agency requirements, whichever are more stringent.

B. Slurry Backfill shall be a two-sack slurry mix and shall conform to the requirements of Section 201 of the SSPWC for Backfill Slurry.

C. Aggregate base course shall be per Plan.

D. Topsoil removed from trenches shall be stockpiled at locations approved by the District's Representative.

2.03 SOURCE QUALITY CONTROL

A. Inspection and testing shall be performed by the District's Representative.

PART 3 - EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.02 TRENCH EXCAVATION

A. All saw cutting shall be neat, straight cuts and shall conform to Section 300-1.3.2 of the SSPWC. All cuts shall be square unless otherwise specifically noted on plans.

B. Trench excavation shall conform to Section 306-1.1 of the SSPWC and the following requirements:

1. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe barrel. Suitable excavations shall be made to receive the bell of the pipe and the joint shall not bear upon the bottom of the trench. All adjustments to line and grade shall be made by scraping away or filling in with sand under the body of the pipe and not by wedging or blocking.

2. If the trench is excavated below the required grade, correct any part of the trench excavated below the grade, at no additional cost to the District. Place the backfill material over the full width of trench in compacted layers not exceeding 6 inches deep to the established grade with allowance for the pipe base. If shoring is required, the trenches shall be shored and braced in accordance with the Trench Construction Safety Orders of the Division of Industrial Safety.

3. When subgrade is encountered that in the opinion of the District's Representative is unsuitable for pipe support, the District's Representative may order the excavation to be carried to an approved depth below the bottom of the pipe and backfilled with sand, to the lines and grades shown on the drawings and specified by the District's Representative.

4. The minimum width of the trench at the top of the pipe zone shall be as necessary to install the pipe. The utility lines shall be centered in the trench. In the event of

(1) actual physical interference between existing crossing subsurface utilities and the proposed utility lines and (2) vertical discrepancy in connecting proposed utility lines to existing utility system, a minimum clearance of 0.5 feet between the utility line and the crossing, interfering utility shall be provided, unless otherwise indicated on the plans.

5. Where existing utilities or tree roots are to be protected, trench excavation shall be by hand. No mechanical excavating equipment shall be used within 6 inches of any utility or root.

6. Trenching machinery may be used for excavations provided the specified trench width can be maintained.

3.03 TRENCH BACKFILL

A. Pipe bedding and trench backfill materials: Suitable imported pipe bedding for utilities shall consist of material having a sand equivalent of at least 30. The sand backfill material shall be placed within the pipe zone that extends from the bottom of the pipe to at least 12 inches above the top of the pipe for the full width of the trench. The horizontal distance between the springline of the pipe and the side walls of the trench shall be such that bedding material can be properly placed and compacted below the haunches of the pipe. Pipe bedding and pipe zone backfill shall be compacted to at least 95 percent relative compaction. Backfill material placement shall conform to provisions of Sections 306-1.2.1 and 306-1.3 of the SSPWC.

B. Trench backfill placed above the pipe zone shall consist of suitable onsite or imported soil. The trench backfill materials shall be compacted to at least 90 percent relative compaction. Compaction shall be increased to a minimum of 95 percent of maximum dry density within structural fills within building areas. Mechanical compaction of trench backfill shall be performed and water consolidation (jetting) methods of compaction shall not be permitted. Trench backfill in landscape areas shall be compacted to a minimum of 90 percent relative compaction or per landscape specifications.

C. Trench Backfilling shall conform to the requirements of Sections 306-1.2.1 and 306-1.3 of the SSPWC:

1. During the process of laying pipe in trenches, sufficient material shall be carefully placed and hand tamped about the pipe to hold it firmly to established line and grade. Oversized material, broken rock or shale, if encountered, shall not be used for backfill.

2. No motor driven mechanical compacting equipment shall be used over pipelines until the backfill has been compacted to 12 inches over the crown of the pipe.

3. All backfill material shall be deposited in horizontal layers not exceeding the thickness specified in Section 306-1.3.2 of the SSPWC and not exceeding 8 inches in thickness. The distribution of materials shall be such that all material following compaction and consolidation will form a homogeneous mass free of voids, pockets, streaks or other imperfections. Backfilling shall be done with earth free from lumps, hardpan, chunks, paving material, organic matter or other deleterious substances.

4. Jetting of bedding or backfill material to obtain specific moisture content or for compaction shall not be permitted. If encountered, existing fill in the utility excavation shall be excavated and recompacted or removed and replaced with new fill materials per requirements of Section 2.02.

5. Compaction of all backfill material for trenches, pavements or structures, shall be per provisions of Sections 306-1.2.1 and 306-1.3 of the SSPWC. Appropriate warning detector tape shall be placed over all utilities.

6. Prior to final cleanup or resurfacing, the District's Representative shall take compaction tests in any backfill area and at any depth, with the Contractor providing equipment and operator to assist in such test. If any such compaction test fails, the Contractor shall correct such failure and pay for any retesting that is required. The District's Representative shall make as many tests as he feels is required to receive a satisfactory and acceptable job.

3.04 STOCKPILING

A. Stockpiling of imported materials or excavated materials shall direct surface water away from approved stockpile site to prevent erosion.

B. After stockpiles are removed, leave area in a clean and neat condition.

3.05 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by District's Representative.

END OF SECTION

SECTION 32 01 30

LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1. 1 SECTION INCLUDES

A. This section includes requirements for the maintenance of the completed landscape installation. All items noted in these specifications that are required as result of the District's option shall be included in the total bid cost of the work.

1.2 MAINTENANCE PERIOD

A. After all work indicated on the drawings or herein specified including all planting, irrigation and miscellaneous work has been completed, inspected, and approved by the District, the Contractor shall maintain all planted areas by means of continuos watering, weeding, mowing, re-seeding, cultivating, spraying, mulching, trimming, edging, and/or any other operation necessary for the care and upkeep for the period of ninety (90) days after the approval of the Work.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Any required spraying work shall be done in accordance with governing agencies.

PART 2 - PRODUCTS

A. All materials used in conjunction with the maintenance work shall conform to the material requirements originally specified for the work. Apply at manufacturer's recommended rate.

PART 3 - EXECUTION

3.1 REPLACEMENTS

A. Contractor shall immediately replace any and all plant materials which, for any reason, die or are damaged while under his care. Replacement plants shall be of the same quality as the originally specified plants.

3.2 REPAIR

A. Damage to planting areas shall be repaired immediately.

B. Depressions caused by vehicles, equipment and foot traffic will be filled with soil, leveled and replanted.

C. Exterminate gophers and moles, repair damage as above. Comply with all District and State requirements for the use of pesticides and or herbicides. Receive approval for the district before applying any herbicides and or pesticides.

3.3 CLEAN-UP

A. All shrub planted areas shall be kept free of debris and weeded at not more than ten-day intervals. If broad leaf weeds become prevalent the District has the option to require that the Contractor apply an approved broad leaf weed herbicide.

B. At completion of the maintenance period, all areas included in the Contract shall be clean and free of debris and weeds. All plant materials shall be live, healthy and free of infestation.

3.4 FERTILIZING

A. shrub areas - Apply one pound of actual nitrogen per 1,000 square feet. Use a balanced fertilizer with a 3:1:2 ratio of NPK with Sulphur. Receive approval from the District before applying. If the District request apply a second application 30 days before the end of the maintenance period.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 - GENERAL

1.01 SUMMARY

A. Aggregate base course for curbs, gutters, sidewalks , and fire access driveway.

1.02 RELATED SECTIONS

A. Section 31 20 00 Earthwork.

B. Section 32 16 00 Curbs, Gutters, Sidewalks, and Driveways.

1.03 REFERENCES

A. Standard Specifications for Public Works (SSPWC), latest edition.

B. ASTM Standards.

C. State Standard Specifications (SSS), Caltrans, latest edition.

1.04 SUBMITTALS:

A. Submit material samples and reports in accordance with requirements of District.

B. Submit samples in sufficient quantities for material testing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregate Base Material shall be Class 2 Aggregate Base conforming to SSS Section 26-1.02A. Aggregate Base shall have a minimum sand equivalence of 22 and a minimum R-value of 78 and shall be free of organic materials and other deleterious substances.

B. Aggregate Base materials used within building areas shall be free of asphaltic materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify substrate has been inspected; gradients and elevations are correct, and dry.

3.02 AGGREGATE BASE PLACEMENT

A. Aggregate base placement shall conform to the provisions of the SSPWC, Section 301-2

B. Level and contour surfaces to elevations and gradients indicated.

C. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

D. Where the required aggregate base thickness is 6 inches or less, the watered base may be spread and compacted in one layer. Where the required thickness is more than 6 inches, the aggregate base material shall be spread and compacted in 2 or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.

E. Aggregate base course shall be dense and unyielding upon proof-rolling with full water truck.

3.03 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch.

B. Scheduled Compacted Thickness shall conform to the provisions of the SSPWC Section 301-2.2.

3.04 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by the District's Testing Laboratory. Compaction testing will be performed in accordance with ASTM D1557, latest edition.

B. If tests indicate work does not meet specified requirements, remove work, replace and retest at Contractor's expense.

END OF SECTION

SECTION 32 12 16

ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Asphaltic concrete paving for parking lots and driveway pavements.

1.02 RELATED SECTIONS

A. Section 31 20 00 Earthwork.

B. Section 32 11 23 Aggregate Base Course.

1.03 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

B. ASTM Standards.

1.04 SUBMITTALS

A. Submit asphalt concrete mix design(s) for approval of the District Representative.

1.05 TESTING AND INSPECTION

A. Testing and inspection of asphalt pavement mix(es) and testing of placed stabilizing base course and asphalt pavement will be performed by the District's Testing Laboratory. Testing and inspection will be performed so as to minimize disruption of work.

B. Allow the District's Testing Laboratory access to the mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in the preparation of asphaltic concrete mix.

PART 2 – PRODUCTS

2.01 GENERAL

A. Provide the aggregate base, and bituminous surface conforming to the requirements of the Standard Specifications for Public Works Construction (SSPWC).

2.02 PAVING MATERIALS

A. Asphalt Concrete: Asphalt concrete material shall be Type III, C2-PG 64-10 per SSPWC Section 400-4. The grading and proportioning of aggregates shall be such that the combined mineral aggregate conforms to the specified requirements.

B. Asphalt Emulsion: SSPWC Section 203-3, Grade SS-1h.

C. Prime Coat: Grade SC-70 per SSPWC Section 203-2.

D. Aggregates for base course shall conform to requirements of Specification Section 02231, Aggregate Base Course.

2.03 ASPHALT PAVEMENT MIX

A. Combine mineral constituents in proportions to produce a mixture conforming to requirements of the SSPWC Section 400-4.

B. Percentage by weight of asphalt cement in mixture shall be in accordance with SSPWC Section 400-4.

C. Maintain thorough and uniform mixture.

D. Bring asphalt and mineral constituents to required temperatures before mixing. Ensure aggregates are sufficiently dry so as not to cause foaming in mixture.

PART 3 – EXECUTION

3.01 GENERAL

A. Execute Work in accordance with SSPWC Section 302.

3.02 PREPARATION

A. Ensure grading of subgrade to required elevation. Subgrade preparation shall be per SSPWC Section 301.

B. Before final rolling, shape entire section, add additional sub-soil if necessary, and compact subgrade to provide grades, elevation and cross-section indicated. Points of finished subgrade surface shall be within 0.04 foot of elevations indicated on the Drawings.

3.03 BASE COURSE

A. Place aggregate base in accordance with requirements of SSPWC Section 301 and to the thickness shown on the Drawings. Grade and compact in 6-inch layers to at least 95 percent of compaction (ASTM D1557).

3.04 MAINTENANCE

A. Maintain the base course until the asphaltic pavement is in place. Maintenance shall include drainage, rolling, shaping and water as necessary to maintain the course in proper condition. Maintain sufficient moisture at the surface to prevent a dusty condition. Areas of completed base course that are damaged shall be conditioned, reshaped and re-compacted in accordance with the requirements of the Specifications without additional cost to the District.

3.05 TACK COAT

A. Prior to the application of the asphalt concrete, a paint binder (tack coat) shall be applied to all surfaces of walkway, curbs, gutters, manholes and drainage structures which will be in contact with asphalt pavement per SSPWC Section 302-5.4.

B. Coat surfaces of catch basins which are to remain free of asphalt with oil, or provide equivalent protection, to prevent asphalt adhesion.

3.06 PRIME COAT

A. Prior to the application of the asphalt concrete, a prime coat shall be applied at a rate of 0.20 to 0.40 gallons per square yard.

3.07 ASPHALT CONCRETE

A. Requirements: The bituminous concrete shall consist of mineral aggregate, uniformly mixed with bituminous material in a central plant in accordance with SSPWC Section 400-4. The percentage of asphalt binder shall be in accordance with SSPWC Section 400-4. The mixing plant and construction equipment shall conform to the requirements of SSPWC Sections 302-5 and 400-4.

B. Placing: Deliver bituminous mixtures to the work site temperatures specified in SSPWC Section 302-5.5. Spread and place in accordance with SSPC Section 302-5.5. Asphalt surface shall be fog-sealed.

C. Compaction: Initial or breakdown rolling and the final rolling of the uppermost layer of the asphalt concrete shall be in accordance with SSPWC Section 302-5.6. Compaction by vehicular traffic shall not be permitted.

3.08 JOINING PAVEMENT

A. Carefully make joints between old and new pavements or between successive days work in such manner as to insure a continuous bond between old and new sections of the course in accordance with SSPWC Section 302.

B. Expose and clean edges of existing pavement. Cut edge to straight, vertical surfaces. Paint all joints with a uniform coat of tack coat before the fresh mixture is placed. Prepare joints in the new pavement in accordance with SSPWC Section 302-5.7.

3.09 JOINING NON-PAVED AREAS

A. Where paving will join landscape or other non-hardscape area a redwood header shall be installed.

3.10 TOLERANCES

A. Flatness: Maximum variation of 1/8 inch when measured with a 10-foot straight edge.

B. Variation from True Elevation: Within 1/4 inch.

3.11 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by the District's Testing Laboratory.

B. Field inspection and testing will be performed by the District's Testing Laboratory. The Contractor shall cooperate with such testing and shall give the District Representative advance notice of paving scheduling. Sufficient "Advance Notice" shall be determined by the District Representative.

C. If tests indicate materials do not meet specified requirement, replace material and retest at no additional cost to the District.

D. Frequency of Test: As determined by the District's Testing Laboratory.

3.12 PROTECTION

A. After placement, protect pavement from mechanical injury.

END OF SECTION

SECTION 32 1313

SITE CONCRETE WORK

PART 1 - GENERAL

1.01 SUMMARY

A. 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.

2. Cast-in-place and surface applied Tactile Warning Pavers.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 32 3113 - Chain Link Fences and Gates.

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-inch by 3-inch concrete Sample of each specified color.

C. Material Sample: Submit one concrete bumper to the Project Inspector for destructive testing.

1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications For Public Works Construction.

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 A185, 4 by 4/W1.4 by W1.4 welded wire mesh.

3. Expansion Joint Filler: Preformed expansion joint filler, bituminous type, complying with ASTM D994.

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. Tactile Warning Pavers:

1. Cast-in-place detectable/warning pavers shall be Vitrified Polymer Composite (VPC) pavers by Armor-Tile (www.armor-tile.com), ADA Solutions Inc. (www.adatile.com) or equal with raised dome dimensions and patterns complying with CBC Chapter 11B.

2. Surface applied detectable/warning pavers are not acceptable.

D. 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 ½-inch wide, 5 ½-inch high and 6-foot long. Reinforce with two #5 reinforcing bars. Provide 2 3/4-inch diameter pre-drilled holes for anchor installation.

2. Bumper Anchors: Provide ½ inch diameter by 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 \directly 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 percent and medium broom finish at slopes up to six percent.

3.02 INSTALLATION OF TACTILE WARNING TILES AND PAVERS

A. Install detectable/warning tile and pavers in strict accordance with manufacturers printed installation instructions and project details.

3.03 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 16 00

CURBS, GUTTERS, SIDEWALKS

PART 1 – GENERAL

1.01 SUMMARY

A. Concrete for curbs, gutters, sidewalks.

1.02 RELATED SECTIONS

A. Section 31 20 00 – Earthwork

1.03 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

B. ASTM Standards.

1.04 SUBMITTALS

A. Submit the following:

1. Product Data: Provide data on admixtures and curing compounds.

2. Concrete mix design(s).

3. Certificates from the batch plant.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with the SSPWC, latest edition; and ASTM Standards, latest edition.

B. Obtain cementitious materials from same source throughout.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F or surface is wet.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

A. Form Materials: Section 303-5 of the SSPWC.

2.02 CONCRETE MATERIALS

A. Concrete Material for Curbs, Walk (Path of Travel), Pavement, and Cast-in-Place Catch Basin:

1. Class 560-C-3250 for cast-in-place catch basins, curbs, and gutters. Portland cement concrete per Standard Specifications for Public Works Construction Section 201-1.1.2.

2. Concrete reinforcements shall be constructed per the Project Plans and Specifications.

2.03 ACCESSORIES

A. Curing Compound shall conform to SSPWC Section 201-4. Pigmented compound shall not demonstrate any residual coloring of the concrete after one week.

2.04 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94.

B. Use accelerating admixtures in cold weather only when approved by the District's Representative. Use of admixtures will not relax cold weather placement requirements.

C. Use calcium chloride only when approved by the District 's Representative.

D. Use set retarding admixtures during hot weather only when approved by the District 's Representative.

2.05 CONCRETE REINFORCEMENT

A. Concrete reinforcement shall conform to SSPWC Section 201-2.2.3 and the Project Plans.

2.06 SOURCE QUALITY CONTROL

A. Provide certificates of compliance from the batch plant.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support imposed loads.

B. Verify gradients and elevations of subgrade are correct.

3.02 PREPARATION

A. Moisten subgrade to minimize absorption of water from fresh concrete. Compact subgrade material to a depth of 12" beneath aggregate base below concrete pavements to 95% relative compaction.

B. Coat surfaces of catch basin frames with oil to prevent bond with concrete pavement.

C. Notify District's Representative a minimum of 24 hours prior to commencement of concrete placement operations.

3.03 FORMING

A. Place and secure forms to correct location, dimension, and profile.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with SSPWC Section 303-5.

B. Install ½" thick fiberboard expansion joint and snap cap. Seal with Sikaflex self-leveling sealant after removal of snap cap (typical).

C. Construct weakened plane joints conforming to SSPWC Section 303-5.4.3, one inch deep, at intervals not exceeding 10 feet.

D. The top edges of curbs shall have 0.5" radius.

3.05 FINISHING

A. Concrete finishes shall be per SSPWC Section 303-5.5.3.

B. Portland cement concrete paving shall have a medium salt (medium broom) finish on all surfaces less than or equal to 5% and slip resistant (heavy broom finish) on all surfaces greater than 5%.

C. Walkway grades in excess of 5% shall conform to requirements of Section 1133B.7.3, California Building Code (2010 edition).

D. Place curing compound in accordance with SSPWC Section 303-5.6 on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.06 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by the District's Testing Laboratory.

B. District 's Testing Laboratory will perform slump and compressive strength tests.

C. Contractor shall maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.07 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, vandalism and mechanical injury.

B. It is the Contractor's responsibility to replace all concrete work subject to vandalism and graffiti at no extra cost to the District.

END OF SECTION

SECTION 32 1723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Parking stripes, markings and accessibility symbols.
2. Fire lane "No Parking."
3. Curb marking and red curbs.

B. Related Requirements:

1. Division 01 - General Requirements.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings, indicating location, extent, color and texture of markings.

B. Material Samples: Submit color Samples.

1.03 PROJECT CONDITIONS

A. Do not install markings when adverse weather conditions are forecasted.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Paint: Water emulsion-based traffic paint.

1. Dunn Edwards: Vin-L-Stripe.
2. Pervo Paint Company: Acrylic Traffic Paint.
3. Sherwin Williams: Setfast Acrylic Traffic Paint.
4. Vista Paint Corporation: Traffic Paint.
5. Equal.

PART 3 - EXECUTION

3.01 PAVEMENT MARKINGS

A. Application of Paint:

1. Prior to application of paint, allow the pavement to properly cure. Clean and prepare in accordance with paint manufacturer's written recommendations.

2. Provide mechanical equipment to apply paint in a uniform, straight or curved pattern, without gaps, holidays, runs, or other defects.

3. Do not permit traffic until paint has completely cured.

4. Apply two coats in thickness recommended by manufacturer.

5. Playground Markings: Submit Samples to Architect for review. Limited color palettes may be submitted.

B. Marking Width and Color: Unless indicated otherwise, marking width and color are as follows:

Location	Width	Color
Parking stall lines	4 inches	White
Traffic markings		
Striping:	4 inches	Yellow
General	4 inches	Yellow
Accessible Parking	4 inches	Blue
International Symbol of Accessibility (ISA)	2 inches	White on blue background
Letters and numbers:		As indicated

*Where two sets of lines overlap, one set shall be white and the other set shall be yellow.

3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 80 00

IRRIGATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section includes general requirements for the installation of the irrigation system.

1.2 RELATED SECTIONS

A. Section 32 90 00 Planting

1.3 CATALOG CUTS

A. Ten (10) days after award of Contract submit to the District for approval, five (5) copies of all Manufacturer's catalog cuts, and specifications for all required products.

1.4 RECORD DRAWINGS

A. The Contractor shall maintain a complete and accurate set of record drawings. These drawings shall be kept up to date with the progress of the Work. The Owner shall furnish a set of drawings on which to record drawing conditions. Record drawings shall be up-dated on a weekly basis.

B. The Contractor shall indicate clearly and correctly Work installed differently from that shown on the Contract Drawings by dimensioning from two permanent points of reference. Show connections to existing water lines, ball valves, pressure supply pipe, control valves, quick couplers, and control wiring.

C. On completion of the Work, the Contractor shall submit the completed Record Drawings to the Landscape Architect for transfer to electronic file. Once complete, this final electronic file shall be reviewed by the Contractor and certified as complete and accurate records of work as-built.

1.5 CONTROLLER CHARTS

A. Reduce the approved irrigation record drawing to a size that will fit into the irrigation controller and still remain legible. Color the chart with one color for each valve and its coverage area then have a printing company encapsulated the chart in 5 mil clear plastic. Install finished controller chart in the controller.

1.6 DRAWINGS

A. For purposes of legibility, irrigation lines are essentially diagrammatic, although size and location of irrigation equipment are drawn to scale wherever possible. Make use of all data in all of the Contract Documents and verify this information at construction site.

1.7 MATERIALS TO BE FURNISHED

A. Prior to final inspection, the Contractor shall furnish the following materials to the District: Two keys for each automatic controller, Two operating wrenches to manually open and close operating nut on gate valves.

1. 8 ON-SITE OBSERVATIONS

A.. The Contractor shall notify the Landscape Architect and District Inspector forty-eight hours in advance for all required On-Site Observations. The final On-Site Observation shall require seven days advance notice. The following are required On-Site Observations:

1. Job start meeting.
2. Prior to start of work review existing irrigation system adjacent to the retrofit work. Review all circuits which may be affected by the new work and review with the Landscape Architect any existing defects or deficiencies that can be determined.
3. Review irrigation mainline with the Landscape Architect prior to backfilling. Record drawings must be current at the time of these On-Site Observations.
4. Review with the Landscape Architect the irrigation main line when pressure test is complete. Pressure supply lines shall be tested under hydrostatic pressure of one hundred fifty pounds per square inch for a period of two hours and must be approved by the Landscape Architect prior to backfilling.
5. Irrigation system coverage test. When the irrigation system is completed, determine if the water coverage for the planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the Contract Drawings. Irrigation coverage must be approved by the Landscape Architect and District Inspector before any ground cover or shrubs are planted.

PART 2 - PRODUCTS

2. 1 GENERAL

All irrigation equipment shall be new and unused prior to installation, and shall conform to the irrigation plan and legend as specified.

2.2 MATERIALS

A. Pipe Cable & Wire:

1. Sleeving – Sch. 40 PVC and Class 200 PVC - 3 Pipe sizes larger than the pipe to be sleeved - 24" below grade. See pipe sleeving chart on irrigation plan.

2. Mainline - (PW Eagle) SCH. 40 PVC - Standard white color - 1-1/2" & Smaller - Solvent weld 24" below grade.

3. Lateral - (PW Eagle) Schedule 40 PVC - Standard white color - 3/4" & Larger - Solvent weld - 12" below grade.

4. 14 Gauge direct bury wire.

B. Quick Coupling Valve (Rain Bird) 44 RC - 1" size - In 10" Green colored round valve box.

C. Valve Boxes

1. Valve boxes for quick couplers and in line check valves shall be 10" round, green lid, with locking bolt. Manufactured by NDS Model No. 212BCB or Carson Model No. 910-3B-Green, or approved equal.

2. Valve boxes for remote control valve assemblies shall be jumbo boxes 13" W x 24" L x 12" D rectangular, green lid, and locking bolt. Manufactured by NDS Model No. 221BCB or Carson Model No. 1324-12-Green or approved equal.

D. Valves:

1. Remote Control Valve - (Superior 3200) Series - sizes noted - in a green colored Jumbo rectangular valve box.

2 Brass gate valves used as isolation valve in remote control valve assembly shall be Nibco T-113, line size or approved equal.

E. Solvents-PVC primer and solvents – As recommended by manufacturer. Weld-on, Christy, or equal.

F. Flexible Sch. 40 PVC Hose-PVC Flex Hose – constructed from durable, UVR, S-0214 non-rigid PVC blend materials, furnished with algae resistant compound,

solvent weld, tan in color, with tan PVC UVR fittings I.P.S. 3/8" size, manufactured by Hunter Model IPS-050250 (0.84") O.D., tan in color.

G. PVC Main Line Fittings- for pipe sizes of 1-1/2" or less, shall be schedule 40 PVC, Type 1, Grade 1, Cell Classification 12454-B, side gated, Lasco or equal.

H. PVC Lateral fittings for pipe size 2" or less shall be Lasco or equal'

I. Nipples and Risers-Nipples and Risers shall be PVC Schedule 80.

J. Pressure Compensating Emitters-Plastic emitters, ½" FIPT, black in color, pressure compensating, 2 GPH flow manufactured by Bowsmith model SL200..

K. Direct Bury Splice Kit (for 14 ga. Wire)-Spears model DS 400.

L. Dripline tubing – 1 GPH emitters spaced 18 inches on center Hunter model number PDL-10-18-100.

M. Thrust Blocks - Concrete for thrust blocks shall be 2500 psi.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Before starting Work on irrigation system, carefully check all grades to determine that Work may safely proceed, keeping within the specified material depths.

B. Do not willfully install the irrigation system as indicated on the Drawings when it is obvious in the field that unknown obstructions, field dimensions, or grade differences exist, that might not have been considered in the engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect.

C. The installation of all irrigation materials, including pipe, shall be coordinated with the landscape Drawings to avoid interfering with the trees, shrubs, or other planting.

D. Lay out irrigation heads and make any minor adjustments required due to differences between site and Drawings. Any such deviations in layout shall be within the intent of the original Drawings, and without additional cost to the District. When directed by the Landscape Architect the layout shall be approved before installation.

3.2 WATER SUPPLY

A. Connections shall be existing main line as indicated on the drawing. Make connections, install new main, and perform all necessary work.

