ADDENDUM NO. 01

Washington Elementary School Modernization
Project #0938-8238-360-34

3/18/2025

1. **CLARIFICATION ON CONSTRUCTION PHASING**
   See drawings for Construction Phasing Years 1-3

2. **RESPONSE TO CONTRACTOR QUESTIONS**

   1. Project Manual/Specifications to be available on District website.
   2. Door hardware to be provided in specifications under SECTION 08 71 00 DOOR HARDWARE.
   3. Doors 134.8, 134.9 134.10, 176, 177, 187 and 188 are existing doors. Omit doors from scope of work.
   4. Window above door to be removed.
   5. Window A is identified on Floor Plans. See Sheet A2.02. Window B are clerestory windows identified on Sheet A3.02 Reflected Ceiling Plans.
   6. Per Pre-Bid Walk, LUSD open to phasing suggestions by contractor in bid document. Projects phasing to be a 3-4 year plan with the following suggestion:
      a. Year 1: Shade structure, fencing & gate at parking lot, Abatement at auditorium, fire alarm system upgrade, upgrade electrical sub panels, abate & modernize classroom wing student restrooms.
      b. Year 2: Abate & Finish remaining staff and student restrooms, abate & replace windows/doors/ exterior painting at Classroom wings, exterior lighting, upgrade electrical main.
      c. Year 3: Abate & replace interior of classrooms: flooring, lighting, ceiling, and paint.
      d. Year 4: Finish outstanding construction items and project close out.
   7. Requests for As-Builts to be directed to Lodi USD.
   8. Corridor 134 is not in scope of work.
   9. Contractor to coordinate with Lodi USD.
   10. Roof construction is composite roofing per as-builts.
   11. The fire alarm plans call for FCI Gamewell, is an Edwards EST 4 acceptable. NO

3. **ADDITIONAL DIVISION 1 DOCS**
   Division 1 and Specifications provided below

* * * END OF ADDENDUM * * *

CONSTRUCTION PHASING

SUMMER 2025

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- FENCING & GATE AT PARKING LOT
- ABATE & APPLY FINISH AT AUDITORIUM
- UPGRADE FIRE ALARM SYSTEM*
- ABATE & FINISH CLASSROOM WING RESTROOMS
- UPGRADE SUB PANELS*

SUMMER 2026

- ABATE & FINISH RESTROOMS (EAST)
- ABATE & REPLACE WINDOWS/DOORS/EXTERIOR PAINT IN BUILDING B & C
- EXTERIOR LIGHTING
- UPGRADE ELECTRICAL MAIN*

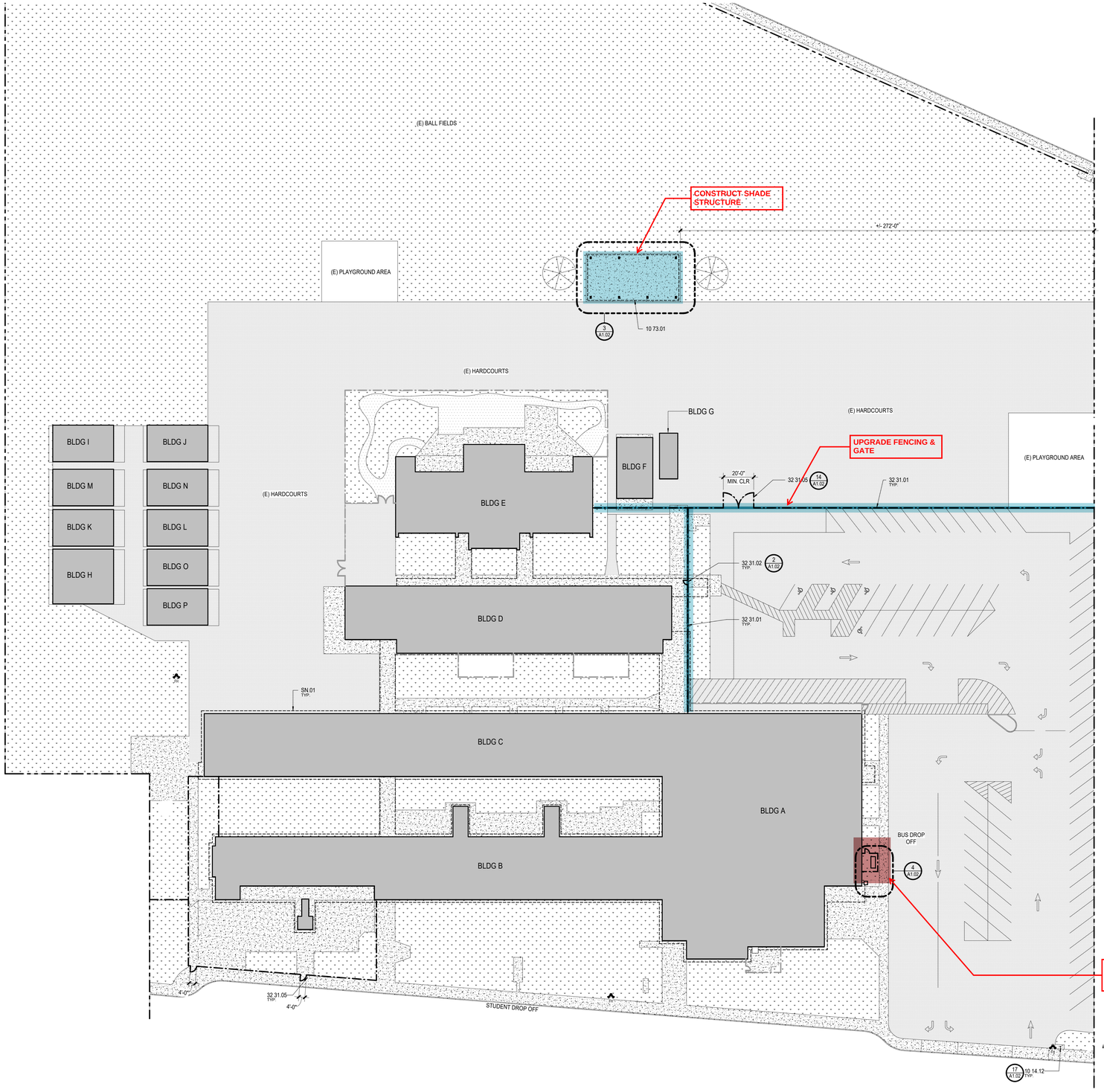
SUMMER 2027

- ABATE & REPLACE INTERIOR OF CLASSROOMS - CARPET, LIGHTING, FLOORING, CEILINGS, CASEWORK AND PAINT AT BUILDING B & C

SUMMER 2028

- FINISH OUTSTANDING CONSTRUCTION ITEMS AND PROJECT CLOSEOUT

NOTES:
*SUGGESTED LINE ITEM IS TO BE COMPLETED AFTER HOURS/WEEKENDS



1 OVERALL IMPROVEMENT SITE PLAN
SCALE: 1" = 30'-0"

SITE PLAN NOTES

1. VERIFY AND CONFIRM ALL JOINT LAYOUTS AT ALL CONCRETE FLATWORK WITH ARCH. PRIOR TO POURING OF CONCRETE.
2. PROVIDE AND INSTALL CONCRETE SIDEWALK EXPANSION JOINTS AT AREAS NOT SPECIFICALLY INDICATED AT 50 FEET ON-CENTER MAX. U.N.O.
3. PROVIDE AND INSTALL CONCRETE SIDEWALK CONTROL JOINTS AT AREAS NOT SPECIFICALLY INDICATED AT DISTANCES EQUIVALENT TO SIDEWALK WIDTH, BUT NOT TO EXCEED 12 FEET ON-CENTER MAX.
4. CONCRETE FLATWORK NOT TO EXCEED 2% IN ANY DIRECTION.
5. CONCRETE FLATWORK TO MEET THE FINISHED HEIGHT OF ADJACENT CONCRETE AREAS.

SITE PLAN LEGEND

- (E) BUILDING IN SCOPE
- (E) FIRE ACCESS LANE
- ACCESSIBLE TOILET ROOM
- (E) LANDSCPE AREA
- (E) AC PAVING
- ASSUMED PROPERTY LINE
- (E) ACCESSIBLE PATH OF TRAVEL
- PROPERTY LINE
- (E) ROOF OUTLINE
- (E) FENCLINE
- FENCLINE
- FH (E) FIRE HYDRANT

KEYNOTE LEGEND

10 14.12	TOW AWAY SIGN
10 73.01	PC SHADE STRUCTURE
32 31.01	CHAIN LINK FENCING
32 31.02	ORNAMENTAL METAL FENCE GATE
32 31.05	METAL FENCE GATE (REFER TO PLAN FOR WIDTH)
SN.01	OUTLINE OF ROOF

SHEET NOTES

SN.01	OUTLINE OF ROOF

YEAR 01
SUMMER 2025

YEAR 02
SUMMER 2026

YEAR 03
SUMMER 2027

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916-355-9922

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LODI UNIFIED SCHOOL DISTRICT
GEORGE WASHINGTON ELEMENTARY SCHOOL
831 WEST LOCKEFORD STREET
LODI, CA 95240
DSA APP No. 02-121905

LODI UNIFIED SCHOOL DISTRICT

G H J
D E F
A B C

KEY PLAN
PLAN NORTH
TRUE NORTH

LICENSED ARCHITECT
LEONA M. KETTERL
C-38823
REN. 09-30-25
STATE OF CALIFORNIA

CLIENT
LODI UNIFIED SCHOOL DISTRICT
PROJECT NUMBER
230216
DATE 07/30/2024
DRAWN BY: MG CHKED BY: LK
REVISIONS

#	DESCRIPTION	DATE

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This document is for plan review only

OVERALL IMPROVEMENT SITE PLAN

A1.01

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NOTES:
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SUMMER 2026

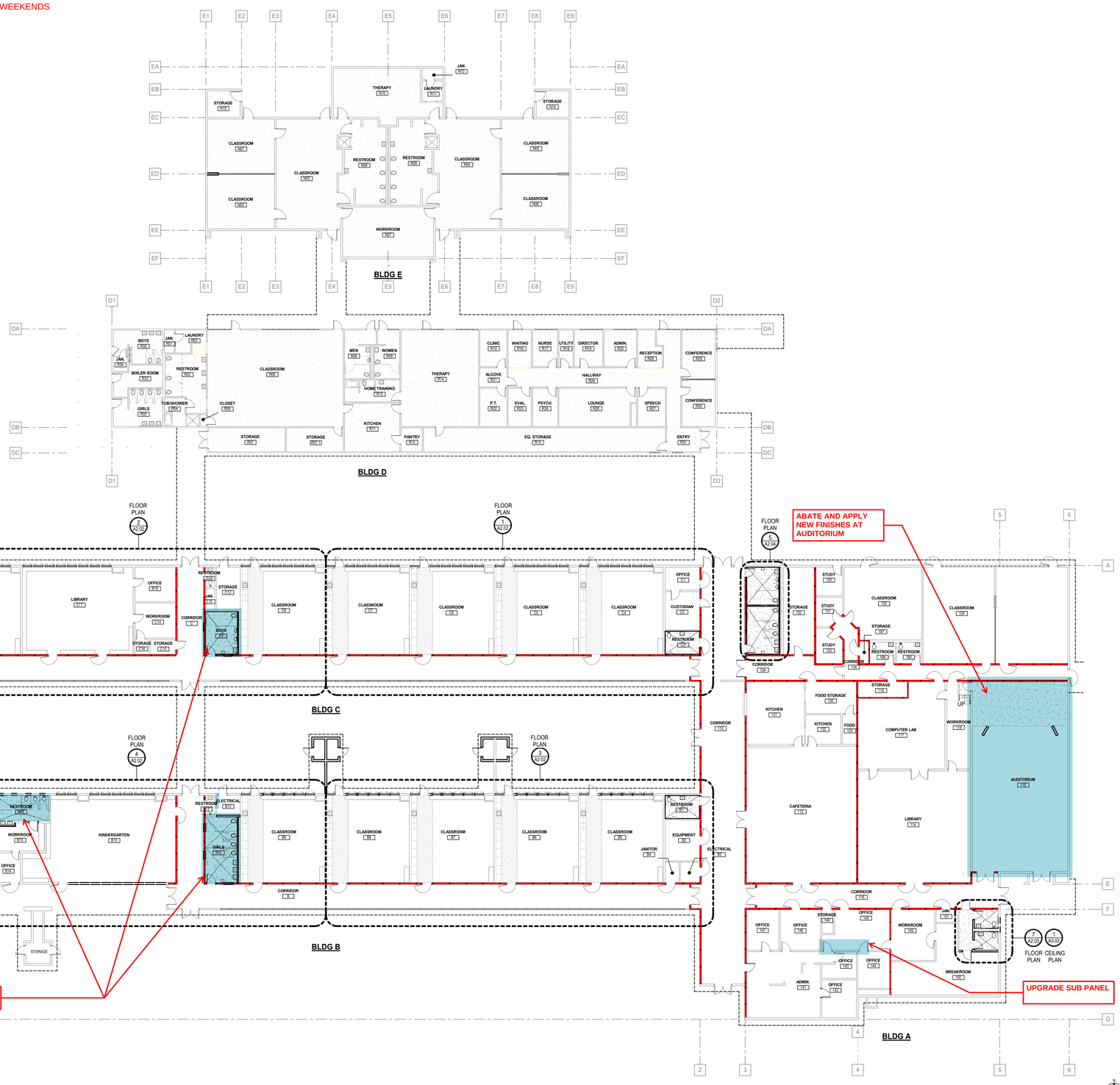
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SUMMER 2028