3.3 PIPE FITTINGS (less than two inch

A. All plastic threaded pipe and fittings shall be assembled using non-hardening sealant

B. All plastic slip fittings shall be solvent-welded as per pipe manufacturer's recommendations.

3.4 LINE CLEARANCE

A. All lines shall have a minimum clearance of four inches from each other, and six inches from lines of other trades. Parallel lines shall be installed directly over one another.

3.5 TRACE WIRE

A. 3" blue colored detectable marking tape "Irrigation Water", Christy model TA-DT-3-BIRR, or equal. Install 12" below grade directly over irrigation mainline.

3.6 TRENCHING

A. Dig trench and support pipe continuously on bottom of ditch. Snake pipe in trench to an even grade as noted.

B. Provide minimum cover of 24 inches for all pressure supply lines.

C. Provide minimum cover of 24 inches for all control wires.

D. Provide minimum cover of twelve inches for all other non-pressure lines.

E. All lines under driveway and roadway pavement shall have a twenty-four inch minimum cover below sub-grade.

3.7 BACKFILLING

A. Backfill for trenching shall be compacted to a dry density equal to the adjacent undisturbed soil, and shall conform to the adjacent grades without dips, sunken areas, humps or other irregularities. Initial backfill on all lines shall be of a fine granular material with no foreign matter larger than one inch in size an six to eight inches deep.

B. All irrigation lines under paving shall be backfilled entirely with sand and compacted.

C. Trenches shall be backfilled promptly after the open trench inspection.

D. After initial backfill placement of 6" to 8" over mainline, place caution tape and complete backfill.

3.8 CONTROL WIRES

A. 24-volt conductors shall be U.F. type, solid wire, U.L. approved for direct burial. Minimum size shall be 14 Ga. or as noted on drawings, used to connect remote control valve solenoids to automatic controller, Paige Wire or approved equal.

B. Wiring shall occupy the same trench and shall be installed along the same route as the pressure supply line wherever possible.

C. An expansion loop of 36 inches shall be provided at each wire connection and/or directional turn, with all wire pull boxes.

3.9 DRIP EMITTERS

A. Layout proposed planting design with marking flags to indicate shrub and tree locations. Obtain approval from the District before proceeding.

B. Trench and install laterals. Install Schedule 40 PVC piping as per plan with flexible PVC tubing segments ending adjacent to each proposed plant location root ball. Refer to irrigation details for all installation requirements and specific equipment components.

C. Flush system thoroughly and install pressure compensating emitters as per plan.

3.10 SLEEVING

A. All lines under paving with PVC pipe with minimum 3 pipe sizes larger than the O.D. of the line to be sleeved. Refer to irrigation sleeving schedule on irrigation plan

3.11 THRUST BLOCKS

A. Install thrust blocks at all directional changes in the main line. Thrust blocks shall be concrete and shall be installed on firm, stable, subgrade and shall be a minimum of one foot below the finish grade. Concrete shall be constructed in accordance with the plans. Thrust blocks shall be installed between undisturbed ground and the fittings to be anchored. Place concrete so pipe joints and fittings remain accessible to repairs.

3.12 FLUSHING THE MAIN LINE

A. Make provisions to flush new main line clean and protect existing main line and existing circuits from any debris.

3.13 FLUSHING THE SYSTEM

A. After all new irrigation pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of irrigation heads, the control valves shall be opened and a full head of water used to flush out the system.

3.14 ADJUSTING OF SYSTEM

A. Adjust valves, and alignment and coverage of all irrigation heads.

B. If it is determined that adjustments in the irrigation equipment or nozzle changes will provide proper and more adequate coverage, make all necessary changes, without additional cost to the Owner, prior to any planting.

C. The entire system shall be operating properly before any planting operations commence.

D. Existing system, which may be affected by retrofit, should be tested for leaks, coverage, etc. before and after new installation is completed. Defective valves, etc. that were operable before installation must be repaired and/or replaced by the contractor.

3.15 CLEAN-UP AND REPAIR

A. Upon completion of the Work, make the ground surface level, remove excess materials, rubbish, debris, etc, and remove construction and installation equipment from the premises. Dispose of in a safe and legal manner.

B. Replace and/or repair to the satisfaction of the District all existing paving disturbed during the course of this work. New paving shall be the same type, strength, texture, finish, and be equal in every way to the material removed.

3.16 GUARANTEE

A. The entire irrigation system shall be guaranteed by the Contractor as to material and workmanship, including settling of backfilled areas for a period of one year following the date of final acceptance of the work.

B. This guarantee is in addition to, and not a limitation of, other rights the district may have under the Contract Documents.

END OF SECTION

SECTION 32 90 00

PLANTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section includes general requirements for the installation of the plant material and lawn repair and seeding.

1.2 RELATED SECTIONS

Section 32 10 30 Maintenance
Section 32 80 00 Irrigation

1.3 SUBMITTALS

A. Furnish material invoices indicating the quantities of fertilizers, soil amendments, and all materials delivered to the job site. Material invoices must be approved by the Landscape Architect prior to incorporating soil amendments. Certificates shall be prepared by the supplier or distributor and shall indicate the quantities and qualities of materials used.

B. Plant Material – Submit clear photos of all plant material specified taken and the source. Indicate plant material height and spread measured at the source. Photos must clearly show the plant quality and size. The Landscape Architect will determine if the photos meet the specifications and if further site inspection at the nursery is required or if another source is required to produce the specified plant material.

1.4 PROTECTION

A. Contractor shall check or locate existing structures, electric cables or conduits, utility lines and other existing features or conditions above or below ground level that might be damaged as a result of the operation. Questions or conflicts arising out of such examination prior to or during operation shall be immediately directed to the attention of the District for necessary action or decisions before resuming operation. Contractor shall be responsible for repair or replacement at no cost to the District for features or conditions damaged through failure to comply with the above procedures.

B. Protect existing trees and tree roots from any damage that may be caused as a result of any planting or irrigation operations.

1.5 ALTERNATES

A. Alternates will not be permitted, except where indicated, and as approved by the Landscape Architect.

1.6 LANDSCAPE ON-SITE OBSERVATIONS

A. The Contractor shall notify the district and the Landscape Architect forty-eight (48) hours in advance for all required On-Site Observations. The final On-Site Observation shall require seven (7) days advance notice.

B. The Contractor shall submit for approval a complete work schedule indicating tentative dates for On-Site Observations.

C. Record drawings shall be current and present at the time of On-Site Observations and shall be updated on a weekly basis.

D. Landscape On-Site Observations shall be required for the following phases of Work:

1. Job start meeting.

2. Finish grading - When all fine grading work is complete, notify the Landscape Architect for approval prior to proceeding with the planting.

3. Soil Preparation - furnish certificates for soil amendments at this time. Quantities must be reviewed by the Landscape Architect prior to incorporating into soil. When all soil preparation work is complete notify the Landscape Architect for approval prior to proceeding with the work.

4. Irrigation System Review - See Irrigation Section.

5. Review plant material for quality prior to planting. The Landscape Architect has the right to reject any plant material that it deems unacceptable at time of delivery.

6. Review planting during the planting process.

7. Review planting after installation.

8. Pre-maintenance - When all Work has been completed a pre-maintenance walk thru shall be conducted and the contractor must receive approval from the District prior to starting the maintenance period.

9. Maintenance - Notify the District and the Landscape Architect after the maintenance period has progressed for thirty days for a review of all work and make all corrections that are deemed necessary.

10. Final Review - After the ninety-day (90) maintenance period is complete notify the District and the Landscape Architect for a final review of all work. All work must receive approval from the District and the Landscape Architect prior to being deemed complete and or filing a notice of completion.

1.7 QUALITY

A. All plant material shall have a growth habit normal to the species and shall be sound, healthy, vigorous and free from insect pests, plant diseases, sun scalds, fresh bark abrasions, excessive abrasions, or other objectionable disfigurements. Tree trunks shall be sturdy and well "hardened off." All plants shall have normal well-developed branch systems, and vigorous and fibrous roots systems which are neither root- nor pot-bound and are free of kinked or girdling roots.

1.8 GUARANTEE

A. All plant material shall be guaranteed for one year. This guarantee is in addition to, and not a limitation of, other rights the District may have under the Contract Document.

PART 2 - PRODUCTS

2.1 MATERIALS-: LANDSCAPE

A. Soil Amendments: Organic soil amendment shall be Agromin "Agromend", or equal.

B. Shrubs: varieties, sizes and quantities as noted on the plans. Plants shall be fully rooted throughout the entire container without any circling roots. 5 gallon plants shall be between 18 inches to 24 inches high and approximately the same width as the container.

C. Backfill material for shrubs shall have a thorough mixture of:

1. 1/2 Agromin "Agromend"
2. 1/2 existing site soil.
3. Commercial Fertilizer (15-15-15), 1 lb. /cu. yd.
4. Iron, Zinc, Manganese, 1 oz. /cu. yd.

2.2 Mulch

A. Shall be Agromend ES-2 Mulch.

PART 3 - EXECUTION

3.1 SITE CONDITION

A. No plant materials shall be planted until all operations in conjunction with the installation of the irrigation system have been approved by the District and the Landscape Architect. Final grades shall be established and the planting areas shall be properly prepared and graded.

3.2 GROUND PREPARATION - ALL AREAS

A. After the Site Clearance and Preparation has been approved by the District planted areas shall be thoroughly cultivated to a depth of six inches to reduce any compaction, which occurs as a result of construction. Protect existing tree roots.

B. Stones or rocks over 1" in size, construction refuse, and other deleterious material shall be removed from the site, safely and legally disposed of.

C. Apply soil preparation materials to all planting areas and thoroughly incorporate into the top six inches of soil.

D. Wet soil thoroughly and allow to settle. Repeat this compaction procedure until soil is stable enough to permit aeration and drainage for plant material.

E. Finish grade all planting areas to a smooth, uniform surface ready for planting. Finish grade shall be two inches below finish grade of adjacent paved surfaces unless otherwise noted on Drawings. Shrub areas shall be fine graded to present a smooth uniform surface with no depressions or high spots.

3.3 PLANTING - SHRUBS

A. Shrub planting shall comply with details on drawings.

B. Make necessary adjustments and excavate pits of square outline and vertical sides for all plants. Scarify sides and bottoms of all plant pits.

C. Protect roots or ball of plants at all times from sun and drying winds.

D. If directed by the Landscape Architect the Contractor shall prune plants in accordance with standard horticultural practice.

E. Wet soil thoroughly and allow to settle. Repeat this compaction procedure until soil is stable enough to permit aeration and drainage for plant material.

END OF SECTION

SECTION 32 92 00
TURF GRASS SPRAYING

PART 1 GENERAL

1.01 SECTION INCLUDES

This section includes requirements for the spraying of the existing turf grass.

1.02 QUALITY ASSURANCE

A. Contractor shall have a valid Applicators License issued by the State of California D.F.A.

B. Contractor shall comply with the California Department of Pesticide Regulation as required for the application of herbicide at school sites.

C. Comply with all District Rules and Requirements.

PART 2 PRODUCTS

2.01 TARGET SPECIES

The weed species (target species) scheduled for removal include existing lawn areas identified on the Drawings.

2.02 HERBICIDE

For this work, Round-Up Pro Max as per the District approved list.

PART 3 EXECUTION

3.01 EXAMINATION OF SITE

A. The Contractor shall examine the site and observe the conditions under which the work shall be done and note any circumstances which will affect the work.

B. Prior to application of herbicide, the Contractor shall walk the site with the Landscape Architect and District Inspector for the purpose of identifying the work area and the target species.

3.02 SITE POSTING

Comply with all State and District requirements for posting notifications on site.

3.03 MANUFACTURERS PRODUCT LABEL

A. Contractor shall have all current product labels and Material Safety Data Sheets on the job site when the work is in progress.

B. Submit to the District, prior to the start of work, written recommendations for all product, rates of application, and copies of labels and M.S.D.S.

3.04 APPLICATION

Apply two (2) separate applications of herbicide with recommended kill time between applications.

3.05 TURF REMOVALS

After turf kill is approved by the District Inspector, scrape and remove from the site lawn areas designated to be removed.

3.06 DISPOSAL

Dispose of dead turf in a legal manner.

END OF SECTION 32 92 00

SECTION 33 10 00

WATER UTILITIES

PART 1 – GENERAL

1.01 SUMMARY

A. Pipe and fittings for site water lines.

B. Valves.

C. Fire hydrant.

D. Water meter

E. Backflow preventer.

1.02 RELATED SECTIONS

A. Section 31 20 00 Earthwork.

B. Section 31 23 33 Trenching and Backfilling.

1.03 REFERENCES

A. American Water Works Association Standards (AWWA).

B. Ventura County Water Works Districts - Design Standards.

C. Standard Specifications for Public Works Construction (Green Book), latest edition.

1.04 SUBMITTALS

A. Submit the following:

1. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories.

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

3. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Turn over to the project manager one set of drawings with all deviations from the plans shown in neat, clean and readable red ink.

4. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

5. Disinfection Report:
    a. Type and form of disinfectant used.
    b. Date and time of disinfectant injection start and time of completion.
    c. Test locations.
    d. Name of person collecting samples.
    e. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
    f. Date and time of flushing start and completion.
    g. Disinfectant residual after flushing in ppm for each outlet tested.

6. Bacteriological Report:
    a. Date issued, project name, and testing laboratory name, address, and telephone number.
    b. Time and date of water sample collection.
    c. Name of person collecting samples.
    d. Test locations.
    e. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
    f. Coliform bacteria test results for each outlet tested.
    g. Certify water conforms, or fails to conform, to bacterial standards of AWWA C651 Section 7.1 Standard Conditions

7. Water Quality Certificate: Certify water conforms to quality standards of City of Moorpark, suitable for human consumption.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of piping mains, valves, connections, fire hydrant, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with County of Ventura Standards, AWWA, and Standard Specifications for Public Works Construction.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.07 QUALIFICATIONS

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section with minimum three years experience.

B. Testing Firm: Company specializing in testing potable water systems, certified by State of California.

C. Submit bacteriologist's signature and authority associated with testing.

1.08 DELIVERY AND STORAGE

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 – PRODUCTS

2.01 GENERAL

A. All water lines shall be designed for a minimum working pressure of 250 psi. All fittings appurtenant piping materials shall be designed for a minimum working pressure of 250 psi unless otherwise indicated.

2.02 PIPE

A. Joints: Mechanical joints shall be used for the waterline construction unless otherwise shown on plans and standard details. Gaskets for mechanical joints shall be rubber conforming to ANSI A21.11 and AWWA C111.

B. Fittings: Fittings shall be ductile iron rated for 250 psi working pressure. Mechanical joint fittings shall conform to ANSI A21.10 or AWWA C110 (short short body style, not approved). Lining for fittings shall be Plastic Engineering P.E.I. 100 epoxy to a minimum thickness of 10 mils. Fittings shall be wrapped with 6 mil. polyethylene sheet. Grease all underground nuts and bolts before wrapped with the polyethylene sheet.

C. Polyvinyl Chloride (PVC) potable water pipe: Pipe material shall be (Polyvinyl chloride (PVC) pressured pipe shall be manufactured in accordance with AWWA Standard Specification C-900).

2.03 GATE VALVES

A. Conform to AWWA C-509-01.

B. Gate valves shall be iron body, NRS valves with O-ring seals, and shall open when the stem is rotated counterclockwise. The valves shall be designed for a minimum working pressure of 250 psig, have a bronze stem, and have a cast iron wedge with styrene butadiene rubber permanently bonded to the wedge. The valves shall have full port openings for unobstructed flow, be designed for underground service, and be in full compliance with the latest revision of AWWA C509. The valve linings and coatings shall be in accordance with AWWA C210-84. Linings and coatings shall be factory applied. Valves shall be furnished with 2-inch square operating nut. Valve shall be wrapped with 6 mil. polyethylene sheet. Grease all underground nuts and bolts before wrapping with the polyethylene sheet.

2.04 FIRE HYDRANT

A. Per County of Ventura Plans & Specifications.

2.05 WATER METER

A. Not Applicable.

2.06 BACKFLOW PREVENTER

A. Per County of Ventura Plans & Specifications.

B. Backflow preventer shall be lead free and USC approved.

2.07 ACCESSORIES

A. Concrete for Thrust Blocks: Contractor shall construct concrete thrust block per County of Ventura Standards.

B. Thrust blocks shall be constructed to bear against undisturbed earth and shall not bear against adjacent pipe, fittings, or valves. Where concrete must be poured around adjacent pipe, a block out or a short pipe length shall be used such that a flexible joint exists within 12 inches of each side of thrust block, unless indicated otherwise on the plans. Concrete shall not be allowed to set in contact with pipe surfaces or to enter or come in contact with any joint.

C. Valve Appurtenances: The Contractor shall furnish and install all valve appurtenances. Provide two galvanized T-handled operating wrenches, 4 feet total length or as required to easily access valve from grade.

D. Valve box body shall be unreinforced concrete 8 ¾" inside diameter traffic box with cast iron ring. The valve box cover shall be cast iron. Both valve body and cover shall be Christy G3 or equal. The cover shall be marked "water." The cover of each valve box shall be provided with a 2" diameter bronze disc and the Contractor shall stamp the valve number on the disc per the Architect's instructions. The disc shall be mounted to the valve box cover or higher using stainless steel screws. The extension piece shall be 8" in diameter, Class 150 P.V.C. water line conforming to the requirements of AWWA C-900.

E. Appropriate warning detector tape shall be placed over all utilities.

1. Underground detectable warning tape shall be placed over all non-metallic underground utilities.

2. 12-gauge copper continuous location wire shall be placed on all water mains.

F. Corrosion-Protection Encasement for Piping

1. Encasement for Underground Metal Piping and Fittings: AWWA C105, Polyethylene film, 10 mil minimum thickness, tube or sheet. Plastic wrap shall be clear or black. Purple wrap shall not be used.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify the existing water main sizes, class of pipes, and locations as indicated.

B. Verify piping system has been cleaned, inspected, and pressure tested.

C. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems

3.02 PREPARATION

A. Remove scale and dirt, on inside and outside, before assembly.

B. Prepare pipe connections to equipment with flanges or unions.

3.03 BEDDING

A. Excavate pipe trench in accordance with Specification Section 31 23 33 for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, compact to a minimum of 95 percent relative compaction.

C. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers to protect the pipe. Jetting is not permitted to obtain required compaction.

D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Route pipe in straight line.

B. Install pipe to allow for expansion and contraction without stressing pipe or joints.

C. Install access fittings to permit disinfection of water system.

D. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main in accordance with County of Ventura Standard Plans & Specifications.

E. Protect metal restrained joint components against corrosion by applying a bituminous coating by coating with non-oxide corrosion resistant greased 10 mil plastic wrap.

F. Establish elevations of buried piping to ensure cover conforming to District Standards. The minimum cover from the finish grade to the top of pipe is 36 inches for potable and fire waterline, any shallower cover to clear with the existing utility crossings shall be reviewed and approved by the District's Representative.

G. Install 12 gauge copper continuous location wire over top of pipe.

H. Backfill trench in accordance with Specification Section 31 23 33.

I. Maintain separation of water main from sewer piping in accordance with the State Department of Health Services, Criteria for the Separation of Water Mains and Sanitary Sewers (Section 64630, Title 22 California Administrative Code), and State Regional Water Quality Control Board.

J. All pipe laid in trench which is to be left for further extension (i.e., end of work day) shall have its open end covered to protect from possible rodent intrusion.

3.05 INSTALLATION - VALVES

A. Set valves on solid bearing per County of Ventura Standard Plans & Specifications.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Install brass valve 1 ½" diameter tags and imprint valve number per District.

3.06 SERVICE CONNECTIONS

A. Install service connections in accordance with County of Ventura Standard Plans & Specifications.

3.07 PRESSURE TEST OF WATER PIPING SYSTEM

A. Water piping system shall be pressure tested for 2 hours at 200 psi, with no allowable drop in water pressure.

B. All leakage tests shall be completed and approved prior to placing of permanent resurfacing.

C. Pressure test shall be witnessed by District's inspector.

3.08 DISINFECTION AND BACTERIA TESTING OF WATER PIPING SYSTEM

A. Water piping system shall be disinfected and flushed per AAWA Section C651.

B. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.

C. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.

D. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory to sample, test and certify water quality suitable for human consumption.

3.09 TEST RECORDS

A. Records shall be made of each piping system installation during the test. These records shall include:

1. Date of test.

2. Description and identification of piping tested.

3. Test fluid.

4. Test pressure.

5. Remarks to include such items as:

a. Leaks (type, location).
b. Repairs made on leaks.

6. Certification by Contractor and signed acknowledgment by the District's Representative.

3.10 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by District's Representative.

B. Perform pressure test on potable water distribution system in accordance with County of Ventura Standard Plans & Specifications except that there is no allowable leakage for the duration of the test.

1. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.

2. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.

END OF SECTION

SECTION 33 30 00

SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Site sanitary sewerage piping, fittings, accessories and bedding.

B. Cleanouts.

1.02 RELATED SECTIONS

A. Section 31 20 00 Earthwork.

B. Section 31 23 33 Trenching and Backfilling.

1.03 REFERENCES

A. Standard Specifications for Public Works Construction SSPWC (Green Book), latest edition.

B. ASTM Standards.

1.04 SUBMITTALS

A. Submit:

1. Product Data: Provide data indicating pipe, pipe accessories and appurtenances, and manhole covers.

2. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

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

4. Manufacturer's Certificate: Certify that installers are certified for installing plastic pipe.

1.05 PROJECT RECORD DOCUMENTS

A. Submit Record Drawings: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 REGULATORY REQUIREMENTS

A. Conform to California Title 24 (CCR) Part 5, latest edition, for installation of the Work of this section.

B. Minimum separation distance and requirements between water, reclaimed water and sewer pipes per the State of California, Department of Health Services shall be established.

PART 2 – PRODUCTS

2.01 SEWER PIPE MATERIALS AND ACCESSORIES

A. Polyvinyl Chloride (PVC) Pipe for Gravity Sewer: ASTM 3034-SDR35 Ring-Tite Polyvinyl Chloride (PVC) gravity sewer pipe and fittings; inside nominal diameter as indicated on Drawings. PVC pipe shall use "locked-in" rubber sealing ring conforming to ASTM D-3212. Joints using flexible Elastomeric Seals. Minimum pipe stiffness at 5% deflection shall be 46 psi for all sizes when tested in accordance with ASTM Method of Test D2412.

2.02 CLEANOUTS

A. Form and cast-in-place, Class 618-CLE-4000 P concrete base pad, with provisions for sewer pipe end section.

B. Frame and cover shall be Christy G3 or equal, lettered "sewer".

2.03 BEDDING MATERIALS

A. Refer to Specification Section 31 23 33 Trenching and Backfilling for Bedding Material.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that trench cut and/or excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with granular fill.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe trench in accordance with Specification Section 31 23 33. Hand trim excavation for accurate placement of pipe to elevations indicated on drawings.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth, compact to minimum of 95 percent of maximum dry density.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Install pipe, fittings and accessories in accordance with manufacturer's instructions.

B. Sewer pipeline shall be placed from downstream to upstream beginning at the downstream connection to the existing sewers.

C. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Install bedding along sides and over top of pipe to minimum compacted thickness of 12 inches; compacted to a minimum of 95 percent of maximum dry density.

E. Refer to Specification Section 31 23 33 for Trenching Requirements. Do not displace or damage pipe when compacting.

F. Install continuous trace wire over top of pipe.

G. Connect to building sanitary sewer lateral at 5' outside of edge of building.

H. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers to protect the pipe.

3.05 INSTALLATION – CLEANOUTS

A. From bottom of excavation clean and smooth to correct elevation.

B. Establish elevations and pipe inverts for inlets and outlets as indicated on drawings.

C. Mount lid and frame level in grout, secured to cone section to elevation indicated on drawings.

3.06 FIELD QUALITY CONTROL

A. Preliminary Tests: The Contractor may perform any tests desired which are not harmful to the lines before backfilling is completed.

B. Cleaning: Before final tests are performed for acceptance of any sewer pipe, clean the pipe by inflatable rubber ball method.

C. Perform air pressure test per SSPWC Section 306-1.4.4.

D. Repairs, if necessary: If the leakage or infiltration is greater than the amount specified, the pipe shall be overhauled and re-laid if necessary by the Contractor, at its own expense, until the joints will hold satisfactorily.

E. Regardless of the results of the above tests, any visible evidence of individual leaks shall be corrected by the Contractor to the satisfaction of the District's Representative.

F. Cleaning Sewer: After all backfilling, compaction testing and paving is completed, sewer lines shall be cleaned by Inflatable Rubber Ball Method, flushed and cleaned, before acceptance by the District's Representative and connection to their sewer system is made.

G. The Contractor shall furnish all sewer line plugs necessary for blocking off all lines as required by the District's Representative until final acceptance.

3.07 PROTECTION

A. Protect finished installation.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Storm drainage piping, fittings, accessories, and bedding.

B. Catch basins.

C. Manholes.

D. Inlet and outlet structures.

1.02 RELATED SECTIONS

A. Section 31 20 00 Earthwork.

B. Section 31 23 33 Trenching and Backfilling.

1.03 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

B. ASTM Standards.

1.04 SUBMITTALS

A. Submit the following in accordance with provisions in Division 1:

1. Product Data: Provide data indicating pipe, pipe accessories and catch basin grates.

2. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

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

4. Layout diagram for storm drain components per plan.

1.05 PROJECT RECORD DOCUMENTS

A. Submit record drawings. Accurately record locations of pipe runs, connections, catch basins, structures, manholes and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as indicated on drawings.

B. Complete pothole work per plans and notify the District of any discrepancy prior to commencing construction.

1.07 COORDINATION

A. Coordinate the work with connection to existing storm drain mains, and trenching.

PART 2 – PRODUCTS

2.01 PIPE MATERIALS

A. Polyvinyl Chloride (PVC) SDR35, per SSPWC Section 207-17.

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required. Fittings shall be watertight.

B. Solvent cap cement: pipe with solvent cement joints per SSPWC Section 207-17.3.3.

2.03 CATCH BASINS AND MANHOLES

A. Precast catch basins shall include traffic rated grate, as manufactured by Brooks or approved equal 3.

B. Cast-in-Place catch basins per Utility Improvement Plan.

2.04 METAL

A. All exposed metal parts are to be galvanized in accordance with SSPWC, Section 210-3.

2.05 CONCRETE

A. All concrete shall be Class 560-C-3250, per SSPWC Section 201.

2.06 BEDDING MATERIALS

A. Refer to Specification Section 31 23 33 Trenching and Backfilling for Bedding Material.

2.07 FILTER FABRIC

A. Filter fabric shall be non-woven geosynthetic per SSPWC Section 213-2.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive Work and excavations, dimensions, and elevations are as indicated on Drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with compacted bedding material.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe trench in accordance with Specification Section 31 23 33. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

B. Place bedding material in trench bottom, level materials in continuous layer. Bedding shall be 1/2 of pipe diameter or 4" minimum thickness whichever is greater, compact to a minimum of 95 percent of maximum dry density.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Construct tongue-and-groove mortar type of joint on RCP per SSPWC Section 207-2.5.

B. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

C. Install sand backfill along sides and over top of pipe. Provide sand backfill over top of pipe to minimum compacted thickness of 12 inches, compacted to a minimum of 95 percent of maximum dry density.