- FINISH OUTSTANDING CONSTRUCTION ITEMS AND PROJECT CLOSEOUT



YEAR 01
SUMMER 2025

GENERAL NOTES

1. DO NOT SCALE DRAWINGS, WRITTEN DIMENSIONS TAKE PRECEDENCE, CONTACT ARCH IF CLARIFICATION IS NECESSARY IN ORDER TO DETERMINE THE INTENT OF THE CONTRACT DOCUMENTS
2. ALL DIMENSIONS ARE TO STRUCTURAL COLUMN LINES OR THE SURFACE OF PARTITION ASSEMBLY U.N.O.
3. FIELD VERIFY ALL DIMENSIONS AND EXISTING CONDITION BEFORE COMMENCING WORK. NOTIFY ARCH. OF ANY DISCREPANCIES PRIOR TO PROCEEDIN WITH AFFECTED WORK
4. NOTES OR DIMENSIONS NOTED AS "TYPICAL" OR "TYP." OR "TYP" SHALL APPLY TO CONDITIONS THAT ARE THE SAME OR SIMILAR THIS SHEET
5. DIMENSIONS NOTED AS "FIELD VERIFY" OR "V.I.F." OR "VIF" SHALL BE MEASURED AND CONFIRMED AT THE PROJECT SITE BY THE CONTRACTOR AND REVIEWED WITH THE ARCH. BEFORE INCORPORATING INTO THE WORK
6. DIMENSIONS NOTED AS "CLEAR" OR "CLEAR INSIDE" REQUIRE SPECIFIC COORDINATION AMONG DISCIPLINES AND OR MANUFACTURERS
7. REFER TO PARTITION TYPES ON SHEET G0.50
8. ALIGN FINISHED FACE OF WALLS WHERE WALL PARTITIONS OF DIFFERING THICKNESS ABUT AND OR ADJOIN IN THE SAME PLANE
9. PROTECT ALL EXISTING CONSTRUCTION TO REMAIN.
10. ALL DOORS SHALL BE SET 4 INCHES OFF THE ADJACENT PERPENDICULAR WALL ON THE HINGE SIDE OF THE DOOR U.N.O., NOTIFY ARCH. OF ANY DOOR-RELATED CONFLICTS, INCLUDING BUT NOT LIMITED TO CONFLICTS CONCERNING ACCESSIBILITY STANDARDS
11. ALL FLOOR SLOPES TO FLOOR DRAINS SHALL NOT EXCEED 1:48
12. PROVIDE AND INSTALL SELF-LEVELING UNDERLAYMENT WHERE UNEVEN FLOOR SLAB EXISTS PRIOR TO INSTALLATION OF FLOOR FINISHES
13. ALL FLOOR FINISH CHANGES SHALL OCCUR AT THE CENTERLINE OF DOORS U.N.O.
14. ALL REQUIRED ACCESSIBLE CLEARANCES FOR ALL ITEMS, INCLUDING BUT NOT LIMITED TO ALL COUNTER TOPS, ALL PLUMBING FIXTURES, ALL DRINKING FOUNTAINS, ALL ELECTRIC WATER COOLERS, ALL LAVATORIES, ALL URINALS, ALL TOILETS SHALL BE STRICTLY ENFORCED.
15. REFER TO OTHER DISCIPLINE DOCUMENTS IN THESE PLANS FOR ADDITIONAL SCOPE OF WORK.
16. ALL NEW EXPOSED ELECTRICAL CONDUIT TO BE PAINTED IP-2.
17. REFER TO G SHEETS FOR SIGNAGE.

1 OVERALL IMPROVEMENT FLOOR PLAN
SCALE: 1/16" = 1'-0"

Not for permitting or construction

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A2.01 - OVERALL IMPROVEMENT FLOOR PLAN

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A2.01 - OVERALL IMPROVEMENT FLOOR PLAN

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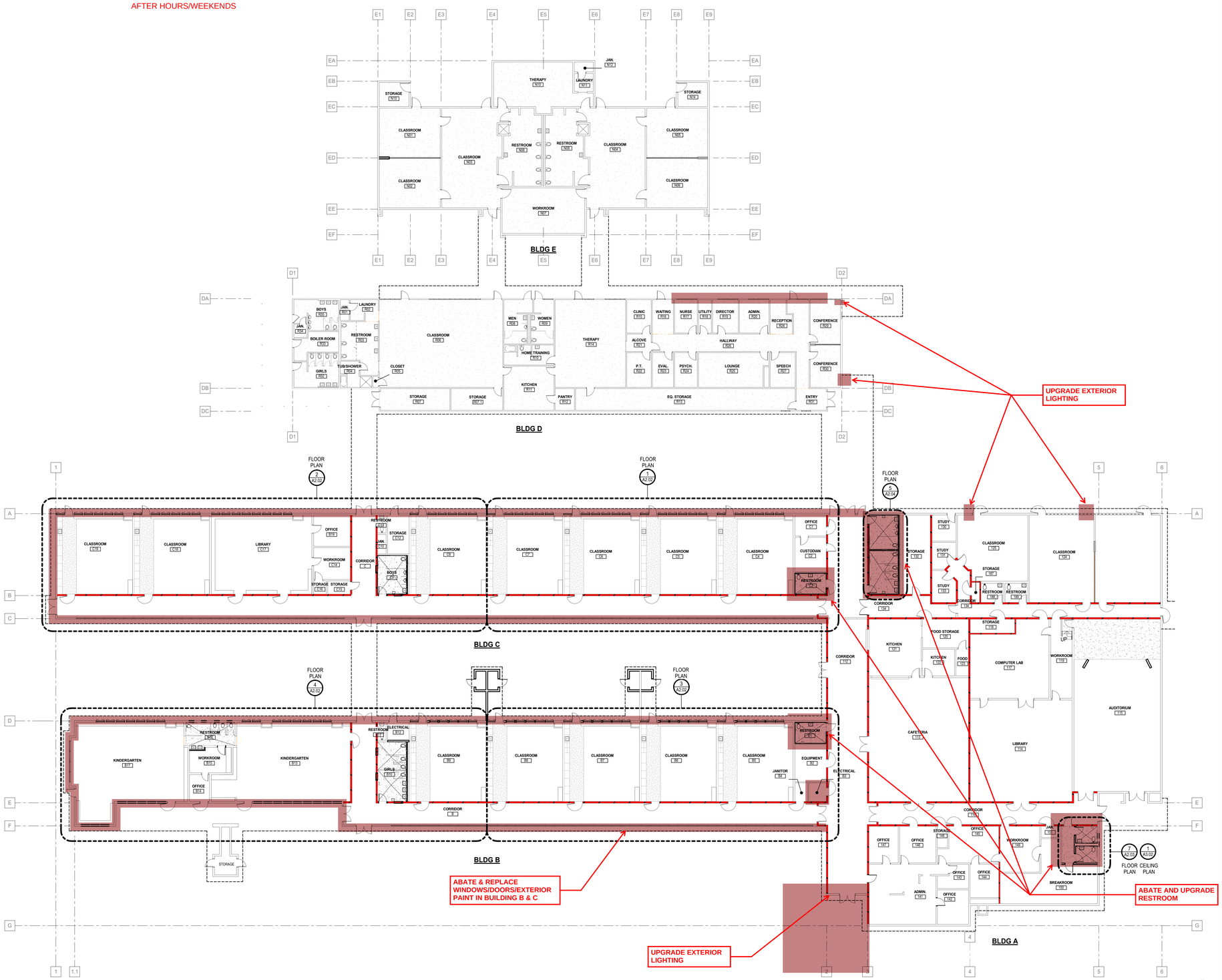
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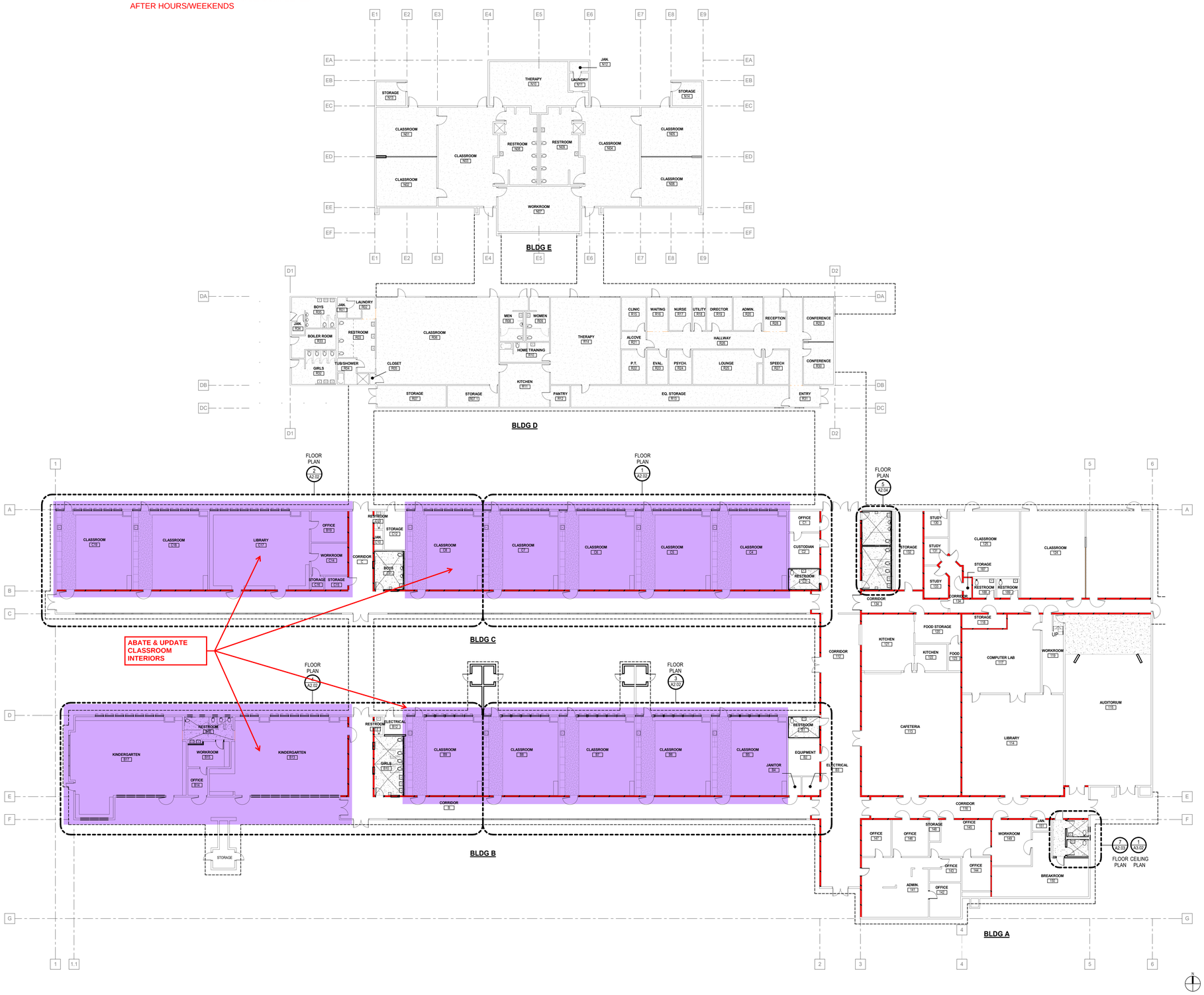
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YEAR 03
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Project Manual

For

Washington Elementary School
Modernization Project

831 W.Lockeford Street, Lodi, CA 95240

Volume 1 and 2

Bidding and Contract Requirements
And
Specifications

for the

Lodi Unified School District
1305 East Vine Street, Lodi, CA

Date: February 15, 2025

PBK Project No.: 230216
DSA Application No.: 02-121905

Package

Project Manual

for:

Washington Elementary School

Modernization Project

for the

Lodi Unified School District

Date: February 15, 2025

PBK Project No.: 230216
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Package

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Architect:
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Folsom, CA 95630-8315
Phone: (916) 355-9922

Electrical:
LEAF Engineering
1110 Iron Point Road
Suite 200
Folsom, CA 95630
Phone: (916) 355-9922

Mechanical:
LEAF Engineering
1110 Iron Point Road
Suite 200
Folson, CA 95630
Phone: (916) 355-9922







Plumbing:
LEAF Engineering
1110 Iron Point Road
Suite 200
Folson, CA 95630
Phone: (916) 355-9922

Structural:
Miyamoto International, Inc.
1450 Halyard Drive #1
West Sacramento, CA 95691
Phone: (916) 373-1995





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Project Manual Cover Sheet and Seal Page.