D. Refer to Specification Section 31 23 33 for Trenching Requirements. Do not displace or damage pipe when compacting.

E. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers or equal to protect the pipe.

3.05 INSTALLATION - CATCH BASINS, MANHOLES

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base with provisions for storm drainage pipe end sections.

C. Level top surface of concrete base to receive shaft sections.

D. Establish elevations and pipe inverts for inlets and outlets as indicated on drawings.

E. Compact top 12" of native materials below the bottom of catch basins and manholes to minimum 95 percent of maximum dry density.

3.06 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by the District's representative.

B. Request inspection prior to and immediately after placing backfill cover over pipe.

C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to the District.

3.07 PROTECTION

A. Protect pipe and backfill cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 4600

SUBDRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Perforated-wall pipe and fittings.
2. Geotextile filter fabrics.

B. Related Requirements:

1. Section 03 3000 – Cast-In-Place Concrete
2. Section 07 1326 Self-Adhering Sheet Waterproofing
3. Section 07 2100 Thermal Insulation

1.2 ACTION SUBMITTALS

A. Product Data: For geotextile filter fabrics and composite drainage panel

PART 2 - PRODUCTS

2.1 PERFORATED-WALL PIPES AND FITTINGS

A. Perforated PE Pipe and Fittings: ASTM F 405 or AASHTO M 252, Type CP; corrugated, for coupled joints.

2.2 SOIL MATERIALS

A. Soil materials are specified in Section 31 2000 Earthwork.

2.3 WATERPROOFING MEMBRANE

A. Material: Comply with specification section 07 1326

2.4 GEOTEXTILE FILTER FABRICS

A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.

B. Structure Type: Nonwoven, needle-punched continuous filament.

1. Survivability: AASHTO M 288 Class 2
2. Styles: Flat and sock.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 2200 Grading.

3.2 FOUNDATION DRAINAGE INSTALLATION

A. Place impervious fill material on subgrade adjacent to bottom of footing after concrete footing forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.

B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.

C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.

D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with adhesive or tape.

E. Install drainage piping as indicated in Part 3.4 "Piping Installation" for foundation subdrainage.

F. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.

G. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.

H. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.

I. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.

J. Place backfill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

3.3 UNDERSLAB DRAINAGE INSTALLATION

A. Excavate for underslab drainage system after subgrade material has been compacted but before drainage course has been placed. Include horizontal distance of at least 6 inches between drainage pipe and trench walls. Grade bottom of trench excavations to required slope, and compact to firm, solid bed for drainage system.

B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.

C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.

D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with adhesive or tape.

E. Install drainage piping as indicated in Part 3 "Piping Installation" Article for underslab subdrainage.

F. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.

G. After satisfactory testing, cover drainage piping with drainage course to elevation of bottom of slab, and compact and wrap top of drainage course with flat-style geotextile filter fabric.

3.4 PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
   1. Retaining-Wall Subdrainage: When water discharges at end of wall into stormwater piping system, install piping level and with a minimum cover of 36 inches unless otherwise indicated. When water discharges to daylight, slope pipe as required for positive drainage flow.
   2. Lay perforated pipe with perforations down.
   3. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

C. Install thermoplastic piping according to ASTM D 2321.

3.5 PIPE JOINT CONSTRUCTION

A. Join perforated PE pipe and fittings with couplings according to ASTM D 3212 with loose banded, coupled, or push-on joints.

B. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.6 CLEANOUT INSTALLATION

A. Cleanouts for Retaining-Wall Subdrainage:

1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
2. In vehicular-traffic areas, use NPS 4 cast-iron soil pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, 18 by 18 by 12 inches deep. Set top of cleanout 1" above grade.
3. In nonvehicular-traffic areas, use NPS 4 PVC pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, 12 by 12 by 4 inches deep. Set top of cleanout flush with grade.
4. Comply with requirements for concrete specified in Section 033000 Cast-in-Place Concrete.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

B. Drain piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

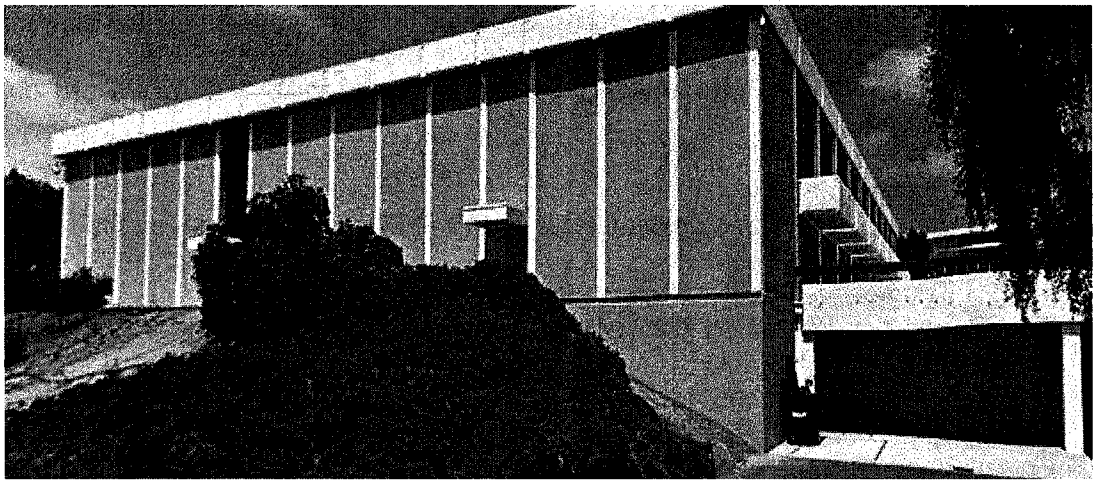
3.8 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 334600

Pre-Renovation Asbestos & Lead-Based Paint Survey Report

REPORT DATE:	**February 28, 2018**
CEI PROJECT CODE:	**MOO-8953-AsbPb**
CLIENT:	**Moorpark College**
JOB SITE ADDRESS:	**Moorpark College Gymnasium 7075 Campus Road Moorpark, CA 93021**



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February 28, 2018

Client **Moorpark College**

Subject: **Pre-Renovation Asbestos and Lead-Based Paint Survey Report**
Moorpark College - Gymnasium
7075 Campus Road
Moorpark, CA 93021
CEI Project Code: MOO-8953-AsbPb

Per your request, Criterion Environmental, Inc. (CEI) performed a limited pre-renovation asbestos and lead-based paint survey at the above referenced property, on February 16, 2018. The survey was conducted to identify the presence or absence of asbestos and lead-based paint in the Gymnasium prior to the potential disturbance of suspect building materials during upcoming renovation activities.

Asbestos Bulk Sampling

CEI collected bulk samples including 9x9" vinyl floor tiles & mastic, spray-applied fireproofing, plaster wall material, HVAC ducting wrap, ducting tape, TSI elbow & insulation runs, drywall joint compound, exterior stucco, spray-applied acoustic ceiling material all from representative rooms and areas to confirm the presence or absence of asbestos containing material. The samples were forwarded to an accredited laboratory with the National Voluntary Laboratory Accreditation Program (NVLAP) for analysis to be analyzed by Polarized Light Microscopy; EPA Method 600/M4-82-020.

Asbestos Sample Results

The results from the bulk samples collected during this limited survey revealed the following:

Positive ACM Samples

- **Tan Basecove Mastic in the women's locker room 107 contains 2% Chrysotile Asbestos.**
- **Drywall joint compound in the men's locker room 129 contains 2% Chrysotile asbestos.**
- **Fireproofing in Lobby Room 209 contains 15-25% Chrysotile asbestos.**
- **Vinyl floor tile in Room 304, 305, and 306 contains 3% Chrysotile asbestos.**
- **Floor Tile Mastic in Room 304, 305, and 306 contains 7% Chrysotile asbestos.**
- **Fireproofing above ceiling in room 304, 305, and 306 contains 20% Chrysotile asbestos.**
- **Drywall joint compound in Northeast partition wall in training room 201 contains 2% Chrysotile asbestos.**
- **Fireproofing in storage room 131 overhead contains 12% Chrysotile asbestos.**

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Negative ACM Samples

- **Plaster at the room 130 hall side revealed no asbestos detected.**
- **Vinyl base cove and mastic in 130 hall side revealed no asbestos detected.**
- **Drywall joint compound in the women's locker room 108 revealed no asbestos detected.**
- **Base cove in the women's locker room 107 revealed no asbestos detected.**
- **Acoustic ceiling tile in room 116 revealed no asbestos detected.**
- **HVAC tape above the ceiling in room 116 revealed no asbestos detected.**
- **Pipe wrap above the ceiling in room 116 revealed no asbestos detected.**
- **Drywall joint compound in the custodial closet adjacent room 116 revealed no asbestos detected.**
- **Vinyl Base cove and mastic in men's locker room 129 revealed no asbestos detected.**
- **Stucco in men's locker room 129 revealed no asbestos detected.**
- **Stucco in Men's staff shower room 140 revealed no asbestos detected.**
- **Vinyl base cove and mastic in the hall outside team room 149 revealed no asbestos detected.**
- **Ceiling in team room 149 revealed no asbestos detected.**
- **Acoustic wall material rooms 211, 202 and 200 revealed no asbestos detected.**
- **Base cove and mastic in wresting room 211 revealed no asbestos detected.**
- **Vinyl base cove and mastic in the lobby 209 revealed no asbestos detected.**
- **Acoustic ceiling tile in the lobby 209 revealed no asbestos detected.**
- **Stucco in lobby 209 revealed no asbestos detected.**
- **Plaster in hall 207 revealed no asbestos detected.**
- **Base cove and mastic in hall 207 revealed no asbestos detected.**
- **Ceiling tile in room 304, 305, and 306 revealed no asbestos detected.**
- **Base cove and mastic in room 304, 305, and 306 revealed no asbestos detected.**
- **Stucco above ceiling in room 304, 305, and 306 revealed no asbestos detected.**
- **Blue fireproofing in mechanical room 301 revealed no asbestos detected.**
- **HVAC Duct wrap and tape in room 301 revealed no asbestos detected.**
- **Thermal systems insulation elbow in room 301 revealed no asbestos detected.**
- **Vinyl base cove and mastic in fitness lab and training room 201, 202 revealed no asbestos detected.**
- **Drywall joint compound in Northwest corner of training room 201 revealed no asbestos detected.**
- **Plaster in room storage room 131 revealed no asbestos detected.**
- **Black and tan Vinyl base cove and mastic in the basketball court room 200 revealed no asbestos detected.**

Complete laboratory analytical data is included below for your review.

Criterion Environmental, Inc.
1879 Portola Road
Suite K
Ventura, CA 93003

www.criterionenv.com

Phone: 805-644-8347
Fax: 805-644-5347
Email: info@criterionenv.com

If disturbance of identified asbestos containing materials will occur, identified ACM should be removed or handled by properly certified asbestos abatement personnel.

If additional suspect materials are encountered during scheduled site renovations/demolition/restoration, they should be tested prior to disturbance or otherwise handles as Presumed Asbestos Containing Materials (PACM) using the same controls and procedures for asbestos abatement.

After abatement of asbestos material, it is important that Criterion Environmental perform asbestos clearance/air verification sampling to confirm the area is safe for re-occupancy and to provide the necessary documentation that the project was properly performed and completed.

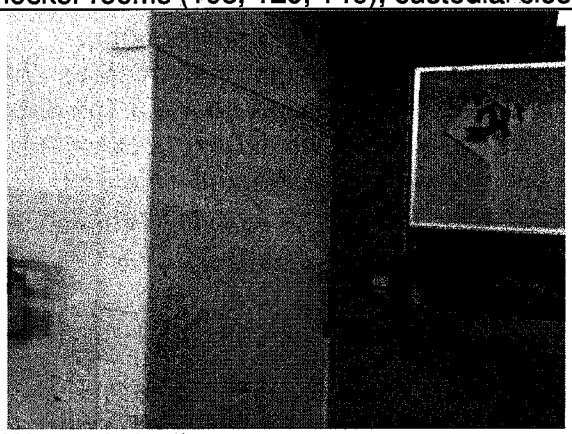
Lead-Based Paint Testing

CEI utilized a Heuresis X-Ray Fluorescence (XRF) Model Pb200i (serial #1766) paint analyzer to detect lead concentrations in selected building components at the subject site. The instrument is calibrated to the manufacturer's specifications and is also calibrated in the field using a National Institute of Standards and Testing (NIST) standard. All samples were collected in accordance with HUD Guidelines.

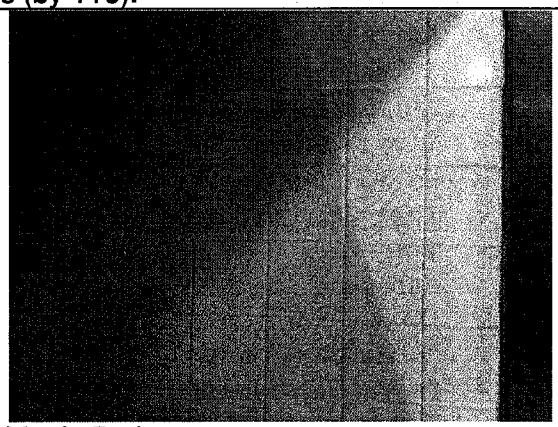
Lead Sampling Results

No positive lead-based paint (concentrations at or greater than 1.0 mg/cm^2) was detected on any painted building components likely to be disturbed. However, lead was identified on the following glazed components at the subject site.

- White black-spotted and White yellow-spotted tiles in the restrooms (204, 206, 208), locker rooms (108, 129, 140), custodial closets (by 116).



Women's Locker room



Men's Bathroom

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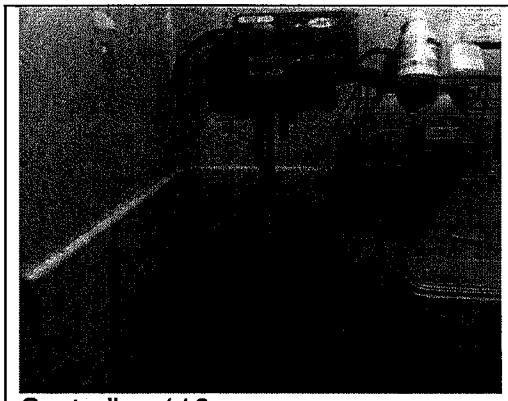
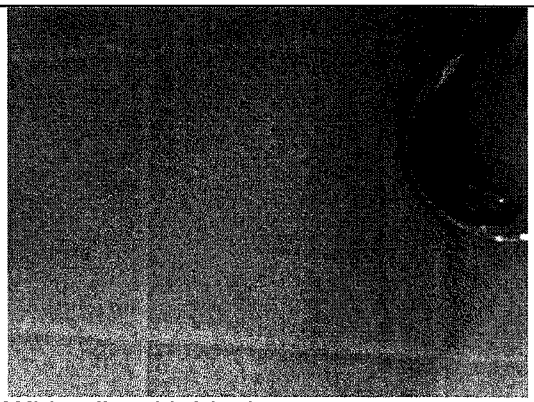
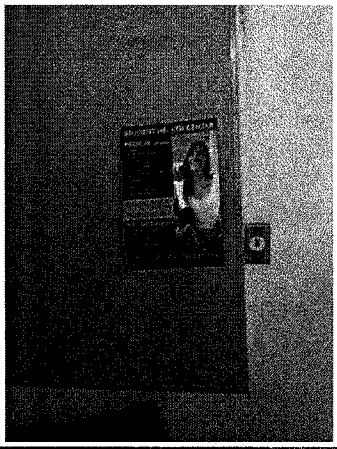
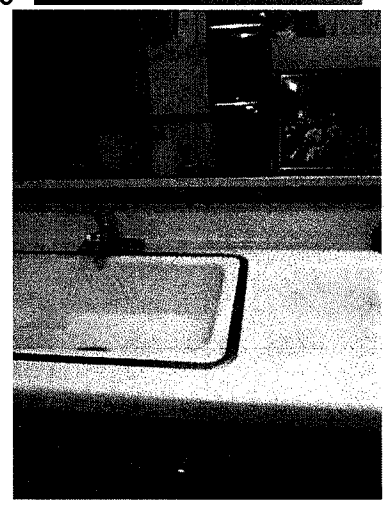

Custodian 116


White tile with black spots



- Bulletin board in the Team Room 149



- Sink in the training room 201

- Large Blue tiles on the wall and floor in training room 201

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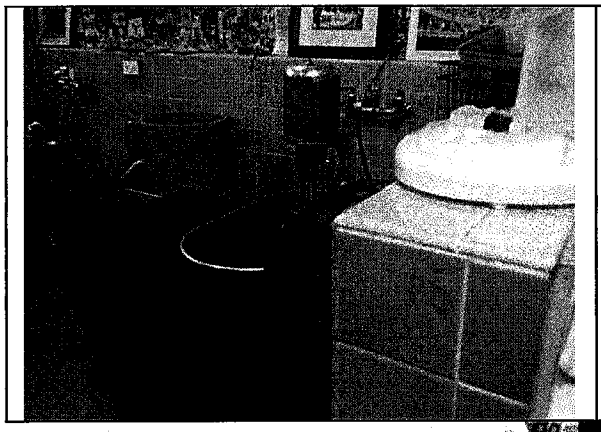

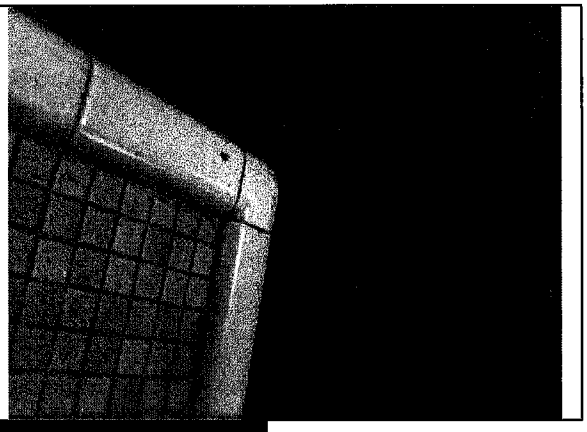

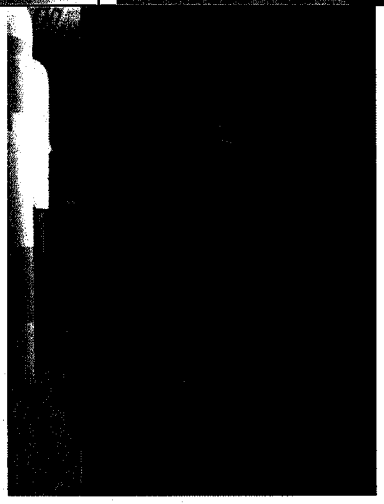

- 3rd floor Mechanical (301) room door

Complete results can be reviewed in the Limited Lead Survey XRF Data Table.

For purposes of this survey, any material containing any detectable level of lead is subject to OSHA's Lead Exposure in Construction Rule (29 CFR Part 1926) and the Department of Toxic Substance Control (DTSC) "Environmental Health Standards for the Management of Hazardous Waste" (CCR Title 22, Division 4.5).

Respectfully submitted,
Criterion Environmental, Inc.

Tim Ryan, B.Sc.
Senior Industrial Hygienist/General Manager
DOHS Certified Asbestos Consultant (No. 06-3979)
CDPH Certified Lead Inspector/Risk Assessor (No. 14697)

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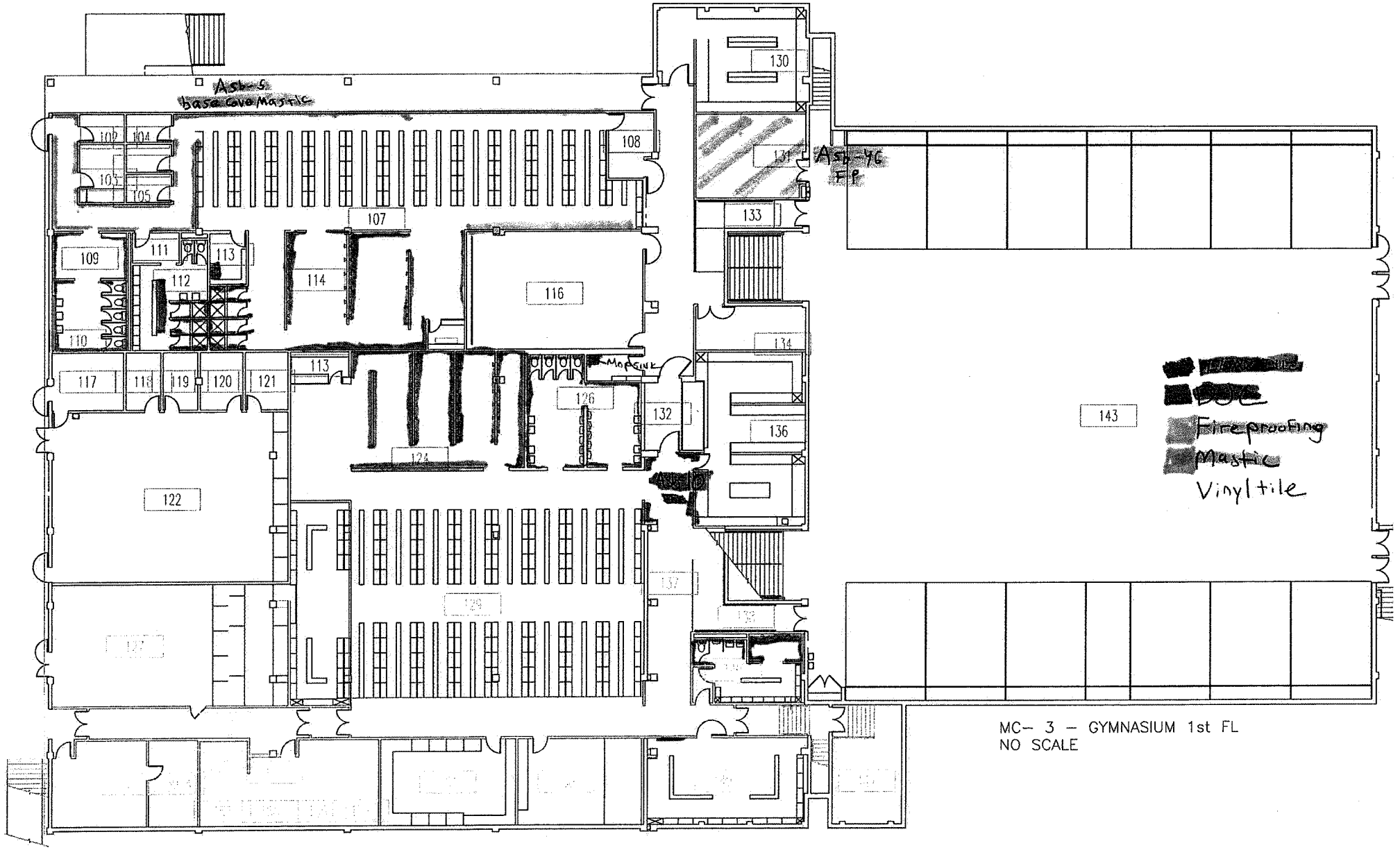
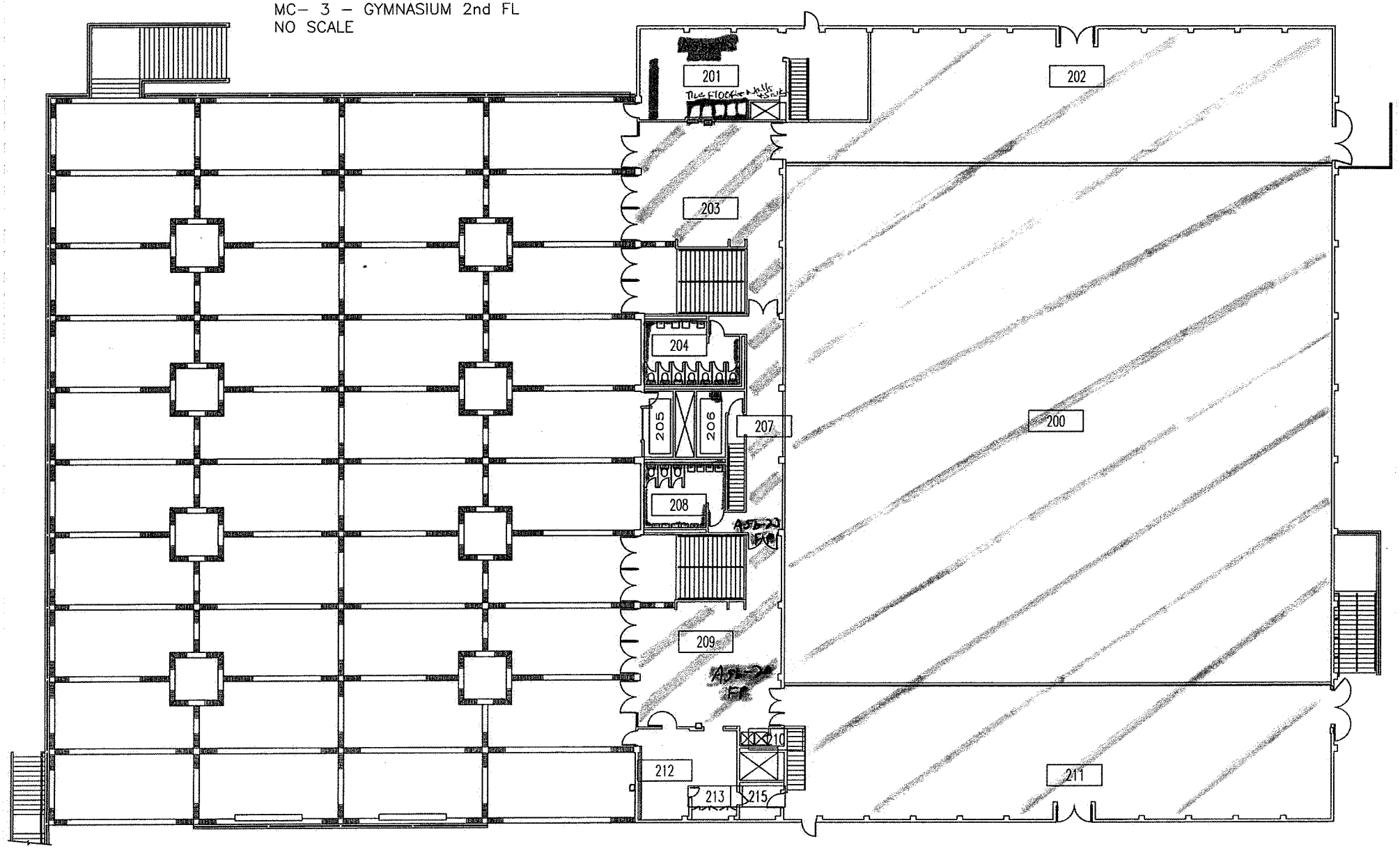
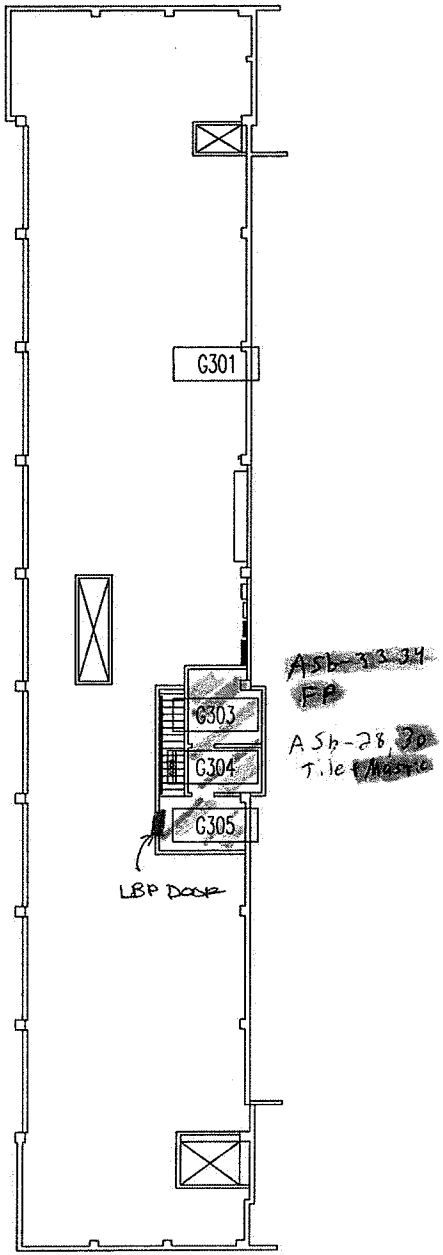


MC– 3 – GYMNASIUM 1st FL
NO SCALE

MC– 3 – GYMNASIUM 2nd FL
NO SCALE





MC– 3 – GYMNASIUM 3rd FL
SCALE: $\frac{1}{16}$" = 1'–0"
(When printed on 11x17 paper)

ASBESTOS HAZARDOUS MATERIALS MITIGATION

MOORPARK COLLEGE – GYMNASIUM UPGRADE PROJECT

MARCH 5, 2018

1. QUALIFICATIONS AND DISCLOSURES

1.1. SITE INVESTIGATION

1.1.1. Contractor acknowledges that he has investigated and satisfied himself as to: a) the conditions affecting the Work, including but not limited to physical conditions of the site which may bear upon site access, handling and storage of tools and materials, access to water, electric, or other utilities that may otherwise affect performance of required activities; b) the character and quantity of all surface and subsurface materials or obstacles to be encountered in so far as this information is reasonably ascertainable from an inspection of the site, including exploratory work done by the Contractor or his designated representative, as well as information presented in Drawings and specifications included with this Contract.

1.1.2. Any failure by the Contractor to acquaint himself with available information will not relieve him from the responsibility for estimating properly the difficulty or cost of successfully performing the Work. The Owner is not responsible for any conclusions or interpretations made by the Contractor on the basis of the information made available by the Owner or the Owner's agents.

1.2. SITE INSPECTION

1.2.1. The Contractor shall coordinate and schedule inspections as required.

1.2.1.1. Contractor's failure to obtain approval of inspections shall not be cause for an increase in the Contract Price or Time.

1.2.1.2. In the event that any unplanned events or emergencies the Contractor agrees to pay the Owner's charges for additional services. This includes charges for the Owner's consultants, including Principal's Time, Monitoring Technician's Time, Air Samples, Bulk Samples, or other reasonable expenses as necessary for Owner to fully observe the Work and/or to protect the Owner's interests.

1.2.1.3. The Owner shall have the only discretion in regards to the consulting services required, and by accepting this contract the Contractor agrees to pay the Owner's charges associated with emergency services, unplanned events, and/or overtime off shift work. Any such expenses incurred by Contractor shall be paid by Owner and deducted from the Contract Price.

1.3. INSURANCE

1.3.1. In addition to any insurance required by the General Conditions, the asbestos sub-contractor, at his own cost and expense, shall procure and maintain during the continuance on this Contract comprehensive bodily injury and property damage liability insurance provided by an A-rated California admitted carrier with a combined single limit of $2,000,000.00 per occurrence. The insurance policy shall provide coverage for all liability arising out of or related to the Project or to the performance of the Work and shall include asbestos and unintentional release of hazardous materials.

1.3.2. The Sub-contractor's insurance policies shall contain a 10-day Notice of Cancellation clause and shall list the following individuals and entities as Certificate holders and Additional Insured.

- *Moorpark College*
- *Criterion Environmental, Inc.*

1.3.3. When rental equipment is to be used in abatement areas or to transport asbestos contaminated waste, a written notification concerning intended use of the rental equipment must be provided to the rental agency, and a signed letter of acknowledgement from the rental agency shall be included in the submittal package.

1.4. LICENSES AND QUALIFICATIONS

1.4.1. The Contractor, or the subcontractor performing asbestos-related work, shall at all times be registered with the State of California Carcinogen Registration Unit of the Division of Occupational Safety and Health. Expiration of a license, or the failure to timely renew licenses or registrations shall be cause for issuance of a Stop Work order until cured, and shall not be cause for an increase in the Contract Price or Time.

1.4.2. Within ten days after the issuance of the Notice to Proceed, the entity that will perform the work under this section shall submit qualifying documentation of the successful completion in 1998 or later of demolition and asbestos/lead-related work for at least three jobs of work similar in complexity and magnitude and other qualifying information. Similar in complexity means three or more types of ACBM, existing asbestos contamination and multi-phase demolition work. Similar in magnitude means an abatement contract value in excess of $10,000.00. Documentation shall include:

1.4.2.1. A detailed description of the work performed.

1.4.2.2. The name, address, phone number and contact person for the client for which the work was done.

1.4.2.3. The name, address and phone number of the company and company representative responsible for air monitoring and site surveillance.

1.4.2.4. A record of any citations issued by Federal, State or Local regulatory agencies relating to asbestos/lead abatement activity from 1995 forward. Include projects, dates, and resolutions.

1.4.2.5. A listing of any asbestos-related legal proceedings/claims in which the Contractor (or employees) scheduled to participate in this project is currently involved in. Include the name, address and phone number of the representative for the opposing side.

1.4.3. Disqualification of Subcontractor

1.4.3.1. The asbestos subcontractor may be disqualified for any of the following reasons:

1.4.3.1.1. The subcontractor is involved in any litigation against the Owner or other litigation related to hazardous materials work with other public entities.

1.4.3.1.2. The subcontractor has defaulted on a previous contract.

1.4.3.1.3. The subcontractor exhibits a lack of competency as evidenced by a deficiency of experience as described in Paragraph 1.4 or the repeated (three rejected submittals) failure to provide an approved submittal.

1.4.3.1.4. The subcontractor has more than one serious or willful citations or stop work orders from regulatory agencies for noncompliance.

1.4.3.2. Disqualification of a subcontractor for cause as described in 1.4.3 and substitution of a qualified subcontractor by the General Contractor shall not be cause for an increase in Contract Price or Contract Time.

2. APPLICABLE STANDARDS AND GUIDELINES

2.1. GENERAL REQUIREMENTS

2.1.1. All work under this Contract shall be performed in strict accordance with all applicable Federal, State, and Local regulations, standards and codes governing demolition, asbestos abatement and any other trade.

2.1.2. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these Specifications exists the most stringent requirements shall prevail.

2.1.3. Safety shall be the first and primary goal guiding the work on this project.

3. DEFINITIONS

3.1. **Abatement** - Procedures to control fiber release from asbestos/lead-containing materials. Includes removal, encapsulation, enclosure, repair, demolition and renovation activities.

3.2. **Airlock** - A system for permitting ingress and egress with minimum air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways separated by a distance of at least 3 feet such that one passes through one doorway into the airlock, allowing the doorway sheeting to overlap and close off the opening before proceeding through the second doorway, thereby preventing flow-through contamination.

3.3. **Air Monitoring** - The process of measuring the particulate content of a known volume of air collected during a specific period of time, and reporting as the result an accurate representation at a point in time of the concentration of asbestos, lead or other airborne contaminants in the area being monitored.

3.4. **Amended Water** - Water to which a surfactant has been added.

3.5. **Architect** - The Project Architect or their representatives.

3.6. **Asbestos containing material (ACM)** - Material composed of asbestos of any type and in an amount greater than 0.1% by weight, either alone or mixed with other fibrous or non-fibrous materials.

3.7. **Asbestos containing waste material** - asbestos containing material or asbestos contaminated objects requiring disposal.

3.8. **Authorized Visitor** - The Owner, Architect, representatives of either Owner or Architect, and any representative of a regulatory or other agency having jurisdiction over the Project.

3.9. **Clean room** - An uncontaminated area or room that is a part of the worker decontamination enclosure system with provisions for storage of worker's street clothes and clean protective equipment. At a minimum, the clean room shall have a shelf and hook for each worker plus four spare clothing storage areas so that all clothing, masks and shoes can be stored off of the floor. Clean rooms shall be sized to fully accommodate the work force at all times.

3.10. **Contractor** - The General Contractor or his authorized representative, or his employees or his subcontractors or sub-subcontractors or other Contractor material or service providers. The General Contractor may elect to delegate or otherwise pass on duties or responsibilities to a subcontractor for the work performed under this section but may not relieve himself of any obligations to the Owner for full compliance with all work performed under this section.

3.11. **Curtained doorway** - A device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms, typically constructed by

placing two overlapping sheets of plastic over an existing or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway and securing the vertical edge of the other sheet along the opposite vertical side of the doorway. Curtained doorways shall be constructed of a minimum thickness of 10-mil poly.

3.12. **Decontamination enclosure system** (decon) - A series of connected rooms, (five-chambers) separated from the work area and from each other by air locks, for the decontamination of workers and equipment.

3.13. **Encapsulant** - A liquid material which can be applied to asbestos/lead containing material which controls the possible release of asbestos/lead fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material an binding its components together (penetrating encapsulant).

3.14. **Encapsulation** - The application of an encapsulant to asbestos/lead containing material to control the release of asbestos/lead into the air.

3.15. **Enclosure** - The construction of an airtight, impermeable, permanent barrier around asbestos/lead containing material to control the release of asbestos/lead into the air.

3.16. **Equipment decontamination enclosure system** - That portion of a decontamination enclosure system designed for controlled transfer of materials and equipment into or out of the work area, typically consisting of a washroom and holding area. This area shall contain a walk-off pan for worker's to clean off their boots, and be large enough to stage materials or equipment being prepared for entry into the work area or exit through the system.

3.17. **Equipment room** - A contaminated area or room that is part of the worker decontamination enclosure system with provisions for storage of contaminated clothing and equipment.

3.18. **Facility** - Any institutional, commercial or industrial structure, installation, or building.

3.19. **Friable asbestos** - Asbestos containing material which can be crumbled to dust, when dry, under hand pressure.

3.20. **HVAC** - Heating, ventilation, and air conditioning system. This includes ducts, duct shafts or equipment chases, plaster, stucco, or gypsum enclosed plenums, partitions or studded enclosures, distribution fittings, pumps, motors, tanks, filters or filter banks, controls, raceways and other components which serve a HVAC-related function.

3.21. **HEPA filter** - A high efficiency particulate air filter capable of removing particles, 0.3 microns in diameter with 99.97% efficiency.

3.22. **HEPA vacuum** - A vacuum system equipped with HEPA filtration.

3.23. **Lead-related Work** - Includes any tasks involving lead (as defined by Title 17 CCR, Division I, Chapter 8) that can or may expose workers to lead dust or fumes above the

Cal/OSHA Permissible Exposure Limit, or involving activities designed to reduce a lead hazard for a minimum of twenty years. All lead-related tasks must be performed by experienced and DHS certified workers.

3.24. **Negative pressure ventilation system** - A local pressure differential exhaust system which ensures a positive flow of air into a contaminated area from an uncontaminated area by utilizing a HEPA filtered exhaust fan to remove air from the contaminated area, thereby lowering the air pressure below that of the surrounding uncontaminated areas.

3.25. **Outside Air** - The air outside buildings and structures.

3.26. **Plasticize** - To cover floors and walls with plastic sheeting as herein specified.

3.27. **Prior Experience** - Experience required of the Contractor on asbestos/lead projects of similar nature and scope to insure capability of performing the asbestos/lead abatement in a satisfactory manner. Similarities shall be in area related to material composition, project size, abatement methods required, number of employees and the engineering work practice and personal protection controls required.

3.28. **"Regulations"** shall include but not be limited to:

3.28.1. U.S. Environmental Protection Agency Regulations for Asbestos (Title 40, Code of Federal Regulations, Part 61, Subparts A & B)

3.28.2. Title 8, California Administrative Code, General Industry Safety Orders,

3.28.3. Title 8, California Administrative Code, Construction Safety Orders

3.28.4. Title 17, California Code of Regulations, Division 1, Chapter 8

3.28.5. California Department of Health Services

3.28.6. All other current regulations promulgated and in effect as of the starting date of the Work. In all cases, the most rigorous standard shall prevail.

3.29. **Removal** - The stripping of any asbestos/lead containing materials from surfaces or components of a facility.

3.30. **Renovation** - Altering in any way one or more facility components.

3.31. **Shower room** - A room between the clean room and the equipment room in the worker decontamination enclosure with hot and cold or warm running water controllable at the tap and suitably arranged for complete showering during decontamination.

3.32. **Strip** - To take off asbestos/lead materials from any part of facility.

3.33. **Structural member** - Any load-supporting member or component of a facility, such as beams and load-supporting walls.

3.34. **Subcontractor** - The individual and/or legal entity and its sub-subcontractors and employees of the Subcontractor and sub-sub-contractors performing the work under this Section.

3.35. **Surfactant** - A chemical wetting agent added to water to improve penetration.

3.36. **Visible emissions** - Any emissions containing particulate material that are visually detectable without the aid of instruments.

3.37. **Waste transfer airlock** - a decontamination system utilized for transferring containerized waste from inside to outside of the work area.

3.38. **Wet cleaning** - The process of eliminating asbestos/lead contamination from building surfaces and objects by using cloths, mops, or other utensils which have been dampened with water and afterwards thoroughly decontaminated or disposed of as asbestos/lead contaminated waste.

3.39. **Work area** - Designated rooms, spaces, or areas of the Project in which asbestos/lead abatement actions are to be undertaken or which may become contaminated as a result of such abatement actions. A contained work area is a work area, which has been sealed, plasticized, and equipped with a decontamination enclosure system. A non-contained work area is an isolated or controlled-access work area, which has not been plasticized nor equipped with a decontamination enclosure system.

3.40. **Worker decontamination enclosure** - A decontamination system consisting of a clean room, a shower room, and an equipment room separated from each other and from the work area with airlocks and curtained doorways

4. SCOPE OF WORK

To our understanding, due to a future renovation of the Gymnasium, the planned abatement for the Gymnasium includes, but is not limited to, removal of ACM spray-applied fireproofing (in all areas of potential disturbance, as well as removal of ACM drywall joint compound and base cove mastic.

This inspection was prepared for the sole use of Moorpark College, its assignees and any regulatory agencies. Activities or work on this project impacting or potentially impacting any materials or components listed in the inspection are included in and governed by this specification.

- The scope covered herein is for asbestos containing materials (ACM) and Presumed Asbestos Containing Materials (PACM) abatement and/or mitigation.

Asbestos Survey Findings and Summary: An Asbestos and Lead Survey of the subject property was conducted on February 16, 2018 by Criterion Environmental Inc. (CEI) of Ventura, CA. The inspection details are provided in CEI's report entitled "Limited Pre-Renovation Asbestos & Lead-Based Paint Survey Report" dated February 28, 2018. This report was used to identify areas of anticipated abatement which would impact ACM as part of the vast renovation project.

The scope of work for this project includes the removal and/or possible disturbance of identified asbestos containing materials (ACM) at the gym, including the following materials:

Positive ACM Samples

- **Tan Base cove Mastic in the women's locker room 107 contains 2% Chrysotile Asbestos.**
- **Drywall joint compound in the men's locker room 129 contains 2% Chrysotile asbestos.**
- **Fireproofing in Lobby Room 209 contains 15-25% Chrysotile asbestos.**
- **Vinyl floor tile in Room 304, 305, and 306 contains 3% Chrysotile asbestos.**
- **Floor Tile Mastic in Room 304, 305, and 306 contains 7% Chrysotile asbestos.**
- **Fireproofing above ceiling in room 304, 305, and 306 contains 20% Chrysotile asbestos.**
- **Drywall joint compound in Northeast partition wall in training room 201 contains 2% Chrysotile asbestos.**
- **Fireproofing in storage room 131 overhead contains 12% Chrysotile asbestos.**

The identified materials noted above may be encountered during the planned abatement activities will be coordinated with and integrated into the planned demolition project for the Gym. See Sampling maps for more details. **NOTE: Bidding abatement contractors will determine and confirm all dimensional quantities of ACM to be removed per the Owner's Demolition Plan.**

5. DESCRIPTION OF GENERAL WORK PARAMETERS

5.1. The Work specified herein shall include the removal of identified asbestos containing materials (ACM).

5.2. All work shall be performed by competent (AHERA-certified) persons trained, knowledgeable and qualified in the techniques of abatement, handling and disposal of asbestos-containing materials and lead hazards, as well as the subsequent cleaning of asbestos and lead contaminated areas.

5.3. The abatement subcontractor shall employ an experienced, competent superintendent and necessary assistants who shall be in attendance at the Project site full time during the progress of the Work until the date of Substantial Completion and for such additional time thereafter as the Owner may deem necessary for the expeditious completion of the Work.

5.3.1. The superintendent shall be satisfactory to the Owner and shall not be changed without the consent of the Owner, unless the superintendent proves to be unsatisfactory to the Contractor or ceases to be in his employ.

5.3.2. The superintendent shall be certified as a Competent Person and shall have a minimum of five years' experience managing asbestos mitigation projects similar in complexity and magnitude to the work to be performed under this section.

5.4. The Contractor shall supply all labor, materials, services, insurance, permits and equipment necessary to carry out the Work in accordance with all applicable Federal, State and Local regulations, these Specifications and the other Contract documents. Under all circumstances statutory regulation shall prevail in a discrepancy between these Specifications and Federal, State or Local regulation. In case of conflicting or contradictory requirements, the General Provisions of the Contract shall prevail over the specific provisions within this Section, except that in all cases, the most rigorous provision shall prevail.

5.5. The Contractor is responsible for protection of all areas utilized during the performance of the Work to ensure the safety of persons and to avoid any increase in expense to the Owner to accomplish the subsequent work comprising the Project.

5.6. Remove, transport and dispose of all waste as asbestos hazardous waste.

5.6.1. Contractor shall be responsible for all profiling and characterization of materials scheduled for disposal off site and shall submit a letter of acknowledgement and acceptance from any landfill proposed to receive such waste.

5.6.1.1. For all proposed landfills, Contractor shall submit for approval all pertinent documentation establishing the capacity of such landfills to accept designated waste for permanent disposal.

5.6.1.2. Should any qualified landfill be rejected by Owner, Owner shall issue a change order for Contractor's increased out-of-pocket expense for transportation and disposal. There shall be no other change in the Contract price or time for a change initiated pursuant to this paragraph.

5.7. The owner shall pay for water consumption utilized on the Project. The water supply shall be able to be shut off in a clean area and hoses attached to run into the contained area or decon for use. No leaks shall be permitted at any time in hoses or fittings. Contractor shall have spare washers and fittings available at all times.

6. SUBMITTALS, NOTIFICATIONS AND DOCUMENTATION

6.1. INITIAL SUBMITTAL

6.1.1. The submittal shall be bound, with a detailed table of contents, numbered pages and each underlined section shall be tabbed.

6.1.1.1. All components of the submittal shall be site specific; general company policies or generic plans shall be deemed non-responsive.

6.1.1.2. A complete and approved submittal package is required before beginning any work covered under this Section.

6.1.2. At a minimum the submittal will include, in the following order, the following sections:

6.1.2.1. Licenses, Insurance Certificates and Notifications

6.1.2.1.1. A copy of required state licenses, state registrations and any additional licenses or registrations required to perform the Work.

6.1.2.1.2. Contractor's insurance certificates evidencing coverage as required by the Contract Documents.

6.1.2.1.3. A copy of the 10-day notification to the Ventura County Air Pollution Control District and a copy of the check tendered for associated notification fees.

6.1.2.1.4. A copy of the 24-hour temporary job site notification to the California Division of Occupational Safety and Health.

6.1.2.1.5. Copies of correspondence notifying fire, emergency and police of the project dates, access and pertinent access constraints, and a statement of acknowledgement from the recipients of such correspondence.

6.1.2.1.6. Landfill licenses, certifications and insurance.

6.1.2.1.7. Submit for approval, a copy of a pro-forma Uniform Hazardous Waste Manifest.

6.1.2.1.8. Contractor's form of daily progress report shall be included within the submittal package for approval as to format.

6.1.2.1.9. For all information and documents required subsequent to commencement of work, provide under the section tab Other Project Documentation a sample of all logs, forms, registers or other documents that will be utilized throughout the Project for approval as to format.

6.1.2.2. Safety Plan

6.1.2.2.1. The Safety Plan shall be site specific for this Project.

6.1.2.2.2. Contractor shall identify potential hazards at this job site and describe actions or responses that will effectively mitigate such hazards. Specific items, at a minimum, shall include:

6.1.2.2.2.1. Include potential hazards related to electricity, slipping, lifting, accumulated debris, lowering removed materials, contaminated attic insulation, etc.

6.1.2.2.2.2. Describe frequency and manner of safety meetings and orientation for personnel on the site.

6.1.2.2.2.3. Post in the clean room area of the worker decontamination enclosure a list containing the names, addresses, and telephone numbers of the Subcontractor, the Building Contractor, the Asbestos Project Manager, the General Superintendent, the Air Sampling Professionals, the testing laboratory and any other personnel who may be required to assist during abatement activities.

6.1.2.3. Emergency Plan

6.1.2.3.1. Emergency planning and procedures shall be developed by the Contractor that are site specific to this Project

6.1.2.3.2. Emergency procedures shall be in written form and prominently posted in the clean change area and equipment room of the worker decontamination area. Prior to entering the work area all persons must read and sign these procedures to acknowledge receipt and understanding of work site layout, location of emergency exits and emergency procedures.

6.1.2.3.3. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities, work schedule and layout of work area, and particularly barriers that may affect response capabilities.

6.1.2.3.4. Employees shall be trained in evacuation procedures in the event of workplace emergencies.

6.1.2.3.5. For non-life-threatening situations - employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the workplace to obtain proper medical treatment.

6.1.2.3.6. For life-threatening injury or illness, worker decontamination shall take least priority. After measures to stabilize the injured worker, remove him from the workplace and secure proper medical treatment.

6.1.2.3.7. Telephone numbers of all emergency response personnel shall be prominently posted in the clean change area and equipment room, along with the location of the nearest telephone.

6.1.2.4. Site Security Plan

6.1.2.4.1. Contractor shall prepare and implement a site-specific security plan that addresses, at a minimum, elements described in paragraph **6.1.2.4**.

6.1.2.4.2. The site shall be secured at all levels of access and security shall be the sole responsibility of the Contractor.

6.1.2.4.3. The Project site is to be restricted only to authorized, trained and appropriately protected personnel. Such persons shall include the Contractor's employees, employees of Sub-subcontractors, Owner employees and representatives, State and Local inspectors and any other designated individuals.

6.1.2.4.4. A list of authorized personnel shall be established prior to job start by Contractor, augmented by names furnished by the Owner and posted in the Contractor's temporary job site office.

6.1.2.4.5. The Contractor shall report entry by unauthorized individuals immediately to the Owner.

6.1.2.4.6. A logbook shall be maintained in the clean-room area of the worker decontamination system. Anyone who enters the controlled work areas must record name, affiliation, time in, and time out for each entry.

6.1.2.4.7. Access to controlled work areas shall be through a single worker decontamination system located as approved in the work plan. Except for waste removal routes and emergency exits, all other means of access (doors, windows, hallways, etc.) shall be blocked or locked so as to prevent entry to or exit from the work area (other than emergency exits).

6.1.2.4.7.1. The waste disposal routes shall be sealed except during the removal of waste from the work areas.

6.1.2.4.7.2. Emergency exits shall not be locked from the inside, but shall be sealed with polyethylene sheeting and tape until needed. Emergency exits shall be clearly designated and emergency pathways delineated.

6.1.2.4.8. Contractor shall be responsible for site security throughout the job, including weekends and off-hours.

6.1.2.4.8.1. Contractor shall ensure that negative air machines remain operating within design parameters twenty-four hours a day throughout the work effort.

6.1.2.4.8.2. Unscheduled inspections during off-hours or weekends by Owner shall be treated as Unplanned Events if they result in the discovery of the loss of negative pressure or other safety hazards.

6.1.2.5. Employee Certifications

6.1.2.5.1. Each employee on site shall maintain proof of identification while on site, including picture identification, and present such identification to the Owner when requested.

6.1.2.5.2. Submit current and legible copies of all appropriate documents certifying that the Contractor's employees, including foremen, supervisors, and any other company personnel or agents have received adequate asbestos training that includes, at a minimum; training at an EPA approved AHERA training center not affiliated with the Contractor.

6.1.2.5.3. Submit documentation from physician that all employees or agents who may be exposed to airborne asbestos have been approved for and are physically capable of working while wearing the respirator required without suffering adverse health effects. In addition, document that personnel have received medical monitoring as required by California DOSH regulations.

6.1.2.5.4. Employee submittals shall be presented, in alphabetical order, with each employee's training certificate, medical report, and a fit test certificate stapled together in the same order. Each employee on site shall present proof of identification including picture identification.

6.1.2.5.5. Each employee shall wear an identification badge at all times while on site, including first and last name. Nametags shall be encased in washable plastic, type size not less 24, Arial font. Any employee not wearing such identification may be immediately barred from the site.

6.2. ADDITIONAL SUBMITTALS

6.2.1. Maintain daily progress reports detailing abatement activities. Include review of progress with respect to established milestones and schedules, problems and action taken, injury reports, and equipment breakdowns.

6.2.1.1. It shall be Contractor's responsibility to provide a copy of each daily report, signed by Contractor's on site representative, to the Owner not later than 10:00 a.m. the following working day.

6.2.1.2. In the event of non-compliance, Owner may issue a Stop Work Order until such time as the Contractor becomes current.

6.2.1.2.1. Contractor shall not be entitled to time extensions for delay resulting from non-compliance in this element of the Contract.

POST ABATEMENT SUBMITTALS

6.2.2. Submit, prior to final acceptance of the Work in this Section, separately and in addition to the requirements of other sections, copies of all approved, executed, Uniform Hazardous Waste Manifests for materials covered in this section.

6.2.3. Submit, prior to final acceptance of the Work in this section, copies of daily entry logbooks with the record of worker and visitor access.

6.3. Contractor shall provide three (3) copies of the initial submittal package to the Owner for initial review and comments.

6.3.0.1. Owner will return one copy of the initial submittal, either approved, approved with comments, or disapproved with comments, within five working days following receipt of the submittal in Owner's office.

6.3.0.2. Contractor shall incorporate a full and satisfactory response to Owner's comments into the submittal and return it to the Owner within five working days.

6.3.0.3. Owner shall review and either approve the submittal or return it for compliance with Owner's initial submittal comments within five working days.

6.3.0.4. The process described in paragraphs **6.3** shall be repeated until the submittal is approved, or as described in paragraph **1.4**.

6.3.0.5. Contractor shall not be entitled to additional payment or time extensions resulting from a disapproved submittal.

7. PRE-START MEETING

7.1. The Contractor shall attend a mandatory pre-abatement job meeting. The Contractor's representatives, along with consulting and monitoring personnel who will actually participate in the program shall attend this meeting.