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VOLUME 1 DISTRICT DOCUMENTS

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00 21 13	Instructions to Bidders
00 21 13.1	Bidder Information and Forms
00 31 19	Existing Conditions
00 31 32	Geotechnical Data
00 41 13	Bid Form and Proposal
00 43 13	Bid Bond
00 43 36	Designated Subcontractors List
00 45 01	Site Visit Certification
00 45 19	Non-Collusion Declaration
00 45 19.01	Iran Contracting Act Certification
00 45 26	Workers' Compensation Certification
00 45 46.01	Prevailing Wage and Related Labor Requirements Certification
00 45 46.02	Disabled Veteran Business Enterprise Participation
00 45 46.03	Certification
00 45 46.04	Drug-Free Workplace Certification
00 45 46.05	Tobacco-Free Environment Certification
00 45 46.06	Hazardous Materials Certification
00 45 46.07	Lead-Based Materials Certification
00 45 46.08	Imported Materials Certification
00 45 46.09	Criminal Background Investigation/Fingerprinting Certification
00 45 46.10	Buy American Certification
00 45 49	Roofing Project Certification
00 45 90	Registered Subcontractors List
00 51 00	Post Bid Interview
00 52 13	Notice of Award
00 55 00	Agreement
00 56 00	Notice to Proceed
00 57 00	Escrow Bid Documentation
00 61 13.13	Escrow Agreement in Lieu of Retention
00 61 13.16	Performance Bond
00 63 40	Payment Bond
00 63 57	Allowance Expenditure Directive Form
00 63 63	Proposed Change Order Form
00 65 19.26	Change Order Form
00 65 36	Agreement and Release of Any and All Claims
00 72 13	Guarantee Form
00 73 13	General Conditions – Stipulated Sum (Single-Prime Contract)
00 73 56	Special Conditions
	Hazardous Materials Procedures and Requirements

DIVISION 1 GENERAL REQUIREMENTS (PROVIDED BY DISTRICT)

01 00 22	Volume 2 Cover Page
01 11 00	Summary of Work

01 21 00 Allowance
01 22 00 Alternates and Unit Prices
01 25 00 Substitution Procedures and Form
01 25 13 Product Options and Substitutions
01 26 00 Changes in the Work
01 29 00 Application for Payment and Conditional and Unconditional Waiver and Release Forms
01 31 00 Project Management and Coordination
01 31 19 Project Meetings
01 32 00 Construction Progress Documentation
01 32 13 Scheduling of Work
01 33 00 Submittals
01 35 13.23 Site Standards
01 41 00 Regulatory Requirements
01 42 13 Abbreviations and Acronyms
01 42 16 Definitions
01 42 19 References
01 43 00 Materials and Equipment
01 45 00 Quality Control
01 45 23 Testing and Inspecting Services
01 50 00 Temporary Facilities and Controls
01 50 13 Construction Waste Management and Disposal
01 52 13 Field Offices
01 64 00 Owner-Furnished Products
01 66 00 Product Delivery, Storage, and Handling
01 71 23 Field Engineering
01 73 29 Cutting and Patching
01 76 00 Alteration Project Procedures
01 77 00 Contract Closeout and Final Claning
01 77 22 Substantial Completion Procedures
01 78 23 Operation and Maintenance Data
01 78 36 Warranties
01 78 39 Record Documents

PROJECT SPECIFICATIONS - Volume 2

DIVISION 2 EXISTING CONDITIONS

02 41 00 Demolition
02 41 13 Selective Site Demolition
02 41 19 Selective Demolition
02 82 00 Asbestos Remediation
02 83 00 Lead-Based Materials Remediation
02 87 13 Mold Remediation

DIVISION 3 CONCRETE

03 10 00 Concrete Forming and Accessories
03 15 00 Concrete Accessories
03 20 00 Concrete Reinforcing
03 30 00 Cast-in-Place Concrete

DIVISION 4 MASONRY Not Used

DIVISION 5 METALS Not Used

DIVISION 6 WOOD, PLASTICS, AND COMPOSITES

06 10 00 Rough Carpentry
06 10 53 Miscellaneous Rough Carpentry
06 16 00 Sheathing
06 40 00 Architectural Woodwork

DIVISION 7 THERMAL AND MOISTURE PROTECTION
07 21 00 Thermal Insulation
07 21 16 Batt Insulation
07 84 00 Firestopping

DIVISION 8 OPENINGS
08 11 13 Hollow Metal Doors and Frames
08 31 13 Access Doors and Frames
08 41 13 Aluminum-Framed Entrances and Storefronts
08 71 00 Door Hardware
08 80 00 Glazing

DIVISION 9 FINISHES
09 21 16 Gypsum Board Assemblies
09 24 10 Cement Plastering Patch and Repair
09 65 13.13 Resilient Base
09 67 23 Resinous Flooring
09 68 01 Carpeting Walk-Off Mats
09 90 00 Painting and Coating

DIVISION 10 SPECIALTIES
10 21 13 Toilet Compartments
10 28 13 Toilet Accessories
10 73 13 Pre-Engineered Shade Structures

DIVISION 11 EQUIPMENT Not Used

DIVISION 12 FURNISHINGS Not Used

DIVISION 13 SPECIAL CONSTRUCTION Not Used

DIVISION 14 CONVEYING EQUIPMENT Not Used

DIVISION 21 FIRE SUPPRESSION Not Used

DIVISION 22 PLUMBING
22 00 00 General Plumbing Provisions
22 00 01 Plumbing

DIVISION 23 MECHANICAL
23 00 00 General Mechanical Provisions
23 00 01 Heating, Ventilating and Air Conditioning

DIVISION 25 INTEGRATED AUTOMATION Not Used

DIVISION 26 ELECTRICAL
26 05 00 Common Work Results for Electrical
26 05 19 Low-Voltage Electrical Power Conductors and Cables
26 05 26 Grounding and Bonding for Electrical Systems
26 05 29 Hangers and Supports for Electrical Systems

26 05 33 Raceway and Boxes for Electrical Systems
26 05 53 Identification of Electrical Systems
26 09 23 Lighting Control Devices
26 24 13 Switchboards
26 24 16 Panelboards
26 27 26 Wiring Devices
26 28 16 Enclosed Switches and Circuit Breakers
26 51 00 Interior Lighting
26 56 00 Exterior Lighting

DIVISION 27 COMMUNICATIONS Not Used

DIVISION 28 ELECTRONIC SAFETY AND SECURITY
28 31 00 Fire Detection and Alarm

DIVISION 31 EARTHWORK Not Used

DIVISION 32 EXTERIOR IMPROVEMENTS
32 13 13 Concrete Paving
32 30 01 Site Concrete
32 31 19 Decorative Metal Fences and Gates

DIVISION 33 UTILITIES Not Used

APPENDIX A Limited 3-Year AHERA Reinspection – Report No. NA237021

END OF SECTION 00 01 10

SECTION 02 41 00 DEMOLITION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Furnishing all labor, materials, and equipment necessary for demolition, dismantling, cutting, and alterations as indicated, specified, and required for completion of the Contract, as applicable. Includes items such as the following:
      a. Protecting existing work to remain.
      b. Hazardous material identification and removal.
      c. Utility service and termination.
      d. Removing debris and equipment.
      e. Removal of items indicated on Drawings.
      f. Landscape and sprinkler demolition and reinstall.
      g. Disposal of material.

B. Related Sections:
   1. Division 02: Existing Conditions.

C. Regulatory Requirements:
   1. Conform to applicable jurisdictional authority regulations and codes for disposal of debris.
   2. Coordinate clearing work with utility companies.
   3. Maintain emergency access ways at all times.
   4. Contractor shall comply with all applicable laws and ordinances regarding hazardous materials, including contaminated soils, hazardous material transformers, and similar materials or components.

1.3 SUBMITTALS:

A. Schedule: Submit a detailed sequence of demolition and removal work, including dates for shutoff, capping, and continuance of utility services.

B. Procedures: Submit written procedures documenting the proposed methods to be used to control dust and noise.

1.4 EXISTING CONDITIONS

A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

B. Conduct demolition to minimize interference with adjacent structures or items to remain. Maintain protected egress and access at all times.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during Work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

B. Conduct demolition to minimize interference with adjacent structures or items to remain. Maintain protected egress and access at all times.

3.2 PROTECTION

A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.

B. In accordance with generally accepted construction practices, Contractor shall be solely and completely responsible for working conditions at the jobsite, including safety of all persons and property during performance of the Work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Safety precautions prevent damage to existing elements identified to remain or to be salvaged and prevent injury to the public and workmen engaged onsite. Demolish roofs, walls, and other building elements in such a manner that demolished materials fall within foundation lines of building. Do not allow demolition debris to accumulate onsite. Pull down hazardous work at end of each day; do not leave standing or hanging overnight, or over weekends:
   1. Protect existing items that are not indicated to be altered. Protect utilities designated to remain from damage.
   2. Protect trees, plant growth, and features designated to remain as final landscaping as shown on Drawings.
   3. Protect bench marks from damage or displacement.

D. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.

E. Fire Safety: Contractor shall conform to Chapter 33 of the California Fire Code (CFC), "Fire Safety During Construction and Demolition," at all times during the construction process. A copy of this chapter can be provided.

F. Any construction review of Contractor's performance conducted by the geotechnical Engineer is not intended to include review of the adequacy of Contractor's safety measures in, on, or near the construction site.

G. Surface Drainage: Provide for surface drainage during period of construction in a manner to avoid creating nuisance to adjacent areas. Contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of Work, regardless of cause, source, or nature of water.

H. Adjacent streets and sidewalks shall be kept free of mud, dirt, or similar nuisances resulting from earthwork operations.

I. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

3.3 EXAMINATION

A. Examine conditions of work in place before beginning Work; report defects.

B. Report existence of hazardous materials or unsafe structural conditions.

3.4 PREPARATION

A. Scheduling:
   1. General: Coordinate and schedule demolition work as required by Owner and as necessary to facilitate construction progress.

B. Hazardous Materials:
   1. General: Identify chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations, and notify such jurisdictional agencies as may be required. Collect and legally dispose of such materials at official disposal locations away from the site.
   2. Asbestos: If asbestos or materials containing asbestos are encountered, stop work immediately and contact Owner. Do not proceed with demolition until directed by Owner.

C. Utility and Service Termination:
   1. Locate and identify existing utility, service, and irrigation system components affected by Work of this Contract. Review existing record Drawings, conduct site investigations, contact Underground Service Alert and other qualified cable/pipe/line locator services, and implement all other means necessary to define the location of underground systems.
   2. Prior to beginning any demolition, properly disconnect all water, gas, and electrical power supply at appropriate disconnect locations. Obtain all necessary releases and approvals from serving utility companies.
   3. Prior to demolition or disconnect, obtain Owner’s approval that such system does not impact facilities or systems beyond the extent of this Contract.
   4. Mark location of disconnected systems. Identify and indicate stub-out locations on Project record documents.

D. Verify that existing plant life and features designated to remain are tagged or identified.
   1. Architect will mark the features, trees, and shrubs to remain within the construction area. Contractor shall not commence clearing and grubbing operations until authorized by Owner and all protective measures are in place.

E. Coordinate the time and duration of all system disconnects with Owner.

3.5 DEMOLITION

A. General Requirements:
   1. Clear areas required for access to site and execution of Work, including pavement, structures, foundations, vegetation, trash, and debris.
   2. Coordinate with Owner the time of day and route to remove demolished materials from premises.
   3. Remove demolished materials from site as work progresses. Upon completion of work, leave areas of work in clean condition.
   4. Remove all buried debris, rubble, trash, or other material not deemed suitable by the

geotechnical Engineer.
5. Fill all voids or excavations resulting from clearing, demolition, or removal of vegetation with specified fill material.