7.2. The Subcontractor and supervisory personnel who will provide on-site direction of the abatement activities must attend. The specific supervisor or foreman who will manage the job full time shall also be present at this meeting.

7.3. Before this meeting the Contractor shall provide all submittals as required under **Section 02080**, and shall have received approval of the submittal package in its entirety. In addition, he shall be prepared to review or provide detailed information concerning:

7.3.1. Preparation of work area.

7.3.2. Personal protective equipment including respiratory protection and protective clothing.

7.3.3. Employees who will participate in the project, including delineation of experience, training, and assigned responsibilities during the project.

7.3.4. Decontamination procedures for personnel, work area and equipment.

7.3.5. Abatement methods and procedures to be utilized.

7.3.6. Procedures for handling and disposing of waste materials.

7.3.7. Procedures for final decontamination and cleanup.

7.3.8. A sequence of work and performance schedule.

7.3.9. Procedures for dealing with health emergencies.

8. MATERIALS AND EQUIPMENT

8.1. MATERIALS

8.1.1. General

8.1.1.1. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and brand name.

8.1.1.2. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or contamination. Replacement materials shall be stored outside of the work area until abatement is completed.

8.1.1.3. Damaged, deteriorating or previously used materials shall not be used and shall be removed from the work site and disposed of properly.

8.1.1.4. Unless otherwise specified, or an alternative clearly described and approved by the Owner, a minimum of two layers of polyethylene sheeting shall be used for walls and floors and shall be a minimum of 6-mil thick. For all other uses sheeting of at least 6-mil thickness shall be used in widths selected to minimize the frequency of joints.

8.1.1.5. Method of attachment may include any combination of duct tape or other waterproof tape, furring strips, spray glue, staples, nails, screws or other effective procedures capable of sealing adjacent sheets of polyethylene and capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions (including the use of amended water).

8.1.1.6. Polyethylene sheeting utilized for worker decontamination enclosure shall be opaque white or black in color and shall be a minimum of 6-mil thick.

8.1.1.7. Disposal bags shall be of 6-mil polyethylene, preprinted with labels as required by EPA regulation 40 CFR 61.152 (b)(i)(iv), applicable Cal-OSHA requirements and requirements of any other regulating agencies.

8.1.1.8. Stick-on labels as per EPA or Cal-OSHA requirements for disposal drums and bags.

8.1.1.9. Warning signs as required by Cal-OSHA.

8.1.2. Removal

8.1.2.1. Surfactant (wetting agent) shall be a 50-50 mixture of polyoxyethylene ether and polyoxyethylene ester, or equivalent; mixed in a proportion of I fluid ounce to 5 gallons of water or as specified by manufacturer. (An equivalent surfactant shall be understood to mean a material with a surface tension of 29 dynes/cm as tested

in its properly mixed concentration, using ASTM method D1331-56-"Surface and Interfacial Tension of Solutions of Surface Active Agents.") Where work area temperature may cause freezing of the amended water solution, the addition of ethylene glycol in amount sufficient to prevent freezing is permitted.

8.1.3. Encapsulation

8.1.3.1. Encapsulation materials shall be lockdown type.

8.1.3.1.1. Encapsulation should not be solvent-based or utilize a vehicle (the liquid in which the solid parts of the encapsulant are suspended) consisting of hydrocarbons.

8.1.3.1.2. Encapsulant shall not be flammable.

8.2. EQUIPMENT

8.2.1. All HEPA filtered equipment shall be brought on site clean and open for inspection by the Owner. New HEPA filters shall be provided and installed on site following inspection.

8.2.1.1. A sufficient quantity of negative pressure ventilation units equipped with HEPA filtration and operated in accordance with ANSI 29.2-79 (local exhaust ventilation requirements) and EPA guidance document EPA 560/5-83-002 Guidance for Controlling Friable Asbestos-Containing Materials in Buildings Appendix F: Recommended Specifications and Operating Procedures for the Use of Negative Pressure Systems for Asbestos Abatement, and shall be utilized so as to provide one workplace air change every 15 minutes.

8.2.1.1.1. Submit calculations to the Owner documenting a sufficient number of negative pressure machines plus one extra machine for each three machines as a backup. Apply a factor of .8 to each machine's rated capacity.

8.2.1.1.2. Machines shall exhaust to the exterior of the building. Exterior openings shall be fitted with a manifold constructed of plywood with sheet metal collars the same diameter as the machine exhaust tubing. Exhaust tubing shall be adequately fastened to the collars to prevent disruption of the negative air system.

8.2.1.1.3. In each work area under negative pressure, continuous pressure differential recording equipment shall record the atmospheric pressure within the contained area. The record shall be attached to each daily job log.

8.2.1.1.4. In the event negative pressure is lost within any given contained area, all work shall cease until negative pressure is restored.

8.2.1.2. Full body disposable protective clothing, including head, body, and foot coverings shall be provided to all workers and authorized visitors in sizes adequate to accommodate movement without tearing.

8.2.1.3. Additional safety equipment (e.g. hard hats, eye protection, disposable gloves, rubber boots), as necessary, shall be provided to all workers and authorized visitors.

8.2.2. Removal

8.2.2.1. A sufficient supply of scaffolds, ladders, lifts, and hand tools (e.g. scrapers, wire cutters, brushes, utility knives, wire saws, etc.) shall be provided as needed.

8.2.2.2. Sprayers with pumps capable of providing 500 pounds per square inch (psi) at the nozzle tip at a flow rate of 2 gallons per minute for spraying amended water.

8.2.2.3. Rubber dustpans and rubber squeegees shall be provided for cleanup.

8.2.2.4. Brushes utilized for removing loose asbestos/lead containing material shall have nylon or fiber bristles, not metal.

8.2.2.5. A sufficient supply of HEPA-filtered vacuum systems shall be available during cleanup.

8.2.3. Encapsulation

8.2.3.1. Encapsulant shall be sprayed using airless spray equipment. Nozzle pressure should be adjustable within the 400 to 1500-psi ranges. Application pressures shall be determined by the encapsulant's viscosity and solids content. Tip size and pressure shall also conform to manufacturer's recommendations.

8.2.3.2. The nature of the encapsulant may effect the requirements for respiratory and dermal protection.

8.2.3.3. Overspray from encapsulants shall be cleaned from all fixtures and equipment remaining in the work area.

8.2.3.4. Encapsulants shall be applied in accordance with all manufacturers' recommendations.

8.3. SUBSTITUTIONS

8.3.1. Approval Required

8.3.1.1. The Contract is based on the materials, equipment and methods described in the Contract Documents.

8.3.1.2. The Owner will consider proposals for substitutions of materials, equipment and methods only when such proposals are accompanied by full and complete

technical data and all other information required by the Owner to evaluate the proposed substitution.

8.3.1.3. Do not substitute materials, equipment or methods unless the Owner has specifically approved such substitution for this Work.

8.3.2. "Or equal"

8.3.2.1. Where the phrase "or equal" or "or equal as approved by the Architect" occurs in the Contract Document, do not assume that materials, equipment or methods will be approved by the Architect unless the item has been specifically approved for this Work by the Architect.

8.3.2.2. The decision of the Owner shall be final.

8.3.3. Availability of specified items

8.3.3.1. Verify prior to bidding that all specified items will be available, in sufficient quantities, in time for use or installation during orderly and timely progress of the Work, and in compliance with the Contract scheduling requirements.

8.3.3.2. In the event that specified items will not be so available, notify the Owner prior to mobilizing the job.

8.3.3.3. Costs of delays because of non-availability of specified items, when the Contractor could have avoided such delays, will be back-charged as necessary and shall not be borne by the Owner.

9. PREPARATION

9.1. TEMPORARY POWER

9.1.1. Contractor shall insure a safe installation (including ground faulting) of temporary power sources and equipment, and;

9.1.1.1. Compliance with all applicable electrical code requirements and Cal-OSHA requirements for temporary electrical systems.

9.1.1.2. Compliance with all Air Pollution Control Department requirements for stationary power sources.

9.1.1.3. Compliance with all Fire Department requirements related to combustible fuel storage and usage

9.1.1.4. Reasonably minimizing the effects of generator noise.

9.1.2. The temporary electrical service shall be sized to provide 150% of the maximum demand of the Contractor's equipment that will remain in service during the

performance of the Project. Contractor shall provide a power distribution schedule and amperage calculation for all electrical devices to be used.

9.1.3. Contractor shall ensure that all power cords are free of cuts, nicks or other damage. Power cords shall not be allowed to gather or coil where they may create a trip hazard. Power cords repaired with duct tape will not be permitted inside contained areas.

9.1.3.1. The Contractor shall provide a temporary power system of sufficient capacity to provide for the electrical demand for work to be performed under **02080.**

9.1.4. Contractor shall provide stationary temporary lighting, meeting minimum OSHA standards, sufficient to safely perform the Work and for Owner to clearly observe the Work without having to use a flashlight or hand held drop lights.

9.1.4.1. The temporary lighting system shall be maintained throughout all areas of the work area for the duration of the Project, and not relocated as the work progresses.

9.2. WORK AREAS

9.2.1. Contractor shall post caution signs meeting the specifications of Cal-OSHA General Industry Safety Order Section 5208 at any location and approaches to a location where airborne concentrations of asbestos may exceed ambient background levels. Signs shall be posted at a distance sufficiently far enough away from the work area to permit an employee to read the sign and take the necessary protective measures to avoid exposure. Additional signs may need to be posted following construction of workplace enclosure barriers.

9.2.2. Pre-clean all surfaces as described in the approved submittal Work Plan in the work area using HEPA-filtered vacuums and/or wet cleaning methods. Do not use any methods that would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. Do not disturb asbestos-containing materials during the pre-cleaning stage.

9.2.3. Seal off all windows, doorways, corridor entrances, drains, electrical devices, ducts, grills, grates, diffusers, skylights and any other openings between the work area and uncontaminated areas outside of the work area (including the outside of the building, tunnels, and crawl spaces) with 6-mil polyethylene sheeting and tape.

9.2.4. Unless otherwise specified, or a substitution alternative clearly described and approved in Contractor's Work Plan by the Owner, a minimum of two layers of polyethylene sheeting shall be used for walls and floors and shall be a minimum of 6-mil thick. For all other uses sheeting of at least 6-mil thickness shall be used in widths selected to minimize the frequency of joints.

9.2.4.1. Floor shall be covered with two layers of 6-mil (minimum) sheeting.

9.2.4.2. Plastic shall be sized to minimize seams. If the floor area necessitates seams, those on successive layers of sheeting shall be staggered to reduce the potential for water to penetrate to the flooring material. A distance of at least 6 feet between seams is sufficient. Do not locate any seams at wall/floor joints.

9.2.4.3. Floor sheeting shall extend at least 12" up the sidewalls of the work area.

9.2.4.4. Sheeting shall be installed in a fashion so as to prevent slippage between successive layers of material.

9.2.5. Unless otherwise specified, cover walls in the work area with polyethylene sheeting.

9.2.5.1. Unless otherwise specified, walls shall be covered with a minimum of two layers of 6-mil polyethylene sheeting.

9.2.5.2. Tops of partition walls that do not extend to the ceiling above shall be completely sealed to prevent water or contaminated waste from entering the wall cavities.

9.2.5.3. Plastic shall be sized to minimize seams. Seams shall be staggered and separated by a distance of at least six feet.

9.2.5.4. Wall sheeting shall overlap floor sheeting by at least 12 inches beyond the wall/floor joint to provide a better seal against water damage and for negative pressure.

9.2.5.5. Wall sheeting shall be secured adequately to prevent it from falling away from the walls. This will require additional support/attachment when negative pressure ventilation systems are utilized. Corners shall be tight and neat, able to resist hand pressure.

9.3. DECONTAMINATION SYSTEMS

9.3.1. Worker decontamination enclosure system shall be provided at all where workers will enter or exit the work area. One system at a single location for each contained work area is required. These systems may consist of existing rooms outside of the work area, if the layout is appropriate, that can be enclosed in plastic sheeting and are accessible from the work area. When this situation does not exist, enclosure systems may be constructed out of metal, wood or plastic support as appropriate.

9.3.2. Plans for construction, including materials and layout, shall be submitted as shop drawings and approved, in writing, by the Owner prior to work initiation. Worker decontamination enclosure systems constructed at the worksite shall utilize 6 mil opaque black or white polyethylene sheeting or other acceptable materials for privacy. Detailed descriptions of portable, prefabricated units, if used, must be submitted for the Owner's approval. Plans must include floor plans with dimensions, materials, size, thickness, plumbing and electrical utilities. The decon shall be sufficiently large to use as a bag-out station, or a separate three stage bag out station may be constructed.

9.3.3. The worker decontamination enclosure system shall consist of at least a clean room, a shower room, and an equipment room, each separated from the other and from the work area by airlock.

9.3.4. Access between any two rooms in the decontamination enclosure system shall be through an airlock with at least 3 feet separating each curtained doorway. Pathways into (from clean to contaminated) and out from (contaminated to clean) the work area shall be clearly designated.

9.3.5. Clean room shall be sized to adequately accommodate the work crew. Benches shall be provided as well as hooks for hanging up street clothes. (Lockers may be provided for valuables, however, workers may be requested to secure valuables in their cars). Shelves for storing respirators shall also be provided in this area. Clean work clothes (if required under disposable clothing), clean disposable clothing, replacement filters for respirators, towels and other necessary items shall be provided for in adequate supply at the clean room. A location for posting notices shall also be provided in this area. Whenever possible, a locking door shall be used to permit access into the clean room from outside the work area. Lighting, heat and electricity shall be provided as necessary for comfort. This space shall not be used for storage of tools, equipment or materials, (except as specifically designated) or as office space.

9.3.6. Shower room shall contain one or more showers as necessary to adequately accommodate workers. Each showerhead shall be supplied with tempered water. The shower enclosure shall be constructed to ensure against leakage of any kind. An adequate supply of soap, shampoo, finger brushes and towels shall be supplied by the Contractor and available at all times. Shower water and other contaminated water shall be drained, collected and filtered through a minimum 3-stage system with at least 0.5 - 1.0 micron particle size collection capability. (Note: A system containing a series of several filters with progressively smaller pore sizes is recommended to avoid rapid clogging of filtration system by large particles). Filtered water shall be contained in a drum in the clean room until the end of the work shift, when it shall be re-pumped through the 3-stage filter to a location approved by Owner.

9.3.6.1. The property is an environmentally sensitive site, particularly with respect to water disposal. No water of any type shall be allowed to drain upon the surface of the site.

9.3.7. The equipment room shall be used for storage of equipment and tools at the end of a shift after they have been decontaminated using a HEPA filtered vacuum and /or wet cleaning techniques as appropriate. Replacement filters (in sealed containers until used) for HEPA vacuums and negative pressure ventilation equipment, extra tools, containers of surfactant and other materials and equipment that may be required during the abatement may also be stored here as needed. A walk-off pan (a small children's swimming pool or equivalent filled with water shall be located in the work area just outside the equipment room for workers to clean off foot coverings after leaving the work area and prevent excessive contamination of the worker decontamination enclosure system. A drum lined with a labeled 6-mil polyethylene bag for collection of disposable clothing shall be located in this room. Contaminated footwear (e.g., rubber boots, other reusable footwear) shall be stored in this area for re-use the following workday.

9.4. WASTE DISPOSAL SYSTEMS

9.4.1. The waste container pass-out airlock shall be constructed at a location away from the worker decontamination enclosure system. The bag-out station shall be located at the point nearest where the waste disposal containers are located.

9.4.2. This airlock system shall consist of an airlock, a container staging area and another airlock with access to outside the work area.

9.4.3. The waste container pass-out airlock shall be constructed in similar fashion to the worker decontamination enclosure system using similar materials and airlock and curtain doorway designs.

9.4.4. This airlock system shall not be used to enter or exit the work site.

9.4.5. The worker decontamination system may be used as a bag-out system with prior written approval from the Owner.

9.4.6. Emergency exits shall be established and clearly marked with duct tape arrows or other effective designations to permit easy location from anywhere within the work area. They shall be secured to prevent access from uncontaminated areas and still permit emergency exiting. These exits shall be properly sealed with polyethylene sheeting, which can be cut to permit egress if needed. These exits may be the worker decontamination enclosure, the waste pass-out airlock and/or other alternative exits satisfactory to fire officials.

9.5. ISOLATION OF WORK AREAS

9.5.1. The contaminated work area shall be separated from uncontaminated, occupied areas of the building by the construction of airtight barriers.

9.5.2. Walls shall be constructed of wood or metal framing to support barriers in all openings greater than 4' x 8'.

9.5.3. A sheathing material (plywood, drywall) of at least 3/8" thickness shall be applied to working side of barrier.

9.5.4. Cover both sides of partition with a double layer of 6-mil polyethylene sheeting with staggered joints and seal in place.

9.5.5. Caulk edges of partition at floor, ceiling, walls and fixtures to form an airtight seal.

9.6. MAINTENANCE OF SYSTEMS

9.6.1. Following completion of the construction of all polyethylene barriers and decontamination system enclosures, allow overnight settling to insure that barriers will remain intact and secured to walls and fixtures before beginning actual abatement activities.

9.6.2. All polyethylene barriers inside the workplace, in the worker decontamination enclosure system, in the waste container pass-out airlock, and at partitions constructed to isolate the work area from occupied areas shall be inspected at least twice daily, prior to the start of each day's abatement activities and following the completion of the day's abatement activities. Document inspections and observations in the daily project log.

9.6.3. Damage and defects in the enclosure system are to be repaired immediately upon discovery at any time.

9.6.4. Use smoke tubes to test the effectiveness of the barrier system when directed by the Owner.

9.6.5. At any time during the abatement activities after barriers have been erected, if visible material is observed outside of the work area or if damage occurs to barriers, work shall immediately stop, repairs be made to barriers and debris/residue cleaned up using appropriate HEPA vacuuming and wet mopping procedures.

9.6.6. If air samples collected outside of the work area during abatement activities indicate airborne fiber concentrations greater than 0.01 f /cc or pre-measured background levels (whichever is higher) work shall immediately stop for inspection and repair of barriers. Cleanup of surfaces outside of the work area using HEPA vacuums or wet cleaning techniques may be necessary.

9.6.7. Install and initiate operation of negative pressure ventilation equipment as needed to provide a minimum of one air change in the work area every 15 minutes. Openings made in the enclosure system to accommodate these units shall be made airtight with tape and/or caulking as needed. If more than one unit is installed, they should be turned on one at a time, checking the integrity of wall barriers for secure attachment and need for additional reinforcement. Insure that adequate power supply is available to satisfy the requirements of the ventilating units.

9.7. Negative pressure ventilation units shall be exhausted to the outside of the building. Twelve-inch extension ducting shall be used to reach from the work area to the outside when required. Careful installation, air monitoring and daily inspections shall be done to insure that the ducting does not release fibers into uncontaminated building areas.

9.8. Once constructed and reinforced as necessary, with negative pressure ventilation units in operation as required, test enclosure for leakage utilizing smoke tubes. Repair or reconstruct as needed.

9.9. Clearly identify and maintain emergency and fire exits from the work area.

9.10. Clean, remove or enclose in polyethylene electrical boxes, motors, or other items above the suspended ceiling system that may interfere with the abatement process and were not previously removed or cleaned and sealed off. Utilize localized spraying of amended water and/or HEPA vacuums to reduce fiber dispersal during the removal of these fixtures.

9.11. Commencement of abatement shall not occur until:

9.11.1. Enclosure systems have been constructed and tested. The Owner shall release a monodispersal agent to test the effectiveness of the area.

9.11.2. Negative pressure ventilation systems are functioning adequately.

9.11.3. All pre-abatement submissions, notifications, posting and permits have been provided and are satisfactory to the Owner.

9.11.4. All equipment for abatement, cleanup and disposal are on hand.

9.11.5. All worker training and certification is completed. AHERA trained workers are required for this Project.

9.11.6. Contractor receives written permission from the Owner to commence abatement.

9.12. ALTERNATIVE PROCEDURES

9.12.1. Procedures described in this specification are to be utilized at all times.

9.12.2. If specified procedures cannot be utilized, a request must be made in writing to the Owner providing details of the problem encountered and recommended alternatives.

9.12.3. Alternative procedures shall provide equivalent or greater protection than procedures that they replace.

9.12.4. The Owner prior to implementation must approve any alternative procedure in writing.

10. WORKPLACE ENTRY AND EXIT PROCEDURES

10.1. PERSONNEL ENTRY AND EXIT

10.1.1. All personnel shall enter the building by using the acceptable or pre-determined access.

10.1.2. All workers and authorized personnel shall enter the work area through the worker decontamination enclosure system.

10.1.3. All personnel who enter the work area must sign the entry log, located in the clean room, upon entry and exit.

10.1.4. All personnel, before entering the work area, shall read and be familiar with all posted regulations, personal protection requirements (including workplace entry and exit procedures) and emergency procedures. A sign-off sheet shall be used to acknowledge that these have been reviewed and understood by all personnel prior to entry.

10.1.5. All personnel shall proceed first to the clean room, remove all street clothes and appropriately don respiratory protection (as deemed adequate for the job conditions) and disposable coveralls, head covering and foot covering. Hard hats, eye protection and gloves shall also be utilized if required. Clean respirator and protective clothing shall be provided and utilized by each person for each separate entry into the work area.

10.1.6. Personnel wearing designated personal protective equipment shall proceed from the clean room through the shower room and equipment room to the main work area.

10.1.7. Before leaving the work area all personnel shall remove gross contamination from the outside of respirators and protective clothing by brushing and/or wet wiping procedures (small HEPA vacuums with brush attachments may be utilized for this purpose, however, larger machines may tear the suits). Each person shall clean bottoms of protective footwear in the walk off pan just prior to entering the equipment room.

10.1.8. Personnel shall proceed to equipment room where they remove all protective equipment except respirators. Deposit disposable clothing into appropriately labeled containers for disposal.

10.1.9. Reusable, contaminated footwear shall be stored in equipment room when not in use in the work area. Upon completion of abatement it shall be disposed of as asbestos contaminated waste (rubber boots may be decontaminated at the completion of the abatement for reuse).

10.1.10. Still wearing respirators, personnel shall proceed to the shower area, clean the outside of the respirators and the exposed face area under running water prior to removal of respirator, and then shower and shampoo to remove residual asbestos/lead contamination. Various types of respirators will require slight modification of these procedures. An airline respirator with HEPA filtered disconnect protection may be disconnected in the equipment room and worn into the shower.

10.1.11. After showering and drying off, proceed to the clean room and don clean disposable (and/or launderable) clothing if there will be later reentry into the work area or street clothes if it is the end of the work shift.

10.1.12. These procedures shall be posted in the clean room and equipment room.

10.2. WASTE CONTAINER PASS-OUT PROCEDURES

10.2.1. Asbestos contaminated waste that has been containerized shall be transported out of the work area through the waste container pass out airlock (or through the worker decontamination enclosure if a separate airlock has not been constructed).

10.2.2. Waste pass out procedures shall utilize two teams of workers, and "inside" team and an "outside" team.

10.2.3. The inside team wearing appropriate protective clothing and respirators for inside the work area shall pass bags or drums to be transported out of the work area through the

waste container pass-out airlock [or through the worker decontamination enclosure if a separate airlock has not been constructed].

10.2.4. The outside team, wearing appropriately assigned respirators, shall enter the airlock from outside the work area, enclose the bags or drums in clean, labeled 6 mil polyethylene bags and remove them from the airlock to the outside. No worker from the outside team shall further enter the work area through this airlock.

10.2.5. The exit from this airlock shall be secured to prevent unauthorized entry.

11. REMOVAL PROCEDURES

11.1. Clean and prepare the work area in accordance with Paragraph 12.

11.2. Wet all friable asbestos containing material with an amended water solution using equipment capable of providing a fine spray mist; in order to reduce airborne fiber concentrations when the material is disturbed. Saturate the material to the substrate, however, do not allow excessive water to accumulate in the work area. Keep all removed material wet enough to prevent fiber release until it can be containerized for disposal. Maintain high humidity in the work area by misting or spraying to assist in fiber settling and reduce airborne concentrations. Wetting procedures are not equally effective on all types of asbestos containing materials but shall none-the-less be used in all cases.

11.3. Saturated asbestos containing material shall be removed in manageable sections. Removed material should be containerized before moving to a new location for continuance of work. Surrounding areas shall be periodically sprayed and maintained in a wet condition until visible material is cleaned up.

11.4. Material removed shall not be dropped or thrown to the floor. Material should be removed as intact sections or components whenever possible and carefully lowered to the floor. Cleanup of removed material shall be continuous.

11.5. Containers (6 mil polyethylene bags or drums) shall be sealed when full (Wet material can be exceedingly heavy. Double bagging of waste material is necessary. Bags shall not be overfilled. They should be securely sealed to prevent accidental opening and leakage by tying tops of bags in an overhand knot or by taping in gooseneck fashion. Do not seal bags with wire or cord. (Bags may be placed in drums for staging and transportation to the landfill. Bags shall be decontaminated on exterior surfaces by wet cleaning and HEPA vacuuming before being placed in clean drums and sealed with locking ring tops).

11.5.1. Bags shall be clear poly to enable a visual inspection to confirm adequate wetness of removed materials.

11.6. Large components removed intact may be wrapped in 2 layers of 6-mil polyethylene sheeting secured with tape for transport to the landfill.

11.7. After completion of all stripping work, surfaces from which asbestos containing materials have been removed shall be wet brushed and sponged or cleaned by some equivalent method to remove all visible residues.

11.8. Clean up shall proceed in accordance with Section 13.

11.9. After the work area has been rendered free of visible residues, a thin coat of a satisfactory encapsulating agent shall be applied to all surfaces in the work area including structural members, building components and plastic sheeting on walls, floors and covering non-removable items, to seal in non-visible residue.

12. CLEANUP PROCEDURES

12.1. Remove and containerize all visible accumulations of asbestos-containing material and asbestos-contaminated attic insulation.

12.2. Wet clean all surfaces in the work area using rags, mops and sponges as appropriate. (Note: Some HEPA vacuums might not be wet-dry vacuums. To pick up excess water and gross wet debris, a wet-dry shop vacuum may be used. This will be contaminated and require cleaning prior to removal from the work area.)

12.3. Remove the cleaned outer layer of plastic sheeting from walls and floors. Windows, doors, HVAC system vents and all other openings shall remain sealed. The negative pressure ventilation units shall remain in continuous operation. Decontamination enclosure systems shall remain in place and be utilized.

12.4. Remove all containerized waste from the work area and waste container pass-out airlock.

12.5. Decontaminate all tools and equipment and remove at the appropriate time in the cleaning sequence.

12.6. The work area shall be cleaned until it is in compliance with State and Local requirements and any more stringent criteria agreed upon by the Contractor and Owner prior to initiation of abatement activities

12.7. Visual inspections and clearance air monitoring shall be performed.

12.7.1. Contractor shall conduct his own thorough and complete visual inspection of the work areas in advance of Owner's visual clearance inspection.

12.7.2. Re-inspections following a failed visual inspection shall be considered as Unplanned Events.

12.8. Following the satisfactory completion of clearance air monitoring remaining barriers may be removed and properly disposed of. A final visual inspection by the Contractor's Hazardous Materials Consultant shall insure that no contamination remains in the work area. Unsatisfactory conditions may require additional cleaning and air monitoring

13. DISPOSAL PROCEDURES

13.1. Disposal must occur at the authorized landfill in accordance with regulatory requirements of NESHAP and applicable State and Local guidelines and regulations, including the California State Department of Health Services, Toxic Substances Control Division.

13.2. Clear and legible copies of all dump receipts, trip tickets, transportation manifests or other documentation of disposal shall be continuously maintained in a designated job-site file, in chronological order, until the end of the job, when they shall be included in the Closeout Book.

13.3. TRANSPORATION TO LANDFILL

13.3.1. Once bags have been removed from the work area, they shall be loaded into an enclosed truck for transportation.

13.3.2. When moving containers, utilize hand trucks, carts and proper lifting techniques to avoid back injuries.

13.3.3. The enclosed cargo area of the truck shall be free of debris and lined with 6 mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first and extend up the sidewalls. Wall sheeting shall be overlapped and taped into place.

13.3.4. Personnel loading asbestos-containing waste shall be protected by disposable clothing including head, body and foot protection and at a minimum, half-face piece, air-purifying, dual cartridge/respirators equipped with high efficiency filters.

13.3.5. Any debris or residue observed on containers or surfaces outside of the work area resulting from clean up or disposal activities shall be immediately cleaned-up using HEPA filtered vacuum equipment and/or wet methods as appropriate.

13.3.6. Large metal dumpsters are sometimes used for asbestos waste disposal. These should have doors or tops that can be closed and locked to prevent vandalism or other disturbance of the bagged asbestos debris and wind dispersion of asbestos fibers. Unbagged material shall not be placed in these containers, nor shall they be used for non-asbestos waste. Bags shall be placed, not thrown, into these containers to avoid splitting.

13.4. DISPOSAL AT LANDFILL

13.4.1. Upon reaching the landfill, trucks are to approach the dump location as closely as possible for unloading of the asbestos containing waste.

13.4.2. Bags shall be inspected as they are off loaded at the disposal site. Material in damaged containers shall be repacked in empty bags as necessary.

13.4.3. Waste containers shall be placed on the ground at the disposal site, not pushed or thrown out of trucks (weight of wet material could rupture containers).

13.4.4. Personnel off loading containers at the disposal site shall wear protective equipment consisting of disposable head, body and foot protection and, at a minimum, half-face, air-purifying, dual cartridge respirators equipped with high efficiency filters.

13.4.5. Following the removal of all containerized waste, the truck cargo area shall be decontaminated using HEPA vacuums and/or wet methods to meet the no visible residue criteria. Polyethylene sheeting shall be removed and discarded, along with contaminated cleaning materials and protective clothing, in bags or drums at the disposal site.

13.4.6. If landfill personnel have not been provided with personal protective equipment for the compaction operation by the landfill operator, Contractor shall supply protective clothing and respiratory protection for the duration of this operation.

14. REESTABLISHMENT OF WORK AREAS AND SYSTEMS

14.1. Reestablishment of the work area shall only occur following the completion of clean-up procedures and after clearance air monitoring has been performed and documented to the satisfaction of the Criterion Environmental, Inc. (CEI) the Owner's Hazardous Materials Consultant.

14.2. Polyethylene barriers shall be removed from walls and floors at this time, maintaining decontamination enclosure systems and barriers over doors, windows, etc. as required.

14.3. The Contractor, as well as CEI (Owner's Representative) shall visually inspect the work area for any remaining visible residue. Evidence of contamination will necessitate additional cleaning requirements in accordance previously cited sections.

14.4. Additional air monitoring shall be performed in accordance with paragraph **13.7** if additional clean up is necessary.

14.5. Following satisfactory clearance of the work area, remaining polyethylene barriers may be removed and disposed of as asbestos contaminated waste.

15. OWNER'S MONITORING

15.1. Owner reserves the right to perform visual inspections, area air monitoring and independent air clearance monitoring at any time, and such monitoring shall not relieve Contractor of his obligations for monitoring.

15.2. Owner may issue a STOP WORK Order whenever Contractor's work or protective measures are not in accord with statutory or contractual restrictions or recommendations

promulgated by regulating authorities. That order shall not be cause for an increase in the Contract Price or Time.

15.3. Contractor shall provide copies of personal air monitoring results to the Owner daily.

16. SUPPORT ACTIVITIES AND PERSONNEL

16.1. TRAINING

16.1.1. Training shall be provided by the Contractor to all employees or agents who may be required to disturb asbestos-containing or asbestos-contaminated materials for abatement and auxiliary purposes and to all supervisory personnel who may be involved in planning, execution, or inspection of abatement projects.

16.1.2. Training shall be provided by an agency approved to provide training under the AHERA. The training shall provide at a minimum certification under the AHERA.

16.1.3. Training shall provide, at a minimum, information on the following topics:

16.1.4. The health hazards of asbestos including the nature of various asbestos related diseases, routes of exposure, known dose-response relationships, the synergistic relationship between asbestos exposure and cigarette smoking, latency periods for disease and health basis for standards.

16.1.5. The physical characteristics of asbestos including fiber size, aerodynamic properties, physical appearance and uses.

16.1.6. Employee personal protective equipment including the types and characteristics of respirator classes, limitations of respirators, proper selection, inspection, donning, use, maintenance and storage of respirators, field testing the face-piece-to-face seal (positive and negative pressure fitting tests), qualitative and quantitative fit testing procedures, variations between laboratory and field fit factors, factors that affect respirator fit (e.g., facial hair), selection and use of disposable clothing, use and handling of launderable clothing, non-skid shoes, gloves, eye protection, and hard hats.

16.1.7. Medical monitoring requirements for workers including required and recommended tests, reasons for medical monitoring, and employee access to records.

16.1.8. Air monitoring procedures and requirements for workers including description of equipment and procedures, reasons for monitoring, types of samples, and current standards with recommended changes.

16.1.9. Work practices for asbestos abatement including purpose, proper construction and maintenance of air-tight plastic barriers, job set- up of airlock, worker decontamination systems and waste transfer airlock, posting of warning signs, engineering controls, electrical and ventilation system lockout, proper working techniques, waste clean-up, and storage and disposal procedures.

16.1.10. Personal hygiene including entry and exit procedures for the work area, use of showers and prohibition of eating, drinking, smoking, and chewing in the work area.

16.1.11. Special safety hazards that may be encountered including electrical hazards, air contaminants (CO, wetting agents, encapsulant, and materials from Contractor's operation) fire and explosion hazards, scaffold and ladder hazards, slippery surfaces, confined spaces, heat stress, and noise.

16.1.12. Workshops affording both supervisory personnel and abatement workers the opportunity to see (and experience) the construction of containment barriers and decontamination facilities.

16.1.13. Supervisory personnel shall, in addition, receive training or contract specifications, liability insurance and bonding, legal considerations related to abatement, establishing respiratory protection medical surveillance programs, EPA, OSHA, and State record keeping requirements, and other topics as requested by the Owner.

16.1.14. Training shall be provided by Individuals approved by the EPA under AHERA.

16.1.15. Training is to have occurred within 12 months prior to the initiation of abatement activities.

16.1.16. Contractor must document training by providing date of training, training entity, course outline, and names and qualifications of trainers.

16.2. MEDICAL MONITORING

16.2.1. The Contractor must provide medical Monitoring to any employee or agent that may be exposed to asbestos in excess of background levels during any stage of the abatement project. The purposes of a medical monitoring program, in addition to meeting the requirements of the law, are to document the state of health of workers for workers compensation and to determine work relatedness of disease as well as to ensure fitness for duty, particularly ability to wear a respirator. Smokers should be made aware of the synergistic effects of cigarette smoking and asbestos exposure. The medical monitoring program provides the appropriate setting to share this information. Employers should also be aware of the potential cost of this additional risk. Medical monitoring shall include at a minimum the requirements of OSHA 29 CFR 1910.1001 (j).

16.2.2. A work/medical history to elicit symptoms of respiratory disease.

16.2.3. A chest x-ray (posterior-anterior, 14 x 13 inches) taken by a certified radiology technician and read by a certified B-reader.

16.2.4. A pulmonary function test, including forced vital capacity (FVC) and forced expiratory volume at one second (FEV1), and FEVI/FVC ratio (administered by a NIOSH or A.T.S Certified Pulmonary Technician and interpreted and compared to standardized normal readings by a Board Certified Pulmonary Specialist).

16.2.5. Employees shall be given the opportunity to be evaluated by a physician to determine their capability to work safely while breathing through the added resistance of a respirator. (Examining physicians shall be aware of the nature of respiratory protective devices and their contributions to breathing resistance. They shall also be informed of the specific types of respirators the employees shall be required to wear and the work they will be required to perform, as well as special workplace conditions such as high temperatures, high humidity, and chemical contaminants to which they may be exposed. Evaluation of groups of workers should take into consideration epidemiological principles as suggested by the American Thoracic Society in their statement on the work relatedness of disease adopted in 1982).

16.3. PERSONNEL PROTECTION REQUIREMENTS

16.3.1. Respiratory Protection

16.3.1.1. All respiratory protection shall be provided to workers in accordance with the submitted written respiratory protection program, which includes all items as required by Cal-OSHA. This program shall be posted in the clean room of the worker decontamination enclosure system.

16.3.1.2. Workers shall be provided with personally issued, individually identified (marked with waterproof -designations) respirators.

16.3.2. Fit testing

16.3.2.1. Workers must perform positive and negative air pressure fit tests each time a respirator is put on, whenever the respirator design so permits.

16.3.2.2. Workers shall be given a qualitative fit test in accordance with procedures detailed in the Cal-OSHA requirements for all respirators to be used on this abatement project. An appropriately administered quantitative fit test may be substituted for the qualitative fit test.

16.3.2.3. Documentation of adequate respirator fit must be provided to the Owner.

16.3.2.4. No employee wearing a beard or facial hair that is located in the fit zone of the respirator shall be permitted to don a respirator and enter the work area.

16.3.2.5. Additional respirators (minimum of 2 of each type) and training on their donning and use must be available at the work site for authorized visitors who may be required to enter the work area.

16.4. PROTECTIVE CLOTHING

16.4.0.1. Disposable clothing including head, foot and full body protection shall be provided in sufficient quantities and adequate sizes for all workers and authorized visitors.

16.4.0.2. At all times, workers shall wear gloves, hard hats and safety glasses.

END OF SECTION

EHS Laboratories

Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237
Telephone: 800.347.4010

Asbestos Bulk Analysis Report

Report Number: 18-02-02744

Client: Criterion Environmental Inc
1879 Portola Road
Suite K
Ventura, CA 93003

Received Date: 02/19/2018
Analyzed Date: 02/19/2018
Reported Date: 02/19/2018

Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Client Number:
05-5861

Fax Number:
805-644-5347

Laboratory Results

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-001A	ASB-1	Base Coat	Tan Granular; Homogeneous	NAD	100% Non-Fibrous
No drywall/joint compound present.					
18-02-02744-001B	ASB-1	Skim Coat	White Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-002	ASB-2		White Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-003A	ASB-3	Cove Base	Beige Vinyl; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-003B	ASB-3	Mastic I	Tan Adhesive; Homogeneous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744
Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-003C	ASB-3	Mastic II	Brown Adhesive; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-004A	ASB-4	Base Coat	Tan Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-004B	ASB-4	Skim Coat	White Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-005A	ASB-5	Cove Base	Beige Vinyl; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-005B	ASB-5	Mastic I	Brown Adhesive; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-005C	ASB-5	Mastic II	Tan Adhesive; White Powdery; Inhomogeneous	2% Chrysotile	98% Non-Fibrous
			Total Asbestos:	**2%**	
Chrysotile present in white powdery material.					
18-02-02744-006	ASB-6		White Paint-Like; Tan Fibrous; Inhomogeneous	NAD	55% Cellulose 25% Fibrous Glass 20% Non-Fibrous
18-02-02744-007	ASB-7		Tan Fibrous; Homogeneous	NAD	94% Cellulose 6% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744

Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-008	ASB-8		Tan/Orange Fibrous; Silver Foil; Inhomogeneous	NAD	18% Cellulose 70% Fibrous Glass 12% Non-Fibrous
18-02-02744-009A	ASB-9	Base Coat	Tan Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-009B	ASB-9	Skim Coat	White Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-010A	ASB-10	Base Coat	Tan Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-010B	ASB-10	Skim Coat	White Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-010C	ASB-10	Joint Comp.	Tan Granular; Homogeneous	2% Chrysotile	98% Non-Fibrous
			Total Asbestos:	**2%**	
18-02-02744-011A	ASB-11	Cove Base	Beige Vinyl; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-011B	ASB-11	Mastic	Tan Adhesive; Homogeneous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744

Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-011C	ASB-11	Leveling Comp.	Tan Brittle; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-012	ASB-12		White Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-013	ASB-13		White Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-014A	ASB-14	Cove Base	Beige Vinyl; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-014B	ASB-14	Mastic I	Brown Brittle Adhesive; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-014C	ASB-14	Mastic II	Tan Adhesive; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-015A	ASB-15	Base Coat	Tan Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-015B	ASB-15	Skim Coat	White Granular; Homogeneous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744

Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-016	Asb-16		Tan Fibrous; White/Beige Brittle to Coarse Powder; Inhomogeneous	NAD	65% Cellulose 35% Non-Fibrous
18-02-02744-017	Asb-17		Tan Fibrous; White/Beige Brittle to Coarse Powder; Inhomogeneous	NAD	65% Cellulose 35% Non-Fibrous
18-02-02744-018A	Asb-18	Cove Base	Black/Gray Vinyl-Like; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-018B	Asb-18	Mastic	Pale Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
18-02-02744-019	Asb-19		Tan Fibrous; White/Beige Brittle to Coarse Powder; Inhomogeneous	NAD	65% Cellulose 35% Non-Fibrous
18-02-02744-020	Asb-20		Off-White Fibrous; Homogeneous	25% Chrysotile	5% Cellulose 70% Non-Fibrous
			Total Asbestos:	**25%**	
18-02-02744-021A	Asb-21	Cove Base	Tan Vinyl-Like; Homogeneous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744
Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-021B	Asb-21	Other *	Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
* Outer Mastic Layer					
18-02-02744-021C	Asb-21	Other *	Brown Adhesive; Homogeneous	NAD	8% Talc 92% Non-Fibrous
* Inner Mastic Layer					
18-02-02744-022	Asb-22		Pale Gray to Tan Fibrous; White Brittle; Inhomogeneous	NAD	40% Cellulose 40% Fibrous Glass 20% Non-Fibrous
18-02-02744-023	Asb-23		Off-White Fibrous; Homogeneous	17% Chrysotile	5% Fibrous Glass 78% Non-Fibrous
			Total Asbestos:	**17%**	
18-02-02744-024	Asb-24		Pale Tan-Gray Fibrous; Off-White Brittle; Inhomogeneous	NAD	40% Cellulose 40% Fibrous Glass 20% Non-Fibrous
18-02-02744-025A	Asb-25	Other *	Off-White Cementitious; Homogeneous	NAD	1% Cellulose 99% Non-Fibrous
* Masonry Material					
18-02-02744-025B	Asb-25	Other *	Off-White Fibrous; Homogeneous	15% Chrysotile	5% Fibrous Glass 80% Non-Fibrous
			Total Asbestos:	**15%**	
* Surface Finish/Fireproofing-Type Material					
18-02-02744-026	Asb-26		Off-White Cementitious; Homogeneous	NAD	1% Cellulose 99% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744

Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-027A	Asb-27	Cove Base	Tan Vinyl-Like; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-027B	Asb-27	Other *	Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
* Outer Mastic Layer					
18-02-02744-027C	Asb-27	Other *	Brown Adhesive; Homogeneous	NAD	10% Talc 90% Non-Fibrous
* Inner Mastic Layer					
18-02-02744-028A	Asb-28	Flooring	Off-White Granular; Homogeneous	3% Chrysotile	97% Non-Fibrous
			Total Asbestos:	**3%**	
18-02-02744-028B	Asb-28	Mastic	Black Adhesive; Homogeneous	7% Chrysotile	2% Cellulose 1% Fibrous Glass 90% Non-Fibrous
			Total Asbestos:	**7%**	
18-02-02744-029A	Asb-30	Flooring	Off-White Granular; Homogeneous	3% Chrysotile	97% Non-Fibrous
			Total Asbestos:	**3%**	
18-02-02744-029B	Asb-30	Mastic	Black Adhesive; Homogeneous	7% Chrysotile	1% Cellulose 92% Non-Fibrous
			Total Asbestos:	**7%**	
18-02-02744-030A	Asb-31	Cove Base	Tan Vinyl-Like; Homogeneous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744
Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-030B	Asb-31	Mastic	Brown Adhesive; Homogeneous	NAD	1% Cellulose 7% Talc 92% Non-Fibrous
18-02-02744-031	Asb-32		Off-White to Pale Gray Cementitious; Homogeneous	NAD	5% Cellulose 95% Non-Fibrous
18-02-02744-032	Asb-33		Pale Beige-Gray Fibrous; Homogeneous	20% Chrysotile	2% Cellulose 78% Non-Fibrous
			Total Asbestos:	**20%**	
18-02-02744-033A	Asb-34	Other *	Off-White Cementitious; Homogeneous	NAD	1% Cellulose 99% Non-Fibrous
* Masonry Material					
18-02-02744-033B	Asb-34	Other *	Off-White Fibrous; Homogeneous	17% Chrysotile	3% Fibrous Glass 80% Non-Fibrous
			Total Asbestos:	**17%**	
* Surface Finish/Fireproofing-Type Material					
18-02-02744-034	Asb-35		Off-White Cementitious; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
18-02-02744-035	Asb-36		Blue Chalky Fibrous; Homogeneous	NAD	35% Cellulose 65% Non-Fibrous
18-02-02744-036	Asb-37		Blue Chalky Fibrous; Homogeneous	NAD	35% Cellulose 65% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744

Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-037A	Asb-38	Mastic	Yellow-Clear Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
18-02-02744-037B	Asb-38	Wrap	Tan Fibrous; Homogeneous	NAD	50% Cellulose 50% Non-Fibrous
18-02-02744-038A	Asb-39	Mastic	Clear-Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
18-02-02744-038B	Asb-39	Wrap	Tan Fibrous; Homogeneous	NAD	50% Cellulose 50% Non-Fibrous
18-02-02744-039A	Asb-40	Mastic	White Adhesive-Like; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
18-02-02744-039B	Asb-40	Covering/ Jacket	Silver Foil-Like; Yellow Adhesive-Like; White Fibrous; Inhomogeneous	NAD	15% Cellulose 85% Non-Fibrous
18-02-02744-039C	Asb-40	Insulation	Yellow Fibroous; Homogeneous	NAD	35% Fibrous Glass 65% Non-Fibrous
18-02-02744-040	Asb-41		Blue Chalky Fibrous; Homogeneous	NAD	35% Cellulose 65% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744

Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-041A	Asb-42	Cove Base	Blue-Gray Pliable; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-041B	Asb-42	Mastic	Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
18-02-02744-042A	Asb-43	Cove Base	Black Pliable; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-042B	Asb-43	Mastic	Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
18-02-02744-043A	Asb-44	Joint Comp.	Off-White Paint-Like; White Powdery; Inhomogeneous	NAD	100% Non-Fibrous
18-02-02744-043B	Asb-44	Drywall	Brown Fibrous; White Chalky; Inhomogeneous	NAD	15% Cellulose 5% Fibrous Glass 80% Non-Fibrous
18-02-02744-044A	Asb-45	Joint Comp.	Off-White/Blue Paint-Like; Off-White Powdery; Inhomogeneous	2% Chrysotile	98% Non-Fibrous

Total Asbestos: 2%

Chrysotile present in off-white powdery material

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744

Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-044B	Asb-45	Tape	White/Brown Fibrous; Inhomogeneous	NAD	20% Cellulose 80% Non-Fibrous
18-02-02744-044C	Asb-45	Plaster	Off-White Chalky Granular; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-045	Asb-46		Tan Fibrous; Gray Platelets; Inhomogeneous	12% Chrysotile	5% Cellulose 83% Non-Fibrous
			Total Asbestos:	**12%**	
Chrysotile present throughout					
18-02-02744-046A	Asb-47	Skim Coat	White Chalky; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-046B	Asb-47	Base Coat	Tan Cementitious; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
18-02-02744-047	Asb-48		Off-White Chalky Granular; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
18-02-02744-048A	Asb-49	Cove Base	Black Pliable; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-048B	Asb-49	Mastic	White Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744

Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
18-02-02744-049A	Asb-50	Cove Base	Tan Pliable; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-049B	Asb-50	Mastic	Brown Adhesive; Homogeneous	NAD	2% Cellulose 3% Talc 95% Non-Fibrous
18-02-02744-050A	Asb-51	Cove Base	Black Pliable; Homogeneous	NAD	100% Non-Fibrous
18-02-02744-050B	Asb-51	Mastic I	White Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
18-02-02744-050C	Asb-51	Mastic II	Tan-Brown Adhesive; Homogeneous	NAD	2% Cellulose 2% Talc 96% Non-Fibrous
18-02-02744-051	Asb-04		White Paint-Like; Gray Fibrous; Inhomogeneous	NAD	55% Cellulose 35% Fibrous Glass 10% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 05-5861 **Report Number:** 18-02-02744

Project/Test Address: MOO-8953-AsbPb; Moorpark College Gym; 7075 Campus Road; Moorpark, CA 93021

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials

QC Sample: 22-M22011-2, 27-M12009-3, 25-M22013-4

QC Blank: SRM 1866 Fiberglass

Reporting Limit: 1% Asbestos

Method: EPA Method 600/R-93/116, EPA Method 600/M4-82-020

Analyst: Sami Hosn, Mark Case, Meredith Outlaw

Reviewed By Authorized Signatory: Tasha Eaddy

Tasha Eaddy
QA/QC Clerk

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Each distinct component in an inhomogeneous sample was analyzed separately and reported as a composite. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C. California Certification #2319 NY ELAP #11714 NVLAP #101882-0 VELAP 460172. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), (for enhanced detection capabilities) for materials regulated by EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

400 Point Count Analysis, where noted, performed per EPA Method 600/R-93/116 with a Reporting Limit of 0.25%.

* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND: NAD = no asbestos detected

Criterion Envi[illegible]ntal Inc.
1879 Portola Rd. Ste. K
Ventura, CA 93003
05-644-8347
FAX - 805-644-5347

* Received extra sample labeled ASB-04

51 PLM

* 29 Sample not received

Environmental Hazard Services
7469 Whitepine Road Richmond, Virginia 23237
804.275.4788 804.275.4907 fax

Project ID: M00-8953-AsbPb

Date: February 16, 2018

Site Address: MoorPark College Gym 7075 Campus Road MoorPark, CA 930[illegible]

Contact: Matthew Lopez mlopez@criterionenv.com

Sample ID	Sample Date	Asbestos: Bulk ID by PLM	Asbestos: (PCM) Fiber Count	Asbestos: PLM Point Count	Asbestos: PLM Gravimetric	Asbestos: TEM AHERA (Air)	Asbestos: TEM Chatfield (Bulk)	Lead: Air	Lead: Paint (%)	Lead: Paint (PPM)	Lead: Paint (mg/cm2)	Lead: Soil	Lead: Wipe * (See Note)	Lead: TCLP (Pb)	Mold: Air: Non Viable	Mold: Bulk: Non Viable (Qualitative)	Air Volume (L) or Wipe Area (ft^2)	Material	Color	Sample Location/Comments	Stop at first Positive (ACM)	TAT
Asb-1	2/16/18	X																DJC/Plaster wall		Room 130		X
Asb-2																		Putty Patch		Room 130 Hall		
Asb-3																		VBC+Mastic		Rm 130		
Asb-4																		Wall		Wmn's LockRoom		
Asb-5																		VBC+Mastic		Women's Locker Room		
Asb-6																		Acos tile		Acos tile Room 116		
Asb-7																		tape HVAC		Ceiling 116		
Asb-8																		APehwap		Room 116		
Asb-9																		Wallwrap		Custodial Room Basement		
Asb-10																		↓		Men's Locker Room		
Asb-11																		VBC+Mastic		Men's Locker Room		
Asb-12																		Stucco Interior		Men's Locker Room		
Asb-13																		↓		Men's Staff Shower		
Asb-14																		VBC+Mastic		Near team Room 149		
Asb-15	↓	↓																Ceiling		Team Room 149		↓

18-02-02744
Due Date:
02/19/2018
(Monday)
AE

Released by: Matthew Lopez
Signature: [signature]
Date/Time: February 16, 2018 2:47pm
2/19/18/0[illegible]

Criterion Environmental Inc.
1879 Portola Rd. Ste. K
Ventura, CA 93003
805-644-8347
FAX - 805-644-5347

Environmental Hazard Services
7469 Whitepine Road Richmond, Virginia 23237
804.275.4788 804.275.4907 fax

Project ID: M00-8953-AsbPh
Site Address: Moorpark College Gym
Date: February 16, 2018
Contact: Matthew Lopez
mlopez@criterionenv.com

7075

Sample ID	Sample Date	Asbestos: Bulk ID by PLM	Asbestos: (PCM) Fiber Count	Asbestos: PLM Point Count	Asbestos: PLM Gravimetric	Asbestos: TEM AHERA (Air)	Asbestos: TEM Chatfield (Bulk)	Lead: Air	Lead: Paint (%)	Lead: Paint (PPM)	Lead: Paint (mg/cm2)	Lead: Soil	Lead: Wipe * (See Note)	Lead: TCLP (Pb)	Mold: Air Non Viable	Mold: Air Non Viable (Qualitative)	Mold: Bulk	Air Volume (L) or Wipe Area (ft^2)	Material	Color	Sample Location/Comments	Stop at first Positive (ACM)	TAT: Standard	TAT: Same Day/RUSH
Asb-16	2/16/2018	X																	Aco Wall Mat	Creme	Horse Hair Second Tier Gym			X
Asb-17																			↓	↓	Horse Hair South Tier Gym			
Asb-18																			VBC + mastic	Black	North Second Flr. Mats Room			
Asb-19																			Aco Wall Mats	Creme	N. wall mats Rm Horse Hair			
Asb-20																			Fire Proof	Grey	Fire Proof Gym Lobby ceiling			
Asb-21																			VBC + mastic	Tan	Lobby			
Asb-22																			Aco. tile	White	Lobby			
Asb-23																			Fire Proofing	grey	West Lobby			
Asb-24																			Aco tiles	White	Room 207 Hall			
Asb-25																			Stucco	White	Int. Ceiling Lobby			
Asb-26																			Wall Mats	↓	Room 207 Hall			
Asb-27																			VBC + mastic	Tan	Room 207 Hall			
Asb-28																			Vinyl tile + mastic	Whitish	Room 304			
Asb-29																			Aco tile	White	Room 304			
Asb-30	↓	↓																	Vinyl tile + mastic	Whitish	Room 304			↓

Released by: Matthew Lopez
Signature:
Date/Time: February 16, 2018 3:00pm
2/19/18 10:

Criterion Env[illegible]ental Inc.
1879 Portola Rd. Ste. K
Ventura, CA 93003

Environmental Hazard Services
7469 Whitepine Road Richmond, Virginia 23237
804.275.4788 804.275.4907 fax

805-644-8347
FAX - 805-644-5347

Project ID: M00-8953-AsbPb

Date: February 16, 2018

Site Address: Moor Park College Gym
7025 Campus Road Moorpark, CA 93021

Contact: Matthew Lopez
mlopez@criterionenv.com

#	Sample ID	Sample Date	Asbestos: Bulk ID by PLM	Asbestos: (PCM) Fiber Count	Asbestos: PLM Point Count	Asbestos: PLM Gravimetric	Asbestos: TEM AHERA (Air)	Asbestos: TEM Chatfield (Bulk)	Lead: Air	Lead: Paint (%)	Lead: Paint (PPM)	Lead: Paint (mg/cm2)	Lead: Soil	Lead: Wipe * (See Note)	Lead: TCLP (Pb)	Mold: Air: Non Viable	Mold: Bulk: Non Viable (Qualitative)	Air Volume (L) or Wipe Area (ft^2)	Material	Color	Sample Location/Comments	Stop at first Positive (ACM)	TAT [illegible]	TAT [illegible]
1	Asb-31	2/16/18	X																Vinyl/Mastic	tan	Room 304			X
2	Asb-32	↓	↓																Fire Proof?	grayish	Rms 304 Ceiling			↓
3	Asb-33																				Rms 303 Ceiling			
4	Asb-34																		↓	↓	Rms 303 Ceiling			
5	Asb-35																		Plaster?	grayish	Room 303 Ceiling			
6	Asb-36																		Fireproofing	Blue	Mechanical Room			
7	Asb-37																		↓	↓	S. Mechanical Room			
8	Asb-38																		HVAC Duct wrap	Yellow	Mech. Room			
9	Asb-39																		tape	↓	Mech Room			
10	Asb-40																		TSI Elbow mud	Yellow White	Mech Room			
11	Asb-41																		Fire Proofing	Blue	East Mech Room			
12	Asb-42																		VBC mastic	grey	Fitness Lab 202			
13	Asb-43																		↓	↓	Fitness Lab training Room			
14	Asb-44																		DJC	White	Fit Lab training Room NW			
15	Asb-45	↓	↓																↓	↓	FitLab training Room NE			↓

Released by: Matthew Lopez

Signature: [signature]

Date/Time: February 16, 2018 3:28 pm

2/19/18 10a

Criterion Envi[illegible]ental Inc.
1879 Portola Rd. Ste. K
Ventura, CA 93003
805-644-8347
FAX - 805-644-5347

Environmental Hazard Services
7469 Whitepine Road Richmond, Virginia 23237
804.275.4788 804.275.4907 fax

Project ID: M00-8953-AsbPb **Date:** February 16, 2018

Site Address: Moorpark College Gym 7075 Campus Road Moorpark, CA 93021 **Contact:** Matthew Lopez mlopez@criterionenv.com

Sample ID	Sample Date	Asbestos: Bulk ID by PLM	Asbestos: (PCM) Fiber Count	Asbestos: PLM Point Count	Asbestos: PLM Gravimetric	Asbestos: TEM AHERA (Air)	Asbestos: TEM Chatfield (Bulk)	Lead: Air	Lead: Paint (%)	Lead: Paint (PPM)	Lead: Paint (mg/cm2)	Lead: Soil	Lead: Wipe * (See Note)	Lead: TCLP (Pb)	Mold: Air: Non Viable	Mold: Bulk: Non Viable (Qualitative)	Air Volume (L) or Wipe Area (ft^2)	Material	Color	Sample Location/Comments	Stop at first Positive (ACM)	TAT
Asb-46	2/16/18	X																Fire Proofing	Grey	room 131 Fireproofing		X
Asb-47	↓	↓																Wallboard	White	Room 131		↓
Asb-48	↓	↓																Plaster?	tan?	Room 131		↓
Asb-49	↓	↓																VBC + mastic	Blck	Court / Gym East		↓
Asb-50	↓	↓																↓	tan	Room 131		↓
Asb-51	↓	↓																↓	Black	Court / Gym West		↓

Released by: Matthew Lopez **Signature:** [signature] **Date/Time:** February 16, 2018 3:39 p.m.