B. Fixture and Equipment Removal:
1. Remove existing fixtures and equipment as identified and shown on Drawings and required by Architect.
2. Verify all service connections to fixtures and equipment designated for removal have been properly disconnected.
3. Remove all conductors from conduit at all abandoned circuits.

3.6 UTILITY AND BUILDING SERVICES REMOVAL AND RE-INSTALLATION

A. Where crossing paths and potential points of interference with existing utility services are shown or can be reasonably inferred from surface conditions or evidence of subsurface systems, such as meter boxes, vaults, relief vents, cleanouts, and similar components:
1. Review all Contract Documents showing crossing paths and potential points of interference.
2. Pot-hole or determine by other means the accurate depth and location of such utilities.
3. Incorporate all costs required to complete work under this Contract, including additional trenching, re-routing of existing and new utilities, and all means necessary to construct work under this Contract.
4. No additional cost to Owner will be allowed for work necessary to accommodate utility conflicts where such crossing paths are shown on Contract Drawings or can be reasonably inferred from surface conditions or components.

B. Remove all conductors from conduit at all abandoned electrical circuits.

C. Seal off ends of all piping, drains, and other components as directed by Architect and serving utility.

D. Where necessary to maintain service to existing utility and building systems, relocate or redirect all conduit and conductors, piping, drains, and associated system components:
1. Re-circuit all electrical as required.
2. Re-circuit all landscape irrigation valving and control systems as required.
3. Temporarily terminate landscape system components in approved boxes or with approved caps, suitable for re-connection or extension.
4. Extend or otherwise modify all site drainage systems, including catch basins, drain inlets, and piping. Fine grade to maintain proper drainage flow pattern to drains.

E. Demolish structure in an orderly and careful manner:
1. Use of explosives prohibited.

3.7 SITE PAVEMENT REMOVAL

A. Remove sidewalk and curb where required for new construction as specified and as indicated on the Drawings:
1. Remove all paving by saw-cutting.
2. Remove concrete paving and curbing at locations shown on Drawings. Locate closest adjacent expansion or weakened plane joint to define start of removal or saw-cutting.

B. Remove asphalt concrete paving areas where required for new construction as specified and as indicated on the Drawings:
1. Remove all paving by saw-cutting.
2. Remove paving assembly as required to expose subgrade.

3.8 LANDSCAPE AND IRRIGATION SYSTEMS DEMOLITION AND RENOVATION

A. Clearing, Grubbing, and Planting Demolition:
   1. Remove grass and grass roots to a minimum depth of two inches (2”) below existing grade.
   2. Remove all shrubs, plants, and other vegetation within the area of the work unless designated to remain. Grub and remove all roots of all vegetation to a depth of 24 inches below existing grade.
   3. Remove only those trees that are specifically designated for removal, or as shown on the Drawings, within the construction area. Remove all stumps. Remove root ball and root systems larger than one inch (1”) in diameter to a depth of two feet (2’) below existing or finished grades, whichever is lower, and a minimum of five feet (5’) beyond the edge of paving, structure, wall, or walkway.
   4. Hand cut existing tree roots over one inch (1”) in diameter as necessary for trenching or other new construction. Apply multiple coats of emulsified asphalt sealant especially made for horticultural use on cut or damaged plant tissues to cut faces and adjacent surfaces. Cover exposed roots with wet burlap to prevent roots from dying out until backfilling is complete.
   5. Disking and mixing of vegetation, trash, debris, and other deleterious materials with surface soils prior to grading is not permitted.
   6. Remove all buried debris, organic material, rubble, trash, or other material not deemed suitable by the geotechnical Engineer.
   7. Fill all voids or excavations resulting from clearing, demolition, or removal of vegetation with fill material in compliance with Section 31 00 00: Earthwork.
   8. Selected equipment of such sizes and capacities that the existing environment is disturbed as little as possible, and to afford ease of mobility within limited and relatively confined work areas. Make every effort to preserve the topography in its natural state.
   9. Keep drains, catch basins, surface drainage courses, and related drainage system components clear of debris and construction materials.
   10. Remove irrigation piping and appurtenances as necessary within area of work, unless noted otherwise to remain. Replace irrigation piping and appurtenances to irrigate new and/or existing landscaping. Contractor shall be responsible for temporary landscape irrigation until such time that irrigation system is restored and operational.

3.9 DISPOSAL

A. Demolished materials become property of the Contractor and shall be removed from premises, except those items specifically listed to be retained by Owner.

B. Dispose of all demolished material, trash, debris, and other materials not used in the work in accordance with the regulations of jurisdictional authority.

C. It is required that all materials that are of a recyclable nature, be transported to a suitable legal recycling facility instead of a dump or refuse facility (unless they are one-in-the same).

D. Burning and Burying of Materials: **Not allowed**.

E. Haul Routes:
   1. Obtain permits as required by jurisdictional agencies. Establish haul routes in advance; post flagmen for the safety of the public and workmen.
   2. Keep streets free of mud, rubbish, etc. Assume responsibility for damage resulting from hauling operations; hold Owner free of liability in connection therewith.

F. Remove demolished materials and debris from site on a daily basis.

3.10 CLEANING

A. Upon completion of work of this Section, promptly remove from the working area all scraps and debris.

B. Clean excess material from the surface of all remaining paved surfaces and utility structures.

C. Power wash all concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

END OF SECTION 02 41 00

SECTION 02 41 13 SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

1.2 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.

1.3 SUMMARY

A. Section Includes:
   1. Furnishing all labor, materials, and equipment necessary for demolition, dismantling, cutting, and alterations as indicated, specified, and required for completion of the Contract, as applicable. Includes items such as the following:
      a. Protecting existing work to remain.
      b. Hazardous material identification and removal.
      c. Utility service and termination.
      d. Removing debris and equipment.
      e. Removal of items indicated on Drawings.
      f. Landscape and sprinkler demolition and reinstall.
      g. Disposal of material.

B. Related Sections:
   1. Division 02: Existing Conditions.

C. Regulatory Requirements:
   1. Conform to applicable jurisdictional authority regulations and codes for disposal of debris.
   2. Coordinate clearing work with utility companies.
   3. Maintain emergency access ways at all times.
   4. Contractor shall comply with all applicable laws and ordinances regarding hazardous materials, including contaminated soils, hazardous material transformers, and similar materials or components.

1.4 SUBMITTALS:

A. Schedule: Submit a detailed sequence of demolition and removal work, including dates for shutoff, capping, and continuance of utility services.

B. Procedures: Submit written procedures documenting the proposed methods to be used to control dust and noise.

1.5 EXISTING CONDITIONS

A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

B. Conduct demolition to minimize interference with adjacent structures or items to remain. Maintain protected egress and access at all times.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during Work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

B. Conduct demolition to minimize interference with adjacent structures or items to remain. Maintain protected egress and access at all times.

3.2 PROTECTION

A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.

B. In accordance with generally accepted construction practices, Contractor shall be solely and completely responsible for working conditions at the jobsite, including safety of all persons and property during performance of the Work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Safety precautions prevent damage to existing elements identified to remain or to be salvaged and prevent injury to the public and workmen engaged onsite. Demolish roofs, walls, and other building elements in such a manner that demolished materials fall within foundation lines of building. Do not allow demolition debris to accumulate onsite. Pull down hazardous work at end of each day; do not leave standing or hanging overnight, or over weekends:
   1. Protect existing items that are not indicated to be altered. Protect utilities designated to remain from damage.
   2. Protect trees, plant growth, and features designated to remain as final landscaping as shown on Drawings.
   3. Protect bench marks from damage or displacement.

D. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.

E. Fire Safety: Contractor shall conform to Chapter 33 of the California Fire Code (CFC), "Fire Safety During Construction and Demolition," at all times during the construction process. A copy of this chapter can be provided.

F. Any construction review of Contractor's performance conducted by the geotechnical Engineer is not intended to include review of the adequacy of Contractor's safety measures in, on, or near the construction site.

G. Surface Drainage: Provide for surface drainage during period of construction in a manner to avoid creating nuisance to adjacent areas. Contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of Work, regardless of cause, source, or nature of water.

H. Adjacent streets and sidewalks shall be kept free of mud, dirt, or similar nuisances resulting from earthwork operations.

I. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

3.3 EXAMINATION

A. Examine conditions of work in place before beginning Work; report defects.

B. Report existence of hazardous materials or unsafe structural conditions.

3.4 PREPARATION

A. Scheduling:
   1. General: Coordinate and schedule demolition work as required by Owner and as necessary to facilitate construction progress.

B. Hazardous Materials:
   1. General: Identify chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations, and notify such jurisdictional agencies as may be required. Collect and legally dispose of such materials at official disposal locations away from the site.
   2. Asbestos: If asbestos or materials containing asbestos are encountered, stop work immediately and contact Owner. Do not proceed with demolition until directed by Owner.

C. Utility and Service Termination:
   1. Locate and identify existing utility, service, and irrigation system components affected by Work of this Contract. Review existing record Drawings, conduct site investigations, contact Underground Service Alert and other qualified cable/pipe/line locator services, and implement all other means necessary to define the location of underground systems.
   2. Prior to beginning any demolition, properly disconnect all water, gas, and electrical power supply at appropriate disconnect locations. Obtain all necessary releases and approvals from serving utility companies.
   3. Prior to demolition or disconnect, obtain Owner’s approval that such system does not impact facilities or systems beyond the extent of this Contract.
   4. Mark location of disconnected systems. Identify and indicate stub-out locations on Project record documents.

D. Verify that existing plant life and features designated to remain are tagged or identified.
   1. Architect will mark the features, trees, and shrubs to remain within the construction area. Contractor shall not commence clearing and grubbing operations until authorized by Owner and all protective measures are in place.

E. Coordinate the time and duration of all system disconnects with Owner.

3.5 DEMOLITION

A. General Requirements:
   1. Clear areas required for access to site and execution of Work, including pavement, structures, foundations, vegetation, trash, and debris.
   2. Coordinate with Owner the time of day and route to remove demolished materials from premises.

3. Remove demolished materials from site as work progresses. Upon completion of work, leave areas of work in clean condition.
4. Remove all buried debris, rubble, trash, or other material not deemed suitable by the geotechnical Engineer.
5. Fill all voids or excavations resulting from clearing, demolition, or removal of vegetation with specified fill material.

B. Fixture and Equipment Removal:
1. Remove existing fixtures and equipment as identified and shown on Drawings and required by Architect.
2. Verify all service connections to fixtures and equipment designated for removal have been properly disconnected.
3. Remove all conductors from conduit at all abandoned circuits.

3.6 UTILITY AND BUILDING SERVICES REMOVAL AND RE-INSTALLATION

A. Where crossing paths and potential points of interference with existing utility services are shown or can be reasonably inferred from surface conditions or evidence of subsurface systems, such as meter boxes, vaults, relief vents, cleanouts, and similar components:
1. Review all Contract Documents showing crossing paths and potential points of interference.
2. Pot-hole or determine by other means the accurate depth and location of such utilities.
3. Incorporate all costs required to complete work under this Contract, including additional trenching, re-routing of existing and new utilities, and all means necessary to construct work under this Contract.
4. No additional cost to Owner will be allowed for work necessary to accommodate utility conflicts where such crossing paths are shown on Contract Drawings or can be reasonably inferred from surface conditions or components.

B. Remove all conductors from conduit at all abandoned electrical circuits.

C. Seal off ends of all piping, drains, and other components as directed by Architect and serving utility.

D. Where necessary to maintain service to existing utility and building systems, relocate or redirect all conduit and conductors, piping, drains, and associated system components:
1. Re-circuit all electrical as required.
2. Re-circuit all landscape irrigation valving and control systems as required.
3. Temporarily terminate landscape system components in approved boxes or with approved caps, suitable for re-connection or extension.
4. Extend or otherwise modify all site drainage systems, including catch basins, drain inlets, and piping. Fine grade to maintain proper drainage flow pattern to drains.

E. Demolish structure in an orderly and careful manner:
1. Use of explosives prohibited.

3.7 SITE PAVEMENT REMOVAL

A. Remove sidewalk and curb where required for new construction as specified and as indicated on the Drawings:
1. Remove all paving by saw-cutting.
2. Remove concrete paving and curbing at locations shown on Drawings. Locate closest adjacent expansion or weakened plane joint to define start of removal or saw-cutting.

B. Remove asphalt concrete paving areas where required for new construction as specified

and as indicated on the Drawings:

1. Remove all paving by saw-cutting.
2. Remove paving assembly as required to expose subgrade.

3.8 LANDSCAPE AND IRRIGATION SYSTEMS DEMOLITION AND RENOVATION

A. Clearing, Grubbing, and Planting Demolition:

1. Remove grass and grass roots to a minimum depth of two inches (2”) below existing grade.
2. Remove all shrubs, plants, and other vegetation within the area of the work unless designated to remain. Grub and remove all roots of all vegetation to a depth of 24 inches below existing grade.
3. Remove only those trees that are specifically designated for removal, or as shown on the Drawings, within the construction area. Remove all stumps. Remove root ball and root systems larger than one inch (1”) in diameter to a depth of two feet (2’) below existing or finished grades, whichever is lower, and a minimum of five feet (5’) beyond the edge of paving, structure, wall, or walkway.
4. Hand cut existing tree roots over one inch (1”) in diameter as necessary for trenching or other new construction. Apply multiple coats of emulsified asphalt sealant especially made for horticultural use on cut or damaged plant tissues to cut faces and adjacent surfaces. Cover exposed roots with wet burlap to prevent roots from dying out until backfilling is complete.
5. Disking and mixing of vegetation, trash, debris, and other deleterious materials with surface soils prior to grading is not permitted.
6. Remove all buried debris, organic material, rubble, trash, or other material not deemed suitable by the geotechnical Engineer.
7. Fill all voids or excavations resulting from clearing, demolition, or removal of vegetation with fill material in compliance with Section 31 00 00: Earthwork.
8. Selected equipment of such sizes and capacities that the existing environment is disturbed as little as possible, and to afford ease of mobility within limited and relatively confined work areas. Make every effort to preserve the topography in its natural state.
9. Keep drains, catch basins, surface drainage courses, and related drainage system components clear of debris and construction materials.
10. Remove irrigation piping and appurtenances as necessary within area of work, unless noted otherwise to remain. Replace irrigation piping and appurtenances to irrigate new and/or existing landscaping. Contractor shall be responsible for temporary landscape irrigation until such time that irrigation system is restored and operational.

3.9 DISPOSAL

A. Demolished materials become property of the Contractor and shall be removed from premises, except those items specifically listed to be retained by Owner.

B. Dispose of all demolished material, trash, debris, and other materials not used in the work in accordance with the regulations of jurisdictional authority.

C. It is required that all materials that are of a recyclable nature, be transported to a suitable legal recycling facility instead of a dump or refuse facility (unless they are one-in-the same).

D. Burning and Burying of Materials: **Not allowed**.

E. Haul Routes:

1. Obtain permits as required by jurisdictional agencies. Establish haul routes in advance; post flagmen for the safety of the public and workmen.
2. Keep streets free of mud, rubbish, etc. Assume responsibility for damage resulting from hauling operations; hold Owner free of liability in connection therewith.

F. Remove demolished materials and debris from site on a daily basis.

3.10 CLEANING

A. Upon completion of work of this Section, promptly remove from the working area all scraps and debris.

B. Clean excess material from the surface of all remaining paved surfaces and utility structures.

C. Power wash all concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

END OF SECTION 02 41 13

SECTION 02 41 19 SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected portions of existing tile roofing.
   3. Demolition and removal of selected site elements.
   4. Accessories necessary for demolition and deconstruction.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose off-site.

B. Remove and Reinstall: Detach items from existing construction with care to prevent damage, clean and refurbish, prepare for reuse, store as necessary, and reinstall where indicated.

C. Deconstruct: To remove by disassembling or detaching an item from a surface, using methods and equipment to successfully prevent damage to the item and surfaces, and dispose of items.

1.4 SUBMITTALS

A. Qualification Data: Submit copies of qualifications for refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building and roof structures.

C. Proposed Protection Measures: Submit report, including Drawings, indicating proposed measures for protecting individuals and property, for environmental protection, dust control, and noise control. Indicate proposed locations, types, and construction of barriers.

D. Schedule of Selective Demolition Activities:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's onsite operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Inventory: Submit a list of items for removal and location of storage of existing items to be removed, saved, and replaced (tile roofing)

F. Pre-Demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that could be construed as damage caused by demolition operations. Submit prior to commencement of the work.

G. Statement of Refrigerant Recovery: Submit statement signed by refrigerant recovery technician responsible for recovering refrigerant, stating that refrigerant present was recovered and recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

H. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Demolition Standards: Comply with ASSE A10.6 and NFPA 241.
2. Comply with EPA regulations prior to commencement of the work. Comply with hauling and disposal regulations of authorities having jurisdiction.
3. Comply with applicable federal, state, and local codes for demolition work, dust and noise control, safety of structure, and debris removal.
4. Obtain required permits from authorities having jurisdiction.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA approved certification program.

C. Pre-demolition conference to be conducted at the site:
1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction scheduled to remain and requires protection.
6. Review with Owner staging areas for equipment and material storage and removal.

D. Arrange selective demolition schedule to avoid interference with Owner's and the school’s operations.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor prior to proceeding. Existing warranties to be provided by Owner prior to the start of construction.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying existing system has been inspected and warranty remains in effect. Submit supporting documentation at closeout.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and the contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

PART 2 PRODUCTS

2.1 MATERIALS

A. Repair Materials:
   1. Use repair materials identical to existing materials:
      a. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
      b. Use materials whose installed performance equals or surpasses that of existing materials.

B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide minimum of 72 hours' notice to Owner of demolition activities that will affect Owner's operations, including but not limited to:
   1. Interruption of power.
   2. Interruption of utility services.
   3. Excessive noise.

B. Condition of Structure:
   1. Conditions existing at time of inspection will be maintained by Owner as far as practical. Owner assumes no responsibility for actual condition of items or structures to be demolished:
      a. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
      b. Before commencing selective demolition, Owner will remove the following items:
         1) Classroom equipment (tables, chairs, and District owned items).
         2) Roof top equipment is **not** part of the demolition scope of work.

C. Hazardous Materials:
   1. It is not anticipated that hazardous materials will be encountered in the Work:
      a. Hazardous materials will be removed by Owner before start of the Work.
      b. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by at least 12 inches (300 mm).

E. Storage or sale of removed items or materials onsite is not permitted.

F. Traffic:
   1. Conduct operations and debris removal to ensure minimum interference with roads, streets, drives, fire lanes, walks, accessible paths, and adjacent occupied or used facilities:
      a. Do not close, block, or obstruct streets, drives, walks, or occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around obstructed traffic ways.

G. Explosives: Explosives are **not** permitted at the site.

H. Flame Cutting: Do not use cutting torches for removal until flammable materials are removed. At concealed spaces, verify conditions prior to flame cutting operations. Maintain portable fire suppression devices during flame cutting operations.

I. Environmental Controls: Use water sprinkling, temporary enclosures, or other acceptable methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions.

J. Utility Services:
   1. Maintain existing utilities and protect against damage during demolition operations:
      a. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, acceptable to Owner and governing authorities.

K. Protections:
   1. Provide temporary barriers to protect Owner's personnel and public from injury from work:
      a. Take protective measures to provide free and safe passage to occupied portions of building.
      b. Provide protection to ensure safe passage of Owner’s personnel and the public around demolition areas and to and from occupied portions of adjacent areas, buildings, and structures.
      c. Provide shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or Work to remain.
      d. Protect existing Work that becomes exposed during demolition operations:
         1) Protect existing improvements, appurtenances, and conditions to remain.
         2) Protect adjacent floors with coverings.
         3) Protect walls, openings, roofs, and adjacent exterior construction to remain and exposed to building demolition operations.
      e. Construct temporary insulated dustproof partitions to separate areas from noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks. Refer to Drawings for location of partitions to be provided.
      f. Provide temporary weather protection when exposing exterior conditions to prevent water leakage or damage to structure or interior areas of existing building.

L. Damages: Promptly repair damages caused to adjacent facilities by demolition work.

3.2 EXAMINATION

A. Verify that affected utilities have been disconnected and capped before commencing selective demolition operations.

B. Review Project record documents of existing construction or existing condition and hazardous material information provided by Owner. Owner does not warrant existing conditions are same as those indicated in Project record documents.

C. Perform an engineering survey of condition of building to determine whether removing an element might result in structural deficiency or unplanned collapse of a portion of structure or adjacent structures during selective building demolition operations:
   1. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

F. Survey of Existing Conditions:
   1. Record existing conditions with measured drawings or preconstruction photographs or video and templates:
      a. Inventory and record the condition of items to be removed. Provide photographs or video of conditions that might be misconstrued as damage caused by operations.
      b. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
      c. For any electrical or low-voltage work to be performed in the Project (including fire alarm, PA, intercom, or data), test entire system for operation prior to initiation of work. Notify Owner of any non-working components. Test entire system at the end of construction to ensure all systems operate properly.

3.3 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

B. Pest Control: Employ certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.

C. Site Access and Temporary Controls: Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities. Comply with requirements for access and protection.

D. Temporary Facilities:
   1. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain:
      a. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
      b. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
      c. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
      d. Cover and protect furniture, furnishings, and equipment that have not been removed.
      e. Comply with requirements for temporary enclosures, dust control, heating, and cooling.

E. Furnishings and Equipment: Cover and protect furniture, equipment, and fixtures from spoilage or damage as necessary.

F. Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise:
   1. Construct dustproof partitions of not less than nominal four-inch (100mm) studs, 5/8-inch (16mm) gypsum wallboard with joints taped on occupied side, and 1/2-inch (13mm) fire retardant plywood on the demolition side.
   2. Insulate partition to provide noise protection to occupied areas.

3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
4. Protect air handling equipment.
5. Weatherstrip openings to prevent the spread of dust.

3.4 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished:
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   4. Disconnect, demolish, and remove fire suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed:
      a. Piping to be removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Piping to be abandoned in place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
      c. Equipment to be removed: Disconnect and cap services and remove equipment.
      d. Equipment to be removed and reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
      e. Equipment to be removed: Disconnect and cap services and remove equipment and deliver to Owner.
      f. Ducts to be removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
      g. Ducts to be abandoned in place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.5 POLLUTION CONTROLS

A. Dust Control:
   1. Use water mist, temporary enclosures, and suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations (XXAQMD) including, but not limited to XXAQMD Rule 403 (Fugitive Dust):
      a. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
      b. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

3.6 PROTECTION

A. Temporary Protection:
   1. Provide temporary barricades and protection required to prevent injury to people and damage to adjacent buildings and facilities to remain:
      a. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building:
         1) Erect temporary pathways and means of egress necessary for ongoing operations compliant with Code and accessibility regulations.
      b. Provide temporary weather protection, during interval between selective demolition

of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

c. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations:
   1) Protect existing work that becomes exposed during demolition operations.
   2) Protect adjacent entrances from damage due to demolition activities.
   3) Protect existing improvements, appurtenances, and conditions to remain.
   4) Protect floors with covering.
   5) Protect walls, openings, roofs, and adjacent exterior construction to remain and exposed to building demolition operations.

2. Cover and protect furniture, furnishings, and equipment that have not been removed.
3. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01, General Requirements:
   a. Construct temporary, insulated dustproof partitions to separate areas from noisy or extensive dirt or dust when operations are performed. Equip partitions with dustproof doors and security locks.
   b. Construct dustproof partitions of not less than nominal four-inch (100mm) studs, 5/8-inch (16mm) gypsum wallboard with joints taped on occupied side, and 1/2-inch (13mm) fire retardant plywood on the demolition side.
   c. Insulate partition to provide noise protection to occupied areas.
   d. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
   e. Protect air handling equipment.
   f. Weatherstrip openings.
4. Damage: Promptly repair damages to adjacent components caused by demolition activities.

B. Temporary Shoring:
   1. Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished:
      a. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.7 SELECTIVE DEMOLITION

A. Demolish and remove existing construction to the extent necessary for new work. Use methods required to complete the work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame cutting operations. Maintain portable fire suppression devices during flame cutting operations.
   5. Maintain fire watch during and for at least 24 hours after flame cutting operations.
   6. Maintain adequate ventilation when using cutting torches.

7. Remove decayed, vermin infested, and dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials to avoid imposing excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and adjacent occupied and used facilities.

C. Removed Items:
1. Clean and pack or crate items after cleaning. Identify contents of containers. Store items in secure area until delivery to Owner:
   a. Transport items to Owner's storage area designated by Owner. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse:
   a. Pack or crate items after cleaning and repairing. Identify contents of containers.
   b. Protect items from damage during transport and storage.
   c. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner, items may be removed to a suitable, protected storage location during selective demolition, cleaned, and reinstalled in original locations after selective demolition operations are complete.

F. Patching and Repair: Repair damage to adjacent construction caused by selective demolition operations promptly.

3.8 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Remove to nearest control joint where possible. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs on Grade: Saw cut perimeter of area to be demolished, and then break up and remove.

E. Interior Slab on Grade: Use best practice removal methods to prevent cracking or structurally disturbing adjacent slabs or partitions. Use power saw where possible.

F. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI *Recommended Work Practices for the Removal of Resilient Floor Coverings*. Do not use methods requiring solvent-based adhesive strippers**.**

G. Below Grade Voids: Completely fill below grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel, or sand, free of trash and debris, stones over six inches (150mm) in diameter, roots, or other organic matter.

H. Partitions: Completely remove indicated interior partitions and interior finishes indicated. Leave adjacent work scheduled to remain sound and ready for patching or for new finishes.

I. Doors and Frames:
   1. Remove from site:
      a. Remove doors, frames, and hardware where indicated. Clean, store, and protect for reinstallation or return hardware to Owner as directed.

J. Cut existing masonry walls for new doors, windows, or openings indicated. Leave openings ready to receive new work or patching.

K. Windows: Remove existing windows where indicated. Remove associated anchors, shims, blocking, operating devices, sealant, and trim. Cut back interior finishes required for plumb surface for patching. Leave openings ready for installation of new materials and finishes.

L. Mechanical, Electrical, and Structural Elements:
   1. If unanticipated mechanical, electrical, or structural elements conflicting with intended function or design are encountered, investigate and measure both nature and extent of the conflict:
      a. Submit written report to Architect in accurate detail. Pending receipt of directive, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.
      b. HVAC Equipment: Remove air conditioning equipment without releasing refrigerants.

3.9 REMOVAL OF STRUCTURAL ELEMENTS

A. Foundation: Demolish foundation walls to a minimum depth of 12 inches (300mm) below existing ground surface. Demolish and remove below grade wood or metal construction. Break up below grade concrete slabs.

B. Pneumatic Operated Hammers:
   1. When possible, reduce use of pneumatic operated hammers. When necessary to use pneumatic tools, locate compressors as remote from occupied areas as possible:
      a. To break large pieces of concrete, isolate concrete from floor slabs and building structure to prevent structure borne vibration.

C. Saw Cutting:
   1. Locate compressors as remote as possible from occupied areas of facility:
      a. Use diamond tipped saw blades and related equipment.
      b. Saw cut portions of walls and slabs. Angle saw blade at floors and corners to cut as closely as possible to desired location.
      c. Control runoff water used with saw to prevent damage to existing materials.

3.10 ROOF REMOVAL

A. Roof Assembly:

1. Remove existing roofing to the extent that can be covered in one day by new roofing. Maintain building interior in watertight and weathertight condition:
   a. Remove existing roof membrane, flashings, copings, and roof accessories.
   b. Remove existing roofing system down to substrate.

B. At new column extensions, cut through roofing as required for welding of new extension. Provide temporary watertight enclosure over stubs and temporarily flash to existing roof to make completely watertight.

C. At existing parapets, remove portions of roofing, flashing, stone, and masonry necessary to weld new steel and set form work. Provide temporary watertight enclosures over areas of open roof and temporarily flash to make watertight.

D. As column forms are placed, temporarily flash columns to existing roofing and cover with watertight tarpaulins before and after pouring. After column forms have been removed, temporarily flash new concrete structure into existing roofing immediately to maintain watertight roof.

E. When removing roofing to place supports for shoring of form work to transfer loads to existing columns or approved structure or to support scaffolding, work platforms, or similar loads, temporarily flash supports to make roof watertight.

F. Remove excess residue. Thoroughly clean and remove asphalt, dust, and loose materials, and leave ready for new work.

3.11 PATCHING AND REPAIRS

A. Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Patching: Comply with Division 01, General Requirements.

C. Repairs:
1. When necessary to repair existing surfaces, patch to produce surfaces suitable for new materials:
   a. Fill holes and depressions in existing masonry walls to remain with masonry patching material applied according to manufacturer's written recommendations.

D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

E. Floors and Walls:
1. Where walls or partitions are demolished, extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance:
   a. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
   b. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
   c. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.12 DISPOSAL OF DEMOLISHED MATERIALS

A. Legally remove demolition waste materials from site and dispose in an EPA approved construction and demolition waste landfill acceptable to authorities having jurisdiction; recycle or reuse components:
   1. Do not allow demolished materials to accumulate onsite.
   2. Remove and transport debris to prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or devices that convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.13 CLEANING

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

END OF SECTION 02 41 19

SECTION 02 82 00 ASBESTOS REMEDIATION

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 requirements including but not limited to:
   1. Asbestos material abatement and disposal.
   2. Accessories necessary for complete removal.

1.3 SUBMITTAL

A. Submit copy of the signed waste manifests indicating the place, time, and exact quantity of asbestos received by an approved landfill.

1.4 QUALITY ASSURANCE

A. Qualifications: Entity having minimum five (5) years' documented experience, holding required current licenses for the removal, transport, disposal, and related activities relative to the work, having the required personal protective equipment for abatement operations, with current liability insurance, and who employs workers fully trained and knowledgeable in the removal of hazardous materials.

B. Stop Asbestos Removal:
   1. If a verbal or written Stop Asbestos Removal Order is given**,** immediately stop asbestos removal and maintain HEPA filtered negative pressure air flow in the containment and adequately wet any exposed Asbestos Contained Material (ACM).
   2. Do not resume asbestos removal activity until authorized to do so in writing from District.
   3. A stop asbestos removal order may be issued at any time by the District if it is determined that abatement conditions/activities are not within regulatory requirements or that an imminent hazard exists to human health or the environment.
   4. Work stoppage will continue until conditions have been corrected.

PART 2 MATERIALS (NOT USED)

PART 3 EXECUTION

3.1 REMEDIATION

A. Owner has conducted an asbestos survey and has determined that asbestos may be present in areas where Work will be performed. The survey is made available for review:
   1. As part of the Work, Owner requires asbestos removal to be performed under the construction Contract.
   2. Asbestos may be present in vinyl tile under architectural woodwork or covered by, but not encapsulated, carpet materials and other types of flooring.
   3. Asbestos may be present in the ductwork above the ceiling panels.
   4. If asbestos is found, stop work in the area and engage an asbestos removal firm to

remediate the asbestos from the area. Do not resume work in the affected areas until the abatement is complete and authorization to proceed with work in the affected areas is given. Work in areas not affected by asbestos may continue.

B. Assume responsibility and liability for compliance with applicable federal, state, and local regulations related to the asbestos abatement work:
   1. Provide and maintain training, accreditations, medical exams, medical records, and personal protective equipment (PPE) including respiratory protection and respirator fit testing, as required by applicable federal, state, and local regulations.
   2. Post required notices prior to the commencement of the work.
   3. Restrict access to containment areas to authorized, trained, and protected personnel.
   4. Prepare and post an emergency plan in clean room and equipment room of the decontamination unit.
   5. Do not permit workers to eat, drink, smoke, chew gum or tobacco, or break the protection of the respiratory protection system in the work area.

C. Entering and Existing Procedures: Establish procedures for entering and existing containment area. Provide personnel decontainment unit with disposable coveralls, head covers, and clean respirators. Provide shower room between personnel decontainment area and equipment room.

D. Decontamination Procedures: Establish and ensure that procedures for decontamination upon leaving containment area are in accordance with federal and state regulations.

E. Provide negative pressure filtration systems to complete air exchange four (4) times per hour. Provide standby system in the event of a machine failure or emergency:
   1. Continuously monitor and record the pressure differential between the work area and the building outside of the work area.

F. Prepare the Affected Area: Remove furnishings and materials to the extent necessary to remediate the asbestos.

G. Containment of Areas:
   1. Provide a secure containment work area in accordance with federal and state regulations. Avoid damage to existing partitions and ceilings scheduled to remain to the extent possible:
      a. Establish critical barriers over each opening into the work area.
      b. Close out vents and air ducts to prevent particulates from entering the HVAC system.

H. Debris:
   1. Place contaminated debris in a designated location within the containment area:
      a. Place debris in minimum six (6) mil poly bags before removing from contaminated areas. Pass clean or decontaminated bags through a double six (6) mil flap doorway into another bag or fiber drum. Remove to disposal dumpster/gondola/vehicle. Do not permit unprotected personnel to come in contact with contaminated bags.
      b. Remove and dispose of contaminated debris legally.

I. Testing: Perform required tests and inspections upon completion of the work. Collect air samples and analyze in accordance with regulations. Upon satisfactory conclusion of testing, remove critical barriers.

J. After thorough decontamination, complete asbestos abatement work upon meeting the regulated area clearance criteria and fulfilling the following:

1. Remove equipment, materials, and debris from the Project area.
2. Package and dispose of asbestos waste, as required.
3. Repair or replace all interior finishes damaged during the abatement work.
4. Fulfill other Project closeout requirements as specified elsewhere in this Specification.

3.2 CERTIFICATE OF COMPLETION BY CONTRACTOR

A. Submit a signed *Certificate of Completion* at the completion of the abatement and decontamination of the regulated area.

END OF SECTION 02 82 00

SECTION 02 83 00 LEAD REMEDIATION

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 requirements including but not limited to:
1. Recognition of lead-based material and its definition.
2. Federal and state requirement reference.
3. Contractor’s Liability.
4. Contractor’s Acknowledgment.

B. Lead as a Health Hazard:
1. Lead poisoning is recognized as a serious environmental health hazard facing children today. Even at low levels of exposure - much lower than previously believed - lead can impair the development of a child's central nervous system, causing learning disabilities and leading to serious behavioral problems. Lead enters the environment as tiny lead particles and lead dust disburses when paint chips or chalks peels or wears away over time, or is otherwise disturbed. Ingestion of lead dust is the most common pathway of childhood poisoning; lead dust gets on a child’s hands and toys and then into a child’s mouth through common hand-to-mouth activity. Exposures may result from construction or remodeling activities that disturb lead paint, from ordinary wear and tear of windows and doors, or from friction on other surfaces.
2. Ordinary construction and renovation or repainting activities carried out without lead-safe work practices can disturb lead-based paint and create significant hazards. Improper removal practices, such as dry scraping, sanding, or water blasting painted surfaces, are likely to generate high volumes of lead dust.
3. Because Contractor and his employees will be providing services for the District, and because Contractor's work may disturb lead-containing building materials, CONTRACTOR IS HEREBY NOTIFIED of the potential presence of lead-containing materials located within certain buildings utilized by the District. All school buildings built prior to 1978 are presumed to contain some lead-based paint until sampling proves otherwise.
4. Refer to “Asbestos and Lead-Based Paint Survey Report – Appendix A” in this Project manual.
5. Education Code section 32240 et seq. is known as the Lead-Safe Schools Protection Act. Under this act, the Department of Health Services is to conduct a sample survey of schools in the State of California for the purpose of developing risk factors to predict lead contamination in public schools (Ed. Code, § 32241).
6. Any school that undertakes any action to abate existing risk factors for lead is required to utilize trained and state-certified contractors, inspectors, and workers (Ed. Code, § 32243, sub. [b]). Moreover, lead-based paint, lead plumbing, solders, or other potential sources of lead contamination shall not be utilized in the construction of any new school facility, or the modernization or renovation of any existing school facility (Ed. Code, § 32244).
7. Both the Federal Occupational Safety and Health Administration (Fed/OSHA) and the California Division of Occupational Safety and Health (Cal/OSHA) have implemented safety orders applicable to all construction work where a contractor's employee may be occupationally exposed to lead.
8. The OSHA Regulations contain specific and detailed requirements imposed on

contractors subject to that regulation. The OSHA Regulations define construction work as work for construction, alteration, and/or repair, including painting and decorating. It includes, but is not limited to, the following:

a. Demolition or salvage of structures where lead or materials containing lead are present.
b. Removal or encapsulation of materials containing lead.
c. New construction, alteration, repair, or renovation of structures, substrates, or portions thereof that contain lead, or materials containing lead.
d. Installation of products containing lead.
e. Lead contamination/emergency cleanup.
f. Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed.
g. Maintenance operations associated with the construction activities described in Division 01, General Requirements, or within this Section.

9. Because it is assumed by the District that a portion of painted surfaces (interior as well as exterior) within the District contain some level of lead, it is imperative that Contractor, workers, and subcontractors fully and adequately comply with all applicable laws, rules, and regulations governing lead-based materials, including title 8, California Code of Regulations, section 1532.1.
10. Contractor shall notify the District if any Work may result in the disturbance of lead-containing building materials. Any and all Work that may result in the disturbance of lead-containing building materials shall be coordinated through the District. A signed copy of this Certification shall be on file prior to beginning Work on the Project, along with all current insurance certificates.

C. Renovation, Repair, and Painting Rule:

1. Toxic Substance Control Act Section 402(a):
   a. The EPA requires lead safe work practices to reduce exposure to lead hazards created by renovation, repair, and painting activities that disturb lead-based paint. Pursuant to the Renovation, Repair and Painting Rule (RRP), renovations in homes, childcare facilities, and schools built prior to 1978 must be conducted by certified renovations firms, using renovators with training by a EPA-accredited training provider, and fully and adequately complying with all applicable laws, rules, and regulations governing lead-based materials, including those rules and regulations appearing within title 40 of the Code of Federal Regulations as part 745 (40 CFR 745).
   b. The RRP requirements apply to all contractors who disturb lead-based paint in a six (6) square foot or greater area indoors or a 20 square foot or greater area outdoors. If a DPH-certified inspector or risk assessor determines that a structure constructed before 1978 is lead-free, the federal certification is not required for anyone working on that particular building.

1.3 SUBMITTAL

A. Contractors Acknowledgment (bottom of Section).

B. Submit copy of the signed waste manifests indicating the place, time, and exact quantity of material received by an approved landfill.

1.4 CONTRACTOR'S LIABILITY

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

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

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

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

SECTION CONTINUES ON NEXT PAGE

CONTRACTOR HEREBY ACKNOWLEDGES UNDER PENALTY OF PERJURY THAT IT:

1. HAS RECEIVED NOTIFICATION OF POTENTIAL LEAD-BASED MATERIALS ON

OWNER'S PROPERTY;

2. IS KNOWLEDGEABLE REGARDING AND WILL COMPLY WITH ALL APPLICABLE LAWS, RULES, AND REGULATIONS GOVERNING WORK WITH, AND DISPOSAL OF, LEAD.

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

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

PROJECT/CONTRACT NO.: _____ (Project or Contract)

between XX District (District) and _____ (Contractor or Bidder).

This certification provides notice to Contractor that:

1. Contractor's work may disturb lead-containing building materials.

2. Contractor shall notify the District if any work may result in the disturbance of lead-containing building materials.

3. Contractor shall comply with the Renovation, Repair, and Painting Rule, if lead-based paint is disturbed in a six (6) square-foot or greater area indoors or a 20-square-foot or greater area outdoors.

END OF SECTION 02 83 00

SECTION 02 87 13 MOLD REMEDIATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This specification covers the removal and disposal of mold. Products shall be as follows or as directed by the Owner. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

B. Related Sections:
1. Division 01: General Requirements.
2. Section 02 41 13: Selective Demolition.

C. References:
1. U.S. EPA “Mold Remediation in Schools and Commercial Buildings” 2. U.S. EPA “A Brief Guide to Mold, Moisture, and Your Home.”

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, experienced means having successfully completed a minimum of five (5) years’ documented experience with projects similar in nature, size, and extent; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality Control Testing: Tests and inspections performed onsite for work scheduled to be performed and upon completed Work.

C. Installer/Applicator/Erector:
1. Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular services, including installation, erection, application, and similar operations for replacement or modifications:
    a. Use of trade specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

1.4 SUBMITTALS

A. List of all personnel to be involved in the work with their training and certifications.
1. List of all products and procedures proposed for use in performance of the work.
2. Test reports.
3. Certificates.
4. Preliminary Visual Assessment Reports.
    a. Photos.
    b. Maps of areas needing remediation.
    c. Approximate Square footage of each area needing remediation.
5. Submit Product Data and Safety Data Sheets for all materials brought on the site to be used.

B. Proposed Schedule
   1. Provide documentation for proposed schedule of work, include inspection and reasonable amount of time for settlement of materials and equipment.

1.5 QUALITY ASSURANCE

A. Conform to all Federal, State, and Local regulations which govern the handling and disposal of mold materials.

B. For areas requiring containment, Contractor to provide bilingual warning signage outside remediation areas. Including yellow caution tape and signage with large black letters:
   1. Signage to read: “Warning DO NOT ENTER remediation work in progress”.

PART 2 PRODUCT - (NOT USED)

PART 3 EXECUTION

A. Environmental Assessment:
   1. The presence of mold, water damage, or musty odors shall be addressed immediately. In all instances, any source(s) of water must be stopped and the extent of water damaged determined.
   2. Water damaged materials shall be dried and repaired.
   3. Mold damaged materials shall be remediated in accordance with this document.
      a. Visual Inspection: A visual inspection is the most important initial step in identifying a possible contamination problem. The extent of any water damage and mold growth shall be visually assessed. This assessment is important in determining remedial strategies.
      b. Ventilation systems shall also be visually checked, particularly for damp filters but also for damp conditions elsewhere in the system and overall cleanliness.
      c. Ceiling tiles, gypsum wallboard (sheetrock), cardboard, paper, and other cellulosic surfaces shall be given careful attention during a visual inspection.
   4. The use of equipment such as a boroscope, to view spaces in ductwork or behind walls, or a moisture meter, to detect moisture in building materials, may be helpful in identifying hidden sources of fungal growth and the extent of water damage.
   5. Bulk/Surface Sampling:
      a. Bulk or surface sampling is not required to undertake a remediation. Remediation of visually identified fungal contamination shall proceed without further evaluation.
      b. Bulk or surface samples may need to be collected to identify specific fungal contaminants as part of a medical evaluation if occupants are experiencing symptoms which may be related to fungal exposure or to identify the presence or absence of mold if a visual inspection is equivocal (e.g., discoloration, and staining).
      c. An individual trained in appropriate sampling methodology shall perform bulk or surface sampling.
         1) Bulk samples shall be collected from visibly moldy surfaces by scraping or cutting materials with a clean tool into a clean plastic bag.
         2) Surface samples shall be collected by wiping a measured area with a sterile swab or by stripping the suspect surface

B. Existing Conditions
   1. Surface sampling is less destructive than bulk sampling. Other sampling methods may also be available. A laboratory specializing in mycology shall be consulted for specific sampling and delivery instructions.
   2. Air Monitoring:
      a. Air sampling for fungi shall not be part of a routine assessment. This is because

decisions about appropriate remediation strategies can usually be made on the basis of a visual inspection. In addition, air-sampling methods for some fungi are prone to false negative results and therefore cannot be used to definitively rule out contamination.

b. Air monitoring may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with a fungal exposure (e.g., pulmonary hemorrhage/hemosiderosis, and aspergillosis).
c. Air monitoring may be necessary if there is evidence from a visual inspection or bulk sampling that ventilation systems may be contaminated. The purpose of such air monitoring is to assess the extent of contamination throughout a building. It is preferable to conduct sampling while ventilation systems are operating.
d. Air monitoring may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls).
    1) The purpose of such air monitoring is to determine the location and/or extent of contamination. e. If air monitoring is performed, for comparative purposes, outdoor air samples shall be collected concurrently at an air intake, if possible, and at a location representative of outdoor air. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."
e. Personnel conducting the sampling shall be trained in proper air sampling methods for microbial contaminants. A laboratory specializing in mycology shall be consulted for specific sampling and shipping instructions.
f. Analysis of Environmental Samples:
    1) Microscopic identification of the spores/colonies requires considerable expertise. These services are not routinely available from commercial laboratories. Documented quality control in the laboratories used for analysis of the bulk/surface and air samples is necessary. The American Industrial Hygiene Association (AIHA) offers accreditation to microbial laboratories (Environmental Microbiology Laboratory Accreditation Program (EMLAP)). Accredited laboratories must participate in quarterly proficiency testing (Environmental Microbiology Proficiency Analytical Testing Program (EMPAT)).
g. Evaluation of bulk/surface and air sampling data shall be performed by an experienced health professional. The presence of few or trace amounts of fungal spores in bulk/surface sampling shall be considered background. Amounts greater than this or the presence of fungal fragments (e.g., hyphae, and conidiophores) may suggest fungal colonization, growth, and/or accumulation at or near the sampled location. Air samples shall be evaluated by means of comparison (i.e., indoors to outdoors) and by fungal type (e.g., genera, and species). In general, the levels and types of fungi found should be similar indoors (in non-problem buildings) as compared to the outdoor air. Differences in the levels or types of fungi found in air samples may indicate that moisture sources and resultant fungal growth may be problematic.

C. Remediation General:
1. In all situations, the underlying cause of water accumulation must be rectified or fungal growth will recur. Any initial water infiltration shall be stopped and cleaned immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth.
2. If the source of water is elevated humidity, relative humidity shall be maintained at levels below 60% to inhibit mold growth.
3. Emphasis shall be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.
4. Five different levels of abatement are described in this section (Below).

5. The size of the area impacted by fungal contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of fungi and dust contaminated with fungi from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. The listed remediation methods are not meant to exclude other similarly effective methods. Any changes to the remediation methods listed in these guidelines, however, shall be carefully considered prior to implementation.
6. Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning shall be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination shall be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. A professional restoration consultant shall be contacted when restoring porous materials with more than a small area of fungal contamination. All materials to be reused shall be dry and visibly free from mold. Routine inspections shall be conducted to confirm the effectiveness of remediation work.
7. The use of gaseous, vapor-phase, or aerosolized biocides for remedial purposes is not recommended. The use of biocides in this manner can pose health concerns for people in occupied spaces of the building and for people returning to the treated space if used improperly. Furthermore, the effectiveness of these treatments is unproven and does not address the possible health concerns from the presence of the remaining non-viable mold. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."

D. **Level I:** Small Isolated Areas (10 sq. ft or less) - e.g., ceiling tiles, small areas on walls.
1. Remediation can be conducted by regular building maintenance staff. Such persons shall receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).
2. Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection shall be worn.
3. The work area shall be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity, pneumonitis, and severe allergies).
4. Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.
5. Contaminated materials that cannot be cleaned shall be removed from the building in a sealed plastic bag. There are no special requirements for the disposal of moldy materials.
6. The work area and areas used by remedial workers for egress shall be cleaned with a damp cloth and/or mop and a detergent solution. g. All areas shall be left dry and visibly free from contamination and debris.

E. **Level II:** Mid-Sized Isolated Areas (10 - 30 sq. ft.) - e.g., individual wallboard panels.
1. Remediation can be conducted by regular building maintenance staff. Such persons

shall receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

2. Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection shall be worn.
3. The work area shall be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity, pneumonitis, and severe allergies).
4. The work area shall be covered with a plastic sheet(s) and sealed with tape before remediation, to contain dust/debris.
5. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.
6. Contaminated materials that cannot be cleaned shall be removed from the building in sealed plastic bags. There are no special requirements for the disposal of moldy materials
7. The work area and areas used by remedial workers for egress shall be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.
8. All areas shall be left dry and visibly free from contamination and debris.

F. **Level III:** Large Isolated Areas (30 - 100 square feet) - e.g., several wallboard panels.
1. A health and safety professional with experience performing microbial investigations shall be consulted prior to remediation activities to provide oversight for the project.
2. The following procedures at a minimum are recommended:
   a. Personnel trained in the handling of hazardous materials and equipped with respiratory protection, (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection shall be worn.
   b. The work area and areas directly adjacent shall be covered with a plastic sheet(s) and taped before remediation, to contain dust/debris.
   c. Seal ventilation ducts/grills in the work area and areas directly adjacent with plastic sheeting.
   d. The work area and areas directly adjacent shall be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity, pneumonitis, and severe allergies).
   e. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.
   f. Contaminated materials that cannot be cleaned shall be removed from the building in sealed plastic bags. There are no special requirements for the disposal of moldy materials.
   g. The work area and surrounding areas shall be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.
   h. All areas shall be left dry and visibly free from contamination and debris.
3. If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the fungi is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level IV are followed.

G. **Level IV:** Extensive Contamination (greater than 100 contiguous square feet in an area)
1. A health and safety professional with experience performing microbial investigations shall be consulted prior to remediation activities to provide oversight for the project.

The following procedures are recommended:

a. Personnel trained in the handling of hazardous materials equipped with:
   1) Full-face respirators with high efficiency particulate air (HEPA) cartridges.
   2) Disposable protective clothing covering both head and shoes.
   3) Gloves.
b. Containment of the affected area:
   1) Complete isolation of work area from occupied spaces using plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).
   2) The use of an exhaust fan with a HEPA filter to generate negative pressurization.
   3) Airlocks and decontamination room.
c. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity, pneumonitis, and severe allergies).
d. Contaminated materials that cannot be cleaned shall be removed from the building in sealed plastic bags. The outside of the bags shall be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building. There are no special requirements for the disposal of moldy materials.
e. The contained area and decontamination room shall be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.
f. Air monitoring shall be conducted prior to occupancy to determine if the area is fit to reoccupy.

H. **Level V:** Remediation of HVAC Systems.

1. A Small Isolated Area of Contamination (<10 square feet) in the HVAC System 1) Remediation can be conducted by regular building maintenance staff. Such persons shall receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).
   a. Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection shall be worn.
   b. The HVAC system shall be shut down prior to any remedial activities. 4) The work area shall be covered with a plastic sheet(s) and sealed with tape before remediation, to contain dust/debris.
   c. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.
   d. Growth supporting materials that are contaminated, such as the paper on the insulation of interior lined ducts and filters, shall be removed. Other contaminated materials that cannot be cleaned shall be removed in sealed plastic bags. There are no special requirements for the disposal of moldy materials.
   e. The work area and areas immediately surrounding the work area shall be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.
   f. All areas shall be left dry and visibly free from contamination and debris.
   g. A variety of biocides are recommended by HVAC manufacturers for use with HVAC components, such as, cooling coils and condensation pans. HVAC manufacturers shall be consulted for the products they recommend for use in their systems.
2. Areas of Contamination (>10 square feet) in the HVAC System: A health and safety professional with experience performing microbial investigations shall be consulted prior to remediation activities to provide oversight for remediation projects involving

more than a small isolated area in an HVAC system. The following procedures are recommended:

a. Personnel trained in the handling of hazardous materials equipped with:
   1) Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended.
   2) Gloves and eye protection
   3) Full-face respirators with HEPA cartridges and disposable protective clothing covering both head and shoes shall be worn if contamination is greater than 30 square feet. 2)
b. The HVAC system shall be shut down prior to any remedial activities.
c. Containment of the affected area:
   1) Complete isolation of work area from the other areas of the HVAC system using plastic sheeting sealed with duct tape.
   2) The use of an exhaust fan with a HEPA filter to generate negative pressurization.
   3) Airlocks and decontamination room if contamination is greater than 30 square feet.
d. Growth supporting materials that are contaminated, such as the paper on the insulation of interior lined ducts and filters, shall be removed. Other contaminated materials that cannot be cleaned should be removed in sealed plastic bags. When a decontamination chamber is present, the outside of the bags shall be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. There are no special requirements for the disposal of moldy materials.
e. The contained area and decontamination room shall be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.
f. All areas shall be left dry and visibly free from contamination and debris.
g. Air monitoring shall be conducted prior to re-occupancy with the HVAC system in operation to determine if the area(s) served by the system are fit to reoccupy.
h. A variety of biocides are recommended by HVAC manufacturers for use with HVAC components, such as, cooling coils and condensation pans. HVAC manufacturers shall be consulted for the products they recommend for use in their systems.

3. Hazard Communication: When fungal growth requiring large-scale remediation is found, the building owner, management, and/or employer shall notify occupants in the affected area(s) of its presence. Notification shall include a description of the remedial measures to be taken and a timetable for completion. Group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals with persistent health problems that appear to be related to bioaerosol exposure should see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures. Individuals seeking medical attention shall be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

3.2 CLOSEOUT DOCUMENTATION

A. Documents required at closeout of project:
   1. Daily logs.
      a. Brief description of work activities.
      b. Number of personnel on site.
      c. Type of equipment used.
      d. Type of Products Used.
      e. List of any non-compliance noted, emergencies, stop work orders(with detailed

explanations)

f. Photographic logs.
g. Report certifying remediation is complete.

END OF SECTION 02 87 13

SECTION 03 10 00 CONCRETE FORMING AND 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. This Section is related to concrete forming and accessories and includes:
   1. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
   2. Installation of items to be embedded in concrete, such as anchor bolts, inserts, embeds, and sleeves.
   3. Openings for other work.
   4. Form accessories.
   5. Form stripping.

B. Related Sections:
   1. Section 03 20 00: Concrete Reinforcing.
   2. Section 03 30 00: Cast-in-Place Concrete.

C. Reference Standards:
   1. ACI 117 Standard Specifications for Tolerances for Concrete Construction and Materials.
   2. ACI 301 Specifications for Structural Concrete.
   3. ACI 318-19 Building Code Requirements for Structural Concrete and Commentary.
   4. ACI 347 Guide to Formwork for Concrete.
   5. National Institute of Standards and Technology - PS 1 Structural Plywood.
   6. 2022 California Building Code, Chapter 19A.
   7. APA American Plywood Association Design and Construction Guide.
   8. Local AQMD - XXAir Quality Management District.

1.3 SUBMITTALS

A. See Division 01: General Requirements.

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

C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties. Review and approval will not include form strength and adequacy.

D. Keep an accurate record of the dates of removal of forms, form shores and reshores, and furnish copies to the SEOR.

1.4 QUALITY ASSURANCE

A. Comply with the pertinent provisions of Division 01, General Requirements.

B. Construct forms according to ACI 347, "Guide to Formwork for Concrete," and conforming to tolerances of ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Division 01, General Requirements, delivering materials in a timely manner to ensure uninterrupted progress.

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

PART 2 PRODUCTS

2.1 FORMWORK - GENERAL

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

B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.

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

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

2.2 WOOD FORM MATERIALS

A. Softwood Plywood: PS 1, B-B Medium or High Density Concrete Form Overlay, Class I, grade marked, not mill oiled.

B. Lumber: DF species; WCLIB Construction grade or better, WWPA No. 1 grade or better; with grade stamp clearly visible.

2.3 REMOVABLE PREFABRICATED FORMS

A. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; two inches (2”) thick.

2.4 FORMWORK ACCESSORIES

A. Form Ties: Prefabricated rod, flat band, wire, internally threaded disconnecting type, or equal, not leaving metal within 1-1/2 inches of concrete surface.

B. Form Release Agent:
   1. Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bug holes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied:
      a. Composition: Colorless reactive, mineral oil-based, soy-based, or vegetable oil-based compound.
      b. Do not use materials containing diesel oil or petroleum-based compounds.
      c. VOC content: In compliance with applicable local, state, and federal regulations.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete. Sides of all footings and grade beams shall be formed, unless the member detail provides at least three inches (3") clear cover to reinforcement and indicates the member is cast against earth. Remove formwork prior to backfilling operations.

3.3 ERECTION - FORMWORK

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

B. Rigidly construct forms to prevent mortar leakage, sagging, displacement, or bulging between studs. Use clean, sound, approved form material, coated with specified materials only, not oil. Provide backing on all plywood joints.

C. Coat forms with the specified resin coating, not form oil. Construct forms to exact shapes, sizes, lines, and dimensions required to obtain level, plumb, and straight surfaces. Provide openings, offsets, keys, reglets, anchorages, recesses, moldings, chamfers, blocking, screeds, drips, bulkheads, and all other required features. Make forms easily removable without hammering or prying against concrete. Space forms apart with metal spreaders. Construct forms to accurate alignment, locations, and grades, and provide against sagging, leakage of concrete mortar, or displacement occurring during and after placing of concrete. Coordinate installation of inserts and anchors in forms according to shop drawings and requirements for Work of other Sections.

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

E. Corners and angles: Provide 3/4-inch by 3/4-inch beveled chamfer strips for all exposed concrete corners and angles square unless indicated otherwise.

F. Reglets and Rebates: Form required reglets and rebates to receive frames, flashing, and other equipment. Obtain required dimensions, details, and precise positions for Work to be installed under other Sections and form concrete accordingly.

G. Form Joints: Align joints and make watertight. Keep form joints to a minimum. Fill joints to produce smooth surfaces, intersections, and arises. Use polymer foam or equivalent fillers at joints and where forms abut or overlap existing concrete to prevent leakage of mortar.

H. Recesses, Drips, and Profiles: Provide smooth milled wood or pre-formed rubber or plastic shapes of types shown and required.

I. Cleanouts and Cleaning: Provide temporary openings in all wall forms and other vertical forms for cleaning and inspection. Clean forms and surfaces to receive concrete prior to placing.

J. Re-Use: Clean and recondition form material before re-use.

3.4 APPLICATION - FORM RELEASE AGENT

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

recommendations.

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

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

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. All necessary pipe sleeves, anchors, or other required inserts shall be accurately installed as part of the work of other Sections, according to Section 03 30 00: Cast-In-Place Concrete, for submittal requirements related to this scope.

B. Obtain approval before framing openings in structural members that are not indicated on Drawings.

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

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

E. Conduits or Pipes:
1. Locate so as not to reduce strength of the concrete.
2. Do not place pipes, other than conduits, in a slab 4-1/2 inches thick or less in any case. Conduit buried in a concrete slab shall not have an outside dimension greater than 1/3 the slab thickness nor be placed below the bottom reinforcing or over the top reinforcing.
3. Sleeves: Pipe sleeves may pass through the slab or walls if not exposed to rusting or other deterioration and are of uncounted or galvanized iron or steel. Provide sleeves of diameter large enough to pass any hub or coupling on pipe, including any insulation.
4. Conduits may be embedded in walls only if the outside diameter does not exceed 1/3 the wall thickness, are spaced no closer than three (3) diameters on centers, and not impair the strength of the structure.

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

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

H. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.

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

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

3.6 FORM CLEANING

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

B. Clean formed cavities of debris prior to placing concrete.

3.7 FORMWORK TOLERANCES

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

B. Deflection: Limit deflection of forming surfaces from concrete pressure to L/240.

C. Finish Lines:
1. Position formwork to maintain hardened concrete finish lines within following permissible deviations:
   a. Variation from plumb:

In 10'-0"	1/4 inch
In any story or 20'-0"	3/8 inch
In 40'-0" or more	3/4 inch

   b. Variation from level or grades indicated:

In 10'-0"	1/4 inch
In any story or 20'-0"	3/8 inch
In 40'-0" or more	3/4 inch

   c. Cross-sectional dimensions:

Minus	1/4 inch
Plus	1/2 inch

3.8 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Division 01, General Requirements.

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

3.9 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and all superimposed loads as determined by testing field cured cylinders, but not sooner than specified in ACI 347. Load supporting forms may be removed when concrete has attained 75 percent of required 28-day compressive strength, but no sooner than three (3) days, provided construction is reshored. Vertical formwork for cast-in-place concrete walls may be removed no sooner than one (1) day following concrete placement, provided that Contractor can demonstrate that no sloughing or sagging of concrete will occur:
1. Reshore structural members as specified per ACI 347.
2. Remove formwork progressively so unbalanced loads are not imposed on the structure.
3. Avoid damage to concrete surfaces during removal.
4. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.

END OF SECTION 03 10 00

SECTION 03 15 00 CONCRETE 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 wheel stops.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of exposed finish requiring color selection.

C. Samples for Verification: For wheel stops, six inches (150 mm) long showing color and cross section, with fasteners.

PART 2 PRODUCTS

2.1 PARKING BUMPERS

A. Concrete Wheel Stops:
   1. Precast, steel-reinforced, air-entrained concrete, 4,000-psi (27.6-MPa) minimum compressive strength, 4-1/2 inches (115 mm) high by nine inches (225 mm) wide by 72 inches (1,800 mm) long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two (2) factory-formed or drilled vertical holes through wheel stop for anchoring to substrate:
      a. Surface appearance: Free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
      b. Mounting hardware: Galvanized-steel hardware as standard with wheel-stop manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WHEEL STOP INSTALLATION

A. General: Install wheel stops according to manufacturer's written instructions unless otherwise indicated.

B. Install wheel stops in bed of adhesive before anchoring.

C. Securely anchor wheel stops to pavement with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION 03 15 00

SECTION 03 20 00 CONCRETE REINFORCING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section is related to concrete reinforcement and includes:
   1. Reinforcing steel for cast-in-place concrete foundations.
   2. Reinforcing steel for cast-in-place concrete slabs-on-grade.
   3. Supports and accessories for steel reinforcement.

B. Related Sections:
   1. Section 03 10 00: Concrete Forming and Accessories.
   2. Section 03 30 00: Cast-in-Place Concrete.

C. Reference Standards:
   1. ACI 301 Specifications for Structural Concrete.
   2. ACI 318 Building Code Requirements for Structural Concrete and Commentary.
   3. ACI SP-066 ACI Detailing Manual.
   4. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   5. ASTM A706/A706M Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
   6. ASTM A775/A775M Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
   7. ASTM D3963/D3963M Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
   8. AWS D1.4 Structural Welding Code - Reinforcing Steel.
   9. CRSI Concrete Reinforcing Steel Institute Manual of Standard Practice.
   10. CRSI Concrete Reinforcing Steel Institute