2/19/18

MOORPARK COLLEGE
LEAD ABATEMENT CONTROL PROCEDURES
FOR
GYMNASIUM RENOVATION PROJECT

PART 1 - GENERAL

1.01 RELATED WORK

1. Coordinate this section with all other sections of this specification.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. According to the client, the abatement contractor is responsible for removing all lead-glazed tile from areas within the gymnasium as part of this renovation project in accordance with applicable regulations and to the satisfaction of the Owner's Representative, Criterion Environmental, Inc.

B. The Contractor, in the course of work, shall be aware that one lead painted door was identified in our survey. It is the door leading to the 3rd floor Mechanical Room. The Contractor shall conduct activities so as to minimize paint dust generation. (remove door intact by the hinges.)

C. The Contractor shall remove and dispose of all disposable protective equipment, cleaning rags, wash water, and any other materials contaminated from these painted surfaces as potentially hazardous material. Waste characterization sampling **must** be done to determine classification of various waste streams. This work will be performed by CEI as well as area monitoring, wipe sampling and final clearance assessment.

D. The Contractor shall assume full responsibility and liability for compliance with all Federal, State, and local regulations pertaining to work practices, hauling, disposal and protection of workers, visitors to site, and building occupants in areas adjacent to work areas.

1.03 DEFINITIONS

A. Whenever the terms below occur in this contract document, they will have the meanings that follow:

1. Action Level: Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period. As used in this section, "30 micrograms per cubic meter of air" refers to the action level.

2. Air Monitoring: The process of measuring the fiber content of a specific volume of air in a stated period of time. Analysis of air samples shall in accordance with the methods specified by the National Institute for Occupational Safety and Health (NIOSH Method 7105).

3. Area Monitoring: Sampling of lead concentrations within the lead control area and inside the physical boundaries that are representative of the airborne lead concentrations, which may reach the breathing zone of personnel potentially, exposed to lead.

4. Eight-Hour Time Weighted Average (TWA): Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.

5. Lead: Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.

6. Lead Permissible Exposure Limit (PEL): Fifty micrograms per cubic meter of air as an 8-hour time weighted average.

7. Personal Monitoring: Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration. Samples shall be representative of the employee's work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and the center at the nose or mouth of an employee.

1.04 CODES AND REGULATIONS

A. All applicable Codes, Standards and Regulations have the same force and are incorporated into the contract documents as if copied directly into the contract documents.

B. Federal Requirements: Federal requirements which govern the hauling and disposal of lead containing material include but are not limited to the following:

1. United States Department of Labor, Occupational and Health Administration (OSHA):

a)	29 CFR 1910.20	Access to Employee Exposure and Medical Records
b)	29 CFR 1910.134	Respiratory Protection
c)	29 CFR 1910.145	Specifications for Accident Prevention Signs and Tags
d)	29 CFR 1910.1025	Lead
e)	29 CFR 1910.1200	Hazard Communication
f)	29 CFR 1926.55	Gases, Vapors, Fumes, Dusts, and Mists
g)	29 CFR 1926.57	Ventilation
h)	29 CFR 1926.62	Lead Exposure in Construction; Interim Rule (with appendices A, B, C and subpart D)
i)	29 CFR 1926.200	Signs, Signals, and Barricades
j)	29 CFR Subpart T	Demolition

2. United States Environmental Protection Agency, including but not limited to:

a)	40 CFR 61 Subpart A	General Provisions
b)	40 CFR 61.152	Standard for Waste Manufacturing Demolition, Renovation, Spraying and Fabricating Operations
c)	40 CFR 241	Guidelines for the Land Disposal of Solid Wastes
d)	40 CFR 257	Criteria for Classification of Solid Waste
e)	40 CFR 260	Hazardous Waste Management Systems: General
f)	40 CFR 261	Identification and Listing of Hazardous Waste
g)	40 CFR 261 and 262	Waste Disposal Facilities and Practices

h)	40 CFR 268	Land Disposal Restrictions
i)	40 CFR 745	Lead; Requirements for Lead-based Paint Activities; Proposed Rule
j)	49 CFR 172	Hazardous Materials Tables and Hazardous Materials Communications Regulations

3. California Code of Regulations (CCR) References:

a)	Title 8, CCR, Section 1532.1	Lead in Construction Standard
b)	Title 8, CCR, Section 5216	Lead Regulations – General Industry Safety Orders
c)	Title 8, CCR, Section 3204	Access to Employee Exposure and Medical Records
d)	Title 8, CCR, Section 5144	Respiratory Protection
e)	Title 8, CCR, Section 5194	Hazard Communication
f)	Title 8, CCR, Section 6003	Accident Prevention, Signs and Tags
g)	Title 17, CCR, Division 1,	Accreditation, Certification, and Work Practices for Lead Related Construction
h)	Title 22, CCR, Chapter 8	Characterization, Handling and Transport of Hazardous Waste - All Sections

4. American National Standards Institute (ANSI) Publications:

   a) 29.2-7 — Fundamentals Governing the Design and Operation of Local Exhaust Systems

   b) 288.2-80 — Practices for Respiratory Protection

5. National Institute of Occupational Safety and health (NIOSH) Publications:

   a) Manual of Analytical Methods, 2nd Ed., Vol. 1, Physical and Chemical Analysis Method (P&CAM)

6. Underwriters Laboratories, Inc. (UL) Publications:

   a) Fire Resistance Directory

   b) 586-77 (R 1982) — Test Performance of High Efficiency Particulate Air Filter Units

C. Local requirements which govern the hauling and disposal of lead containing material include but are not limited to the following:

1. Local health departments, landfill and disposal requirements.

1.05 WORKER PROTECTION

A. Personal protection, in the form of disposable coveralls and NIOSH/MSHA approved respirators, is required for all workers, supervisors, and visitors entering the work area during the removal and cleaning operations.

B. Each worker shall be supplied with a minimum of two (2) complete disposable uniforms every day. Removal workers shall not be limited to two (2) uniforms, and the abatement Contractor will be required to supply additional uniforms as is necessary. Under no circumstances will anyone entering the removal area be allowed to reuse a contaminated uniform. In addition to uniforms for the workers, the Contractor shall also supply uniforms for Criterion Environmental and other personnel who are authorized to inspect the work site.

C. Work clothes shall consist of disposable full-body coverall, head covers, gloves, boot or she covers, and eye protection.

D. Supply workers and supervisory personnel with NIOSH/MSHA approved respirators and HEPA filters. Respiratory protection shall be implemented for all work performed under this Section unless Criterion Environmental approves lesser requirements. The respirators shall be sanitized and maintained according to the manufacturer's specifications and applicable regulations. Disposable respirators shall not be considered acceptable under any

circumstances. Maintain on-site a sufficient supply of HEPA filters to allow workers and supervisory personnel to change contaminated filters when needed. The Contractor is solely responsible for means and methods used and for compliance with applicable regulations and shall comply with the following:

1. Half-mask, negative pressure, air purifying respirators equipped with high efficiency filters shall be used during the use of caustics and during component removal and encapsulation abatement methods, with the exception of surface preparation for encapsulation method.

2. Type C Respirator (supplied air respirator) will be required during all abrasive blasting activities as required by OSHA. Type C respirators are positive pressure respirators. The air coming through the hose pushes lead particles away from the mask.

E. Respirators shall be individually assigned to removal workers for their exclusive use. All respiratory protection shall be provided to workers in accordance with the written submitted respiratory protection program, which includes all items in OSHA 29 CFR 1910.134 (b) (1-11). A copy of this program shall be kept at the work site, and shall be posted in the clean area.

F. Workers must perform negative and positive pressure fit tests each time a respirator is put on, whenever the respirator design so permits. Powered air purifying respirators shall be tested for adequate flow as specified by the manufacturer.

G. Workers shall be given a qualitative fit test in accordance with procedures detailed in OSHA 29 CFR 1910.1025, Appendix D, Qualitative Fit Test Protocols, for all respirators to be used on this abatement project. An appropriately administered quantitative fit test may be submitted for the qualitative fit test.

H. Upon leaving the active work area, cartridges must be removed, and respirators cleaned in disinfectant solution and clean water rinse. Clean respirators should be stored in plastic bags when not in use. The lead abatement Contractor shall inspect respirators daily for broken, missing, or damaged parts.

I. Provide personal sampling to check personal exposure levels. Samples shall be taken for the duration of the work-shift or for eight hours, whichever is less. Personal samples need not be taken every day but must be taken in accordance with 29 CFR 1910.1025. Sampling will determine if the eight-hour Time-Weighted-Average (TWA) exceed the action level.

J. Comply with all OSHA requirements of worker medical examinations for approval to wear respiratory protection.

K. Blood Monitoring and medical surveillance of workers shall occur as follows:

1. Periodic medical exam and blood monitoring shall occur within at least two months prior to the start of the work of this contract, for all workers and supervisors.

2. All workers and supervisor shall have indicated prior to the start of work, a blood lead level of below 30 micrograms of lead per deciliter (*u*g/dl) of whole blood.

3. All workers on this project shall have blood tests performed after a maximum two months into the work of this contract. Workers shall be removed from the work site as soon as three blood samples average 25 *u*g/dl or a single test averages 30 *u*g/dl or above.

4. More frequent medical exams are required upon notification that a worker is pregnant, a worker requests medical attention, a worker shows signs of difficulty in breathing during respirator fit test or use, or as appropriate for workers removed from work due to lead exposure.

5. Worker shall not be sent back to perform de-leading work until three blood tests average below 25 *u*g/dl over a two-week period.

PART 2 - DEMOLITION AND LEAD-GLAZED TILE ABATEMENT

2.01 RELATED DOCUMENTS

A. Drawings, Contract Documents, and other Technical Specifications sections apply to work of this section.

2.02 RELATED WORK

A. Section 1.01 - Definitions and Standards

B. Section 1.02 - Codes and Regulations

C. Section 1.03 - Worker Protection

2.03 CODES AND STANDARDS

A. All work shall conform to the standards as set forth in the applicable Federal, State and local laws, regulations, ordinances and guidelines, in such form that they exist at the time the work is conducted, and may be required by any subsequent regulations.

B. Waste Generator (The Owner) and Contractor responsibility: The Owner, per EPA and State of California regulations, is ultimately responsible for the disposition of waste materials. However, this does not relieve the Contractor from any liability with regard to compliance with all applicable Federal, State or local regulations pertaining to work practices, hauling, and disposal of wastes (including testing of wastes), and the protection of workers.

2.04 SUMMARY OF WORK

A. Perform all planning, administration, execution, and cleaning necessary to safely remove INTERIOR lead-containing ceramic tile as indicated in the Contract Documents, exercising due care and utilizing proper protective measures as necessary to prevent personnel, faculty and student exposures and environmental contamination.

The Contractor shall furnish all labor, materials, services, insurance and equipment necessary to carry out the complete abatement, including the characterization and disposal of any lead-contaminated waste.

Contractors performing work in/at this facility are hereby notified that various building surfaces and materials that may be impacted by building renovation have been painted (at one time) with lead-based paint. Components may include, but are not limited to the

following:

- INTERIOR LEAD-GLAZED CERAMIC TILE

Any existing debris or debris that occurs as a result of the handling or disturbance of this Lead containing component shall be treated as hazardous waste.

B. Detailed and comprehensive information regarding those items determined to be lead containing can be found in Criterion Environmentals' Exterior lead-based paint investigation report.

2.05 EXISTING CONDITIONS

A. Existing conditions are correctly reported to the best of the Owner's knowledge. In the event of conflicting conditions, modifications to the new requirements and/or quantities shall be made with, a change order (additive or negative) based on the Owner's Representatives and/or Criterion Environmental's verification.

B. Results of the lead-based paint investigation report are available for review at the Contractor's request and are available through the Owner or Criterion Environmental. The Contractor is cautioned that any interpretations, conclusions or opinions that are based on this information are done solely by the Contractor.

C. The Owner Representative and Criterion Environmental make no representation, warranty or guaranty that the conditions reflected by the testing data either are representative of those conditions existing throughout the protect area, or that unforeseen developments may not occur, or that materials other than, or in proportions different than those indicated, may not exist.

D. The Contractor is advised that the locations of all lead-containing material may not be clearly known and that the Contractor shall proceed with caution in all phases of the work. If additional lead-containing material is discovered during the course of the work, the Contractor may be directed by the Owner to include the removal of these additional items in the work scope, at an agreed upon price or unit prices provided by the Contractor in their bid package.

E. The Contractor shall plan to schedule the project in a manner that would most benefit the Owner and meet the necessary deadlines. The project may require separate mobilizations based on the Phasing Plan.

2.06 SCOPE OF WORK

A. Removal (Abatement) work includes the following affected areas:

1. Lead-glazed ceramic tile on all interior finishes to be removed as part of this renovation project. Standard Lead Abatement Set up regulations apply. (Containment, Low level Trigger tasks, etc.)
2. Lead-glazed mop sink(s) to be removed as part of this renovation project. Standard Lead Abatement Set up regulations apply. (Containment, Low level Trigger tasks, etc.)
3. Lead-based Paint on Mechanical Room Entry door on 3rd floor. Remove intact from hinges. (Containment, Low level Trigger tasks, etc.)

B. The work shall be conducted in accordance with the following general Guidelines, and this work-plan:

1. Properly remove lead-glazed tiles, as directed by Criterion Environmental.

2. Properly package, characterize, transport and dispose of lead painted materials, paint "chips" and associated debris, cleaning materials and used personal protective equipment.

3. Characterize packaged waste prior to removal of waste from the site.

4. Transport the packaged lead waste to an approved landfill and dispose of as hazardous waste, in accordance with the waste characterization and all applicable regulations.

5. Perform personal lead exposure monitoring and biological monitoring required for the safety of the Contractor's workers,

C. Work Not Included.

1. Environmental testing (Area Monitoring, Wipe sampling, clearance assessments and Waste Characterization) for the Owner and its Representatives by Criterion Environmental.

2.07 SUBMITTALS

A. Provide submittals to the Owner's Representative and Criterion Environmental at least ten (10) working days prior to mobilization to the site to allow for sufficient and prompt review by the Owner's Representative and Criterion Environmental. Revise and resubmit as necessary to establish compliance with the specified requirements-

B. Submit three complete bound sets of the submittals as described in owner submittal requirements. Submit separate sets entitled "Pre-Job Submittals" and "Post-Job Submittals",

2.08 POTENTIAL LEAD HAZARD

A. Workers and Visitor Procedures: The Contractor is hereby advised that the U.S. Government has determined lead to be a POISON. Contractor shall provide workers with respirators, which as a minimum shall meet the requirements of Cal-OSHA and protective clothing during preparation of system of enclosures, prior to commencing, during actual lead removal, and until final clearance tests are accepted by Criterion Environmental, Inc.

B. The disturbance or dislocation of LBP may cause lead dust to be released into the building's atmosphere, thereby creating a potential health hazard to workers and building occupants. Apprise all workers, supervisory personnel and subcontractors who will be at the job site of the existing lead hazard. Additionally, advise all persons of the proper procedures to be followed, in accordance with Title 8 CCR, and all other applicable regulations.

C. Prohibited LBP activities:

1. Open flame burning or torching
2. Chemical stripping using methylene chloride based paint strippers
3. Uncontained abrasive blasting
4. Uncontained power washing
5. Dry sanding, scraping or wire brushing
6. Power sanding without HEPA filtration attachments
7. Sanding of surfaces after chemical stripping
8. Use of heat guns

2.09 WORKER PROTECTION

A. It is the responsibility of the Contractor to maintain adequate protective equipment and procedures for all his employees, and those of subcontractors and suppliers, at all, times, and to instill in them a high level of safety consciousness for the duration of the Project.

2.10 PRODUCT HANDLING

A. Deliver all materials as described in this Section in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name.

B. Store all materials subject to damage off the ground, away from wet or damp surfaces, and undercover in a manner sufficient to prevent damage or contamination.

C. Remove from the premises all damaged or deteriorating materials. Dispose of materials that become contaminated in accordance with applicable regulatory standards.

2.11 GENERAL SEQUENCE OF WORK

A. The following general sequences of work are intended to provide guidance for performing the Work.

B. The Contractor shall address its specific sequencing in the submitted work plan.

1. Lead Painted Substrates with Paint in Good Condition

   a) Prepare work area as specified in Section 2.06.

   b) Place "poly drop cloths" around base of, or adjacent to, affected area of material to be removed.

   c) Demolish painted material in pieces as large as practical or intact when possible.

   d) Package demolition debris and other generated waste in barrels for characterization and disposal as possible hazardous waste.

   e) Characterize waste.

   f) Remove packaged waste from work area.

   g) Transport waste to approved landfill for disposal in accordance with all applicable guidelines.

2. For Lead Painted Substrates with Paint in Poor Condition or Metal Substrate Requiring Cutting:

   a) Construct work area enclosure and decontamination units.

   b) Prepare work area as specified in Section of 2.06.

   c) Remove flaking, cracked and chipped paint using manual methods (scrapers,

needle guns, etc.) or abrasive blasting.

d) If metal cutting is required, remove paint from painted areas to provide a paint-free surface where metal cutting will be performed. Minimize the amount of paint chipping and cracking.

e) Demolish painted substrates.

f) Place demotion debris and other generated waste in barrels for characterization and disposal as possible hazardous waste.

g) Remove packaged waste from work area.

h) Decontaminate work area.

i) Remove work area enclosure and decontamination units; leave "drop cloth" under area where work will be performed.

j) Following waste characterization, transport paint and other hazardous waste generated to approved landfill for disposal as hazardous waste.

2.12 GENERAL GUIDELINES

A. Place all tools, staging, etc. necessary for the work in the area to be isolated prior to erection of plastic sheeting temporary enclosure.

B. Contractor shall shut down and lock out all electrical power to the area. Contractor shall wire in temporary power specified from outside the work area for abatement activities. This includes lighting inside enclosure unless it is rated for a wet location.

C. Construct Temporary Facilities

1. Provide a securable, portable building pre-approved by Owner's Representative and Criterion Environmental for the temporary storage of all solid, hazardous or contaminated wastes and wastewater generated during the project. At Owner's Representative's option, Owner's Representative's may designate an area on-site for Contractor's use as a temporary hazardous waste storage location. Contractor is responsible for security of hazardous waste from the time it is generated until its ultimate disposal at the landfill.

2. Construct decontamination units for lead paint work as specified in Section 2.14.

3. Inspect containers for leaks or corrosion weekly and keep written records of inspection on site.

2.13 ACCESS CONTROL

A. Permit access to the lead-contaminated work areas only through the decontamination unit. All other means of access shall be closed off and sealed and warning signs displayed on the clean side of the sealed access.

B. Provide warning signs in accordance with OSHA 29 CFR 1926.62 outside critical barriers surrounding lead paint work area, reading as follows:

1. WARNING, LEAD WORK AREA, POISON, NO SMOKING OR EATING

2.14 REMOVAL PROCEDURES

A. Work Area Decontamination Facility Construction

1. Construct separate worker decontamination units in compliance with OSHA guidelines concerning number, size and placement of airlocks, etc. Shower in worker decontamination unit shall open into airlock on both contaminated and uncontaminated sides. Construct decontamination units of appropriate materials (including plywood and plastic sheeting). Shower in personnel decontamination units shall contain both hot and cold running water. Supply sufficient shower units to comply with OSHA regulations. Post OSHA decontamination procedures in clean room and equipment room for duration of Project. Decontamination units shall be weather tight and shall have a lockable door. Provide keys for decontamination door to Owner's Representative and Criterion Environmental.

2. Install wastewater collection system. Collect shower and wash water for characterization and disposal. Shower and wash water shall be segregated from other wastes, filtered through a filter having not more than 5 micron pore size, and characterized for disposal as a separate waste stream. Dispose of used filters with solid waste. Install a sump pump of sufficient capacity to collect twice the amount of waste liquid and sludge expected to be produced. Pump shall be capable of pumping sludge of consistency expected. Sump pump shall be constructed to drain filtered wastewater directly into waste disposal barrels.

B. Demolition of Lead-Glazed Tile Material

1. Provide warning signs and barrier tape to demarcate the lead-paint work area.

2. Provide drop cloths of six-mil polyethylene sheeting at the base of materials to be demolished. Extend drop cloths a minimum of six feet beyond the area(s) where lead painted materials will be demolished.

3. Install HEPA filter equipped air filtration devices in the work area to continuously filter air in the work area. Exhaust duct must extend a minimum of six feet beyond

the work area and direct the exhaust away from the work.

4. Using a garden sprayer, or other suitable "airless" type sprayer, lightly mist the component to be removed with water in order to minimize potential dust emissions during the removal procedure.

5. The affected component or item shall be removed and wrapped in two layers of six-mil polyethylene sheeting, or placed in lined containers, and stored for waste stream characterization and disposal. The component removal procedure shall be performed as follows:

   a) Score any paint or caulking lines along adjoining wall or surface from which component is to be removed with a razor knife, utility knife or other suitable instrument. This will permit prying away of item with minimal paint chipping and dust release. Component removal shall be performed in a manner that minimizes damage to adjacent components.

   b) Remove any screws or other fasteners, and using a pry device, carefully remove the affected item away from the substrate. The prying device shall be inserted behind the fastener at one end of the component and pressure applied. Repeat this process at any other fastener locations until the entire component is released. The Contractor shall take care to minimize dust generation and paint chip release.

   c) The Contractor shall clean up any dust or glaze chips using a combination of wet-wiping techniques and HEPA-filtered vacuum equipment. The Contractor shall not allow dust or paint chips to accumulate, and shall engage in continuous clean up of debris generated during abatement.

6. A thorough cleaning of adjacent and/or adjoining surfaces, fixtures or components shall be conducted following the removal sequence. Appropriate wet-cleaning techniques and the use of tri-sodium phosphate (TSP) or an owner-approved substitute shall be utilized.

2.15 CLEAN UP AND CLEARANCE TESTING

A. Provide general clean up of work area concurrent with the removal of lead paint. Do not permit accumulation of debris on workspace floor.

B. At Criterion Environmental's discretion, wipe samples will be collected around the various lead paint removal work areas and in "clean rooms" of decontamination units to document effectiveness of Contractor's isolation practices. If samples indicate levels higher than background levels, Contractor will be required to perform clean up of contaminated areas at no additional expense to the Owner.

C. Criterion Environmental shall conduct air monitoring prior to, and throughout removal and cleaning operations. If air samples indicate airborne lead levels higher than the action level, Contractor will be required to perform clean up of contaminated areas at their own expense.

D. Lead Paint Removal Clean Up and Clearance Testing

1. HEPA-vacuum all surfaces to remove loose debris.

2. Wipe all surfaces with a solution of TSP and water to remove dust and film. Dispose of wipe rags frequently to avoid spreading contamination.

3. Notify Criterion Environmental for visual inspection to determine completeness of cleaning.

4. Once the work area is deemed visibly clean, Criterion Environmental will collect Final Clearance wipe samples.

   a) Wipe samples will be collected inside the work area to document the acceptability of cleaning,

      1) Samples will be collected and analyzed in accordance with. SW 846/7420, EPA 239.1

      2) The area will be considered clean if all samples indicate lead contamination of 40 micrograms of lead per square foot or less.

5. Upon notification from Criterion Environmental that final lead clearance samples indicate acceptable clearance levels, the Contractor shall dismantle the decontamination enclosure systems, remove critical barriers, and thoroughly HEPA-vacuum and wipe area with TSP solution.

E. Demolition Clean-Up and Clearance Testing

1. HEPA-vacuum all surfaces to remove loose debris.

2. Carefully remove drop cloth, folding inward to trap debris.

3. Wet mop all surfaces with tri-sodium phosphate (TSP) solution. Allow to dry and mop work area a second time. Dispose of mops/mop heads frequently to avoid spreading contamination.

4. Notify Criterion Environmental for observation to determine completeness of cleaning.

5. Upon verification from Criterion Environmental that the work area is visibly clean,

Criterion Environmental will conduct Final Clearance wipe testing. Wipe samples will be collected in the work area to document the acceptability of cleaning.

a) Wipe samples will be collected and analyzed in accordance with SW 846/7420, EPA 239.1.

b) The exterior areas will be considered clean if all wipe clearance samples indicate lead concentrations of 400 micrograms of lead per square foot or less.

F. A preliminary visual observation will be performed in the work areas by Criterion Environmental following notification by Contractor that said areas have been properly cleaned and are ready for final clearance testing. Areas will be observed for the presence of visible dust, dirt and debris.

G. Visual observation will be made by Criterion Environmental after final clean-up to determine the presence of visible dust, dirt, and debris.

H. The Contractor shall perform additional cleaning at no additional expense to the Owner, if, in the opinion of Criterion Environmental or the Owner's Representative, based upon the final visual observation, previous clean-up operations were determined to be inadequate.

I. Tests will be performed in the work area after final clean up, if necessary as previously specified in this section.

J. Lead sample results will be reported in terms of micrograms of lead per cubic meter of air (air samples) or micrograms of lead per square foot of surface (wipe samples). Samples will be collected in accordance with EPA, OSHA, or HUD-recommended procedures for the type of sample being collected.

K. If any sample indicates contaminant levels higher than the specified clearance levels, full decontamination and clearance procedures (including re-sampling) shall be performed at Contractor's expense.

2.16 DISPOSAL OF LEAD WASTE

A. For purposes of bidding, the Contractor shall consider all waste as hazardous until demonstrated otherwise prior to the removal of waste from the site. The cost for all waste stream testing and disposal costs shall be borne by the Contractor, and shall be included in the Contractor's base bid.

B. Place all hazardous and potentially hazardous waste generated from lead paint work in drums lined with two six-mil polyethylene bags, or other suitable containers with two layers of six-mil polyethylene sheeting.

C. Store all solid and hazardous waste with drum lids on wooden pallets at site until disposal characterization has been performed, and the results have been reviewed by Criterion Environmental and the Owner's Representative prior to manifesting. Use drum lid covers on all drums to prevent accumulation of water on top of drums until drums are placed in covered storage.

D. Employ spill protection procedures to protect against leaks in temporary storage.

E. Dispose of the waste at designated landfills in accordance with the provisions of the Contract Documents, waste characterization testing, and in compliance with all applicable regulations. The Contractor shall submit the written manifest to the Owner prior to removing any waste from the site, and shall submit completed manifests to the Owner following disposal at an approved landfill.

F. The Contractor shall comply with all the provisions as set forth in the CCR and the Resource Conservation and Recovery Act (RCRA), as well as any State solid waste plan requirements. Representative samples shall be submitted for all materials subject to disposal, and shall be at a minimum, one sample for each type of component or material to be disposed. The characteristics for hazardous waste in California have been promulgated in CCR, Title 22, Section 66261.24 as the total threshold limit concentration (TTLC). For purposes of disposal, the soluble threshold limit concentration (STLC) will be determined by the waste extraction test (WET). The waste is considered to be a California Class I hazardous waste if the total lead content is greater than 1,000 milligrams per kilogram (mg/kg). The waste is considered to be non-hazardous if the total lead content is below 50 mg/kg. If the total lead content is between 50 mg/kg and 1,000 mg/kg, the WET should be conducted to determine if the lead content in the component exceeds the STLC of 5 milligrams per liter (mg/L). If the result is less than 5 mg/L, the material is considered non-hazardous, and if it exceeds 5 mg/L, the material is considered a California Class I hazardous waste. In order to comply with the Federal testing requirements, a toxicity characteristic leachate procedure (TCLP) analysis is required. If the lead content is found to be less than 5 mg/L, the waste does not need to be stabilized prior to disposal, but if it does exceed 5 mg/L, then, the waste would need to be stabilized prior to disposal.

G. The Contractor shall submit to the Owner a written description of the waste transfer procedure and shipping route, and shall comply with all applicable State, local and DOT regulations regarding the handling and transfer and removal of hazardous waste. The

Contractor shall be responsible for all actions of the waste hauler relating to waste removal and disposal under this Contract.

END OF SECTION

Comp Heuresis Corp. Limited X Data table Februa 6, 2018
Model 200i

Shot #	PBC	Units	3 SD	Result	Date	Time	Job	Room	Component	Side	Substrate	Color
1		1 mg/cm2	0.1	Positive	2/16/2018	9:45:39	moor gym	Interior	Calibrate			
2		1 mg/cm2	0.1	Positive	2/16/2018	9:45:49	moor gym	Interior	Calibrate			
3		1 mg/cm2	0.1	Positive	2/16/2018	9:45:59	moor gym	Interior	Calibrate			
4		0 mg/cm2	0.3	Negative	2/16/2018	9:47:25	moor gym	Exterior	wall		Plaster	Beige
5		0.1 mg/cm2	0.3	Negative	2/16/2018	9:47:39	moor gym	Exterior	wall		Plaster	Beige
6		0.1 mg/cm2	0.3	Negative	2/16/2018	9:49:11	Wom team room	Interior	wall	A	Plaster	Beige
7		0.2 mg/cm2	0.3	Negative	2/16/2018	9:52:51	Wom team rm	Interior	wall	C	Plaster	Beige
8		0.5 mg/cm2	0.3	Negative	2/16/2018	9:53:08	Wom team rm	Interior	wall	C	Plaster	Beige
9		0.5 mg/cm2	0.3	Negative	2/16/2018	9:54:17	Wom team rm 130	Interior	Ceiling	C	Plaster	Beige
10		0.2 mg/cm2	0.3	Negative	2/16/2018	9:55:02	south hall rm 130	Interior	wall	A	Plaster	Beige
11		0.2 mg/cm2	0.3	Negative	2/16/2018	9:55:47	south hall rm 130	Interior	door	A	Metal	Beige
12		0.1 mg/cm2	0.3	Negative	2/16/2018	9:56:01	south hall rm 130	Interior	door casing	A	Metal	Beige
13		**12.6 mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**9:59:56**	**womens lcker 108**	**Interior**	**wall**	**C**	**Tile**	**White**
14		0.2 mg/cm2	0.3	Negative	2/16/2018	10:00:47	womens lcker 108	Interior	Floor	C	Tile	Yellow
15		0.3 mg/cm2	0.3	Negative	2/16/2018	10:01:08	womens lcker 108	Interior	Floor	C	Tile	White
16		0.1 mg/cm2	0.3	Negative	2/16/2018	10:01:37	womens lcker 108	Interior	wall	C	Tile	White
17		0 mg/cm2	0.3	Negative	2/16/2018	10:01:49	womens lcker 108	Interior	wall	C	Tile	White
18		-0.1 mg/cm2	0.3	Negative	2/16/2018	10:02:20	womens lcker 108	Interior	Upper wall	C	Plaster	White
19		0.1 mg/cm2	0.3	Negative	2/16/2018	10:06:33	womens lcker 108	Interior	Ceiling	C	Plaster	White
20		-0.1 mg/cm2	0.3	Negative	2/16/2018	10:06:41	womens lcker 108	Interior	Ceiling	C	Plaster	White
21		0.1 mg/cm2	0.3	Negative	2/16/2018	10:08:10	womens lcker 108	Interior	Shelf	C	Metal	Green
22		0.1 mg/cm2	0.3	Negative	2/16/2018	10:08:17	womens lcker 108	Interior	Shelf	C	Metal	Green
23		0.2 mg/cm2	0.3	Negative	2/16/2018	10:09:31	womens lcker 108	Interior	door casing	C	Metal	Brown
24		0.1 mg/cm2	0.3	Negative	2/16/2018	10:09:40	womens lcker 108	Interior	door casing	C	Metal	Brown
25		0.4 mg/cm2	0.3	Negative	2/16/2018	10:10:28	130 hall	Interior	wall	C	Plaster	Beige
26		0.3 mg/cm2	0.3	Negative	2/16/2018	10:11:59	130 hall	Interior	wall	D	Plaster	White
27		-0.4 mg/cm2	0.3	Negative	2/16/2018	10:12:32	130 hall	Interior	baseboard	A	Metal	White
28		0.1 mg/cm2	0.3	Negative	2/16/2018	10:12:57	130 hall	Interior	Floor	A	Wood	White
29		0.2 mg/cm2	0.3	Negative	2/16/2018	10:13:23	130 hall	Interior	door casing	A	Metal	Brown
30		**15 mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**10:20:09**	**custo by 116**	**Interior**	**wall**	**B**	**Tile**	**White**
31		0.2 mg/cm2	0.3	Negative	2/16/2018	10:21:34	custo by 116	Interior	wall	D	Plaster	White
32		-0.4 mg/cm2	0.3	Negative	2/16/2018	10:24:29	mens locker rm 129	Interior	wall	D	Tile	White
33		**20.5 mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**10:24:35**	**mens locker rm 129**	**Interior**	**wall**	**D**	**Tile**	**White**

Type XRF Lead Paint Analyzer
Serial Num. 1766

Criterion Env.
805.644.8347

Shot #	PBC	Units	3 SD	Result	Date	Time	Job	Room	Component	Side	Substrate	Color
34	0	mg/cm2	0.3	Negative	2/16/2018	10:25:54	mens locker rm 129	Interior	Floor	D	Tile	White
35	0.2	mg/cm2	0.3	Negative	2/16/2018	10:26:14	mens locker rm 129	Interior	Floor	D	Tile	Green
36	0.2	mg/cm2	0.3	Negative	2/16/2018	10:26:24	mens locker rm 129	Interior	Floor	D	Tile	Green
37	-0.2	mg/cm2	0.3	Negative	2/16/2018	10:27:10	mens locker rm 129	Interior	Sink	D	Porcelain	White
38	-0.5	mg/cm2	0.3	Negative	2/16/2018	10:27:16	mens locker rm 129	Interior	Sink	D	Porcelain	White
39	-0.4	mg/cm2	0.3	Negative	2/16/2018	10:27:24	mens locker rm 129	Interior	Sink	D	Porcelain	White
40	-0.5	mg/cm2	0.3	Negative	2/16/2018	10:27:30	mens locker rm 129	Interior	Urinal	D	Porcelain	White
41	-0.2	mg/cm2	0.3	Negative	2/16/2018	10:27:41	mens locker rm 129	Interior	Urinal	D	Porcelain	White
42	-0.2	mg/cm2	0.3	Negative	2/16/2018	10:28:25	mens locker rm 129	Interior	Toilet	D	Porcelain	White
43	0.1	mg/cm2	0.3	Negative	2/16/2018	10:28:52	mens locker rm 129	Interior	Toilet	D	Porcelain	White
44	-0.3	mg/cm2	0.3	Negative	2/16/2018	10:30:03	mens locker rm 129	Interior	wall	B	Tile	White
45	**19.8**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**10:30:09**	**mens locker rm 129**	**Interior**	**wall**	**B**	**Tile**	**White**
46	0.1	mg/cm2	0.3	Negative	2/16/2018	10:31:01	mens locker rm 129	Interior	Cabinet	D	Metal	Green
47	-0.1	mg/cm2	0.3	Negative	2/16/2018	10:31:25	mens locker rm 129	Interior	wall	C	Plaster	White
48	0.1	mg/cm2	0.3	Negative	2/16/2018	10:31:31	mens locker rm 129	Interior	wall	C	Plaster	White
49	0.2	mg/cm2	0.3	Negative	2/16/2018	10:34:42	equipment rm 136	Interior	door casing	A	Metal	Brown
50	0.3	mg/cm2	0.3	Negative	2/16/2018	10:34:56	equipment rm 136	Interior	wall	A	Plaster	Brown
51	0.1	mg/cm2	0.3	Negative	2/16/2018	10:35:57	equipment rm 136	Interior	Fill-In	A	Metal	Brown
52	0.1	mg/cm2	0.3	Negative	2/16/2018	10:39:01	mens staf shower 140	Interior	Floor	C	Tile	Green
53	0.3	mg/cm2	0.3	Negative	2/16/2018	10:39:07	mens staf shower 140	Interior	Floor	C	Tile	Green
54	0.2	mg/cm2	0.3	Negative	2/16/2018	10:39:12	mens staf shower 140	Interior	Floor	C	Tile	Green
55	-0.2	mg/cm2	0.3	Negative	2/16/2018	10:39:34	mens staf shower 140	Interior	wall	C	Tile	White
56	**21.4**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**10:39:45**	**mens staf shower 140**	**Interior**	**wall**	**C**	**Tile**	**White**
57	-0.3	mg/cm2	0.3	Negative	2/16/2018	10:40:55	mens staf shower 140	Interior	Sink	B	Porcelain	White
58	-0.3	mg/cm2	0.3	Negative	2/16/2018	10:41:28	mens staf shower 140	Interior	Toilet	B	Porcelain	White
59	0.2	mg/cm2	0.3	Negative	2/16/2018	10:44:15	team room149	Interior	Pipe	B	Metal	White
60	0.1	mg/cm2	0.3	Negative	2/16/2018	10:44:43	team room149	Interior	wall	C	Plaster	White
61	**2.9**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**10:46:39**	**team room149**	**Interior**	**wall**	**C**	**Unknown**	**Blue**
62	0.6	mg/cm2	0.2	Negative	2/16/2018	10:46:52	team room149	Interior	wall	C	Plaster	White
63	0.1	mg/cm2	0.3	Negative	2/16/2018	10:47:07	team room149	Interior	wall	C	Plaster	White
64	**2.8**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**10:48:11**	**team room149**	**Interior**	**wall**	**A**	**Unknown**	**Blue**
65	0.1	mg/cm2	0.3	Negative	2/16/2018	10:50:16	elec rm 147	Interior	wall	B	Concrete	White
66	0	mg/cm2	0.3	Negative	2/16/2018	10:50:30	elec rm 147	Interior	wall	A	Concrete	White

Shot #	PBC	Units	3 SD	Result	Date	Time	Job	Room	Component	Side	Substrate	Color
67	0.6	mg/cm2	0.2	Negative	2/16/2018	10:51:06	elec rm 147	Interior	Railing	A	Metal	Gray
68	0	mg/cm2	0.3	Negative	2/16/2018	10:53:41	wreast mats 3rd fl	Interior	wall	D	Plaster	Gray
69	0.3	mg/cm2	0.3	Negative	2/16/2018	10:54:05	wreast mats 3rd fl	Interior	wall	D	Wood	White
70	-0.1	mg/cm2	0.2	Negative	2/16/2018	10:54:19	wreast mats 3rd fl	Interior	wall	D	Wood	Black
71	0.3	mg/cm2	0.2	Negative	2/16/2018	10:54:39	wreast mats 3rd fl	Interior	wall	D	Wood	Black
72	0.3	mg/cm2	0.2	Negative	2/16/2018	10:54:53	wreast mats 3rd fl	Interior	wall	D	Wood	Blue
73	0.1	mg/cm2	0.2	Negative	2/16/2018	10:55:15	wreast mats 3rd fl	Interior	wall	B	Wood	White
74	-0.1	mg/cm2	0.2	Negative	2/16/2018	10:55:21	wreast mats 3rd fl	Interior	wall	B	Wood	White
75	0.1	mg/cm2	0.3	Negative	2/16/2018	10:55:53	wreast mats 3rd fl	Interior	door	B	Metal	Blue
76	0.5	mg/cm2	0.3	Negative	2/16/2018	10:56:39	wreast mats 3rd fl	Interior	door	B	Metal	Beige
77	0.1	mg/cm2	0.3	Negative	2/16/2018	10:57:08	wreast mats 3rd fl	Interior	Pipe	D	Metal	Beige
78	0	mg/cm2	0.3	Negative	2/16/2018	11:01:25	wreast mats 3rd fl	Interior	Fill-In	C	Metal	Blue
79	0.1	mg/cm2	0.3	Negative	2/16/2018	11:05:24	209	Interior	Floor	A	Tile	Brown
80	0.2	mg/cm2	0.3	Negative	2/16/2018	11:05:37	209	Interior	Floor	A	Tile	Red
81	0.2	mg/cm2	0.3	Negative	2/16/2018	11:05:55	209	Interior	Floor	A	Tile	Brown
82	0.1	mg/cm2	0.3	Negative	2/16/2018	11:06:23	209	Interior	wall	A	Wood	White
83	0.1	mg/cm2	0.3	Negative	2/16/2018	11:06:48	209	Interior	wall	C	Plaster	White
84	0.1	mg/cm2	0.3	Negative	2/16/2018	11:07:10	209	Interior	door casing	B	Plaster	White
85	0	mg/cm2	0.3	Negative	2/16/2018	11:07:36	209	Interior	door casing	A	Plaster	Brown
86	0.1	mg/cm2	0.2	Negative	2/16/2018	11:08:51	212	Interior	wall	A	Unknown	Brown
87	**17.5**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**11:13:21**	**208 mens bath**	**Interior**	**wall**	**A**	**Tile**	**White**
88	-0.5	mg/cm2	0.3	Negative	2/16/2018	11:14:02	208 mens bath	Interior	Toilet	A	Porcelain	White
89	-0.2	mg/cm2	0.3	Negative	2/16/2018	11:14:20	208 mens bath	Interior	Toilet	A	Porcelain	White
90	-0.3	mg/cm2	0.3	Negative	2/16/2018	11:14:29	208 mens bath	Interior	Toilet	A	Porcelain	White
91	0.1	mg/cm2	0.3	Negative	2/16/2018	11:14:51	208 mens bath	Interior	Toilet	C	Porcelain	White
92	0.2	mg/cm2	0.3	Negative	2/16/2018	11:15:21	208 mens bath	Interior	Floor	C	Tile	White
93	0	mg/cm2	0.3	Negative	2/16/2018	11:15:36	208 mens bath	Interior	Floor	C	Tile	Green
94	0.1	mg/cm2	0.3	Negative	2/16/2018	11:15:41	208 mens bath	Interior	Floor	C	Tile	Green
95	0.1	mg/cm2	0.3	Negative	2/16/2018	11:15:46	208 mens bath	Interior	Floor	C	Tile	Green
96	0.2	mg/cm2	0.3	Negative	2/16/2018	11:16:17	208 mens bath	Interior	wall	C	Plaster	White
97	-0.1	mg/cm2	0.2	Negative	2/16/2018	11:22:41	207	Interior	wall	B	Unknown	Beige
98	0.1	mg/cm2	0.3	Negative	2/16/2018	11:22:53	207	Interior	wall	B	Unknown	Beige
99	0.2	mg/cm2	0.3	Negative	2/16/2018	11:24:55	204 wom bath	Interior	wall	A	Tile	Yellow

Shot #	PBC	Units	3 SD	Result	Date	Time	Job	Room	Component	Side	Substrate	Color
100	0.2	mg/cm2	0.3	Negative	2/16/2018	11:25:20	204 wom bath	Interior	wall	A	Tile	White
101	**12.8**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**11:25:50**	**204 wom bath**	**Interior**	**wall**	**A**	**Tile**	**White**
102	-0.4	mg/cm2	0.3	Negative	2/16/2018	11:26:35	204 wom bath	Interior	Fill-In	A	Porcelain	White
103	0	mg/cm2	0.2	Negative	2/16/2018	11:27:05	204 wom bath	Interior	Fill-In	A	Unknown	Yellow
104	0.1	mg/cm2	0.3	Negative	2/16/2018	11:29:05	207 hall	Interior	Floor	A	Tile	Red
105	0.2	mg/cm2	0.3	Negative	2/16/2018	11:29:27	207 hall	Interior	Floor	A	Tile	Brown
106	**13**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**11:34:39**		**206 Interior**	**wall**	**C**	**Tile**	**White**
107	0.3	mg/cm2	0.3	Negative	2/16/2018	11:35:28		206 Interior	wall	B	Plaster	White
108	0.4	mg/cm2	0.3	Negative	2/16/2018	11:38:13		304 Interior	wall	A	Plaster	Beige
109	0.3	mg/cm2	0.3	Negative	2/16/2018	11:38:30		304 Interior	Floor	A	Tile	Beige
110	0.3	mg/cm2	0.3	Negative	2/16/2018	11:39:37		305 Interior	Pipe	A	Metal	Beige
111	0.1	mg/cm2	0.3	Negative	2/16/2018	12:04:47	301 mechan	Interior	wall	A	Plaster	Beige
112	**1.1**	**mg/cm2**	**0.1**	**Positive**	**2/16/2018**	**12:05:36**	**301 mechan**	**Interior**	**door**	**A**	**Metal**	**Gray**
113	0.2	mg/cm2	0.3	Negative	2/16/2018	12:06:25	301 mechan	Interior	door casing	A	Metal	Gray
114	0	mg/cm2	0.3	Negative	2/16/2018	12:07:55	301 mechan	Interior	Floor	A	Concrete	Blue
115	0	mg/cm2	0.3	Negative	2/16/2018	12:08:29	301 mechan	Interior	Pipe	A	Metal	Black
116	0	mg/cm2	0.3	Negative	2/16/2018	12:08:40	301 mechan	Interior	Pipe	A	Metal	Black
117	0.1	mg/cm2	0.3	Negative	2/16/2018	12:08:54	301 mechan	Interior	Pipe	A	Metal	Black
118	0.1	mg/cm2	0.3	Negative	2/16/2018	12:08:59	301 mechan	Interior	Pipe	A	Metal	Black
119	0.2	mg/cm2	0.3	Negative	2/16/2018	12:36:51	201 training rm	Interior	Pipe	D	Metal	White
120	0	mg/cm2	0.3	Negative	2/16/2018	12:37:10	201 training rm	Interior	wall	D	Plaster	White
121	0	mg/cm2	0.2	Negative	2/16/2018	12:37:45	201 training rm	Interior	door casing	A	Wood	White
122	0.3	mg/cm2	0.3	Negative	2/16/2018	12:38:19	201 training rm	Interior	door casing	D	Metal	Blue
123	0.3	mg/cm2	0.3	Negative	2/16/2018	12:38:39	201 training rm	Interior	door casing	D	Metal	Beige
124	0.1	mg/cm2	0.3	Negative	2/16/2018	12:39:03	201 training rm	Interior	door	D	Metal	Brown
125	0.8	mg/cm2	0.2	Negative	2/16/2018	12:39:29	201 training rm	Interior	Railing	B	Metal	Brown
126	0.2	mg/cm2	0.3	Negative	2/16/2018	12:41:01	201 training rm	Interior	Stair tread	B	Concrete	Brown
127	0.2	mg/cm2	0.3	Negative	2/16/2018	12:41:07	201 training rm	Interior	Stair tread	B	Concrete	Brown
128	0.2	mg/cm2	0.3	Negative	2/16/2018	12:41:28	201 training rm	Interior	wall	B	Plaster	Beige
129	**4.9**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**12:42:38**	**201 training rm**	**Interior**	**Sink**	**B**	**Porcelain**	**White**
130	0.3	mg/cm2	0.3	Negative	2/16/2018	12:43:26	201 training rm	Interior	door casing	D	Metal	Brown
131	0.4	mg/cm2	0.3	Negative	2/16/2018	12:43:37	201 training rm	Interior	door casing	D	Metal	Brown
132	**13.6**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**12:44:03**	**201 training rm**	**Interior**	**wall**	**B**	**Tile**	**Blue**

Shot #	PBC	Units	3 SD	Result	Date	Time	Job	Room	Component	Side	Substrate	Color
133	**20.1**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**12:44:36**	**201 training rm**	**Interior**	**Floor**	**B**	**Tile**	**Blue**
134	0.3	mg/cm2	0.3	Negative	2/16/2018	12:44:57	201 training rm	Interior	Floor	B	Tile	Blue
135	0.4	mg/cm2	0.3	Negative	2/16/2018	12:45:03	201 training rm	Interior	Floor	B	Tile	Blue
136	0.2	mg/cm2	0.3	Negative	2/16/2018	12:45:09	201 training rm	Interior	Floor	B	Tile	Blue
137	**21**	**mg/cm2**	**0.3**	**Positive**	**2/16/2018**	**12:45:17**	**201 training rm**	**Interior**	**Floor**	**B**	**Tile**	**Blue**
138	0.3	mg/cm2	0.3	Negative	2/16/2018	12:46:03	201 training rm	Interior	door	C	Metal	Blue
139	0.2	mg/cm2	0.3	Negative	2/16/2018	12:46:21	201 training rm	Interior	door casing	C	Metal	Black
140	0.1	mg/cm2	0.3	Negative	2/16/2018	12:46:44	201 training rm	Interior	wall	C	Plaster	Black
141	0.1	mg/cm2	0.3	Negative	2/16/2018	12:50:46	bask court	Interior	Floor	C	Tile	Brown
142	-0.2	mg/cm2	0.3	Negative	2/16/2018	12:51:21	bask court	Interior	H20 Fount	C	Porcelain	White
143	0.1	mg/cm2	0.3	Negative	2/16/2018	12:51:27	bask court	Interior	H20 Fount	C	Porcelain	White
144	0.1	mg/cm2	0.3	Negative	2/16/2018	12:51:32	bask court	Interior	H20 Fount	C	Porcelain	White
145	0.5	mg/cm2	0.3	Negative	2/16/2018	13:06:22	bask court	Interior	H20 Fount	C	Porcelain	White
146	0.2	mg/cm2	0.3	Negative	2/16/2018	13:06:29	bask court	Interior	H20 Fount	C	Porcelain	White
147	1	mg/cm2	0.1	Positive	2/16/2018	13:08:12		Interior	Calibrate			
148	1	mg/cm2	0.1	Positive	2/16/2018	13:08:22		Interior	Calibrate			
149	1	mg/cm2	0.1	Positive	2/16/2018	13:08:32		Interior	Calibrate			

Criterion Environmental Inc.
Lead ¤ Asbestos ¤ Mold ¤ Training ¤ VOC's ¤ Radon
Consultants ¤ Engineers ¤ Hygienists

April 6, 2018

Mr. John Sinutko
Moorpark College Gym
7075 Campus Rd.
Moorpark, CA 93021

Subject: **ADDENDUM: Additional Ceiling Surfacing Testing**
Moorpark College Gym
7075 Campus Road
Moorpark, CA 93021
CEI Client ID# MOO-8953-ASBPb

During the recent testing at Moorpark College Gym, on February 28, 2018, for the abatement and renovation project at the subject site referenced above, additional testing was requested to confirm the presence or absence of asbestos in the acoustic sound proofing material that was previously assumed to be positive for asbestos. On April 2, 2018, Thomas Knouse, a DOSH Certified Building Inspector, collected three samples of the acoustic soundproofing ceiling material, under the direction of Tim Ryan, a DOSH Certified Asbestos Consultant with CEI.

- **The surfacing material across the gym ceiling above rooms 200, 202, & 211 (basketball court, fitness room, & wresting room) was determined by lab analysis as "No asbestos detected". Therefore, is it not the same material as that found above room 303 & 304 and no longer requires asbestos abatement as originally specified in the Asbestos Work Abatement Specification dated March 5, 2018.**

Criterion Environmental, Inc.

Tim Ryan (B.Sc.) LRCIA, LRCPM
DOSH Certified Asbestos Consultant (#06-3979)
CDPH Certified Lead Inspector/Assessor/Monitor (#14697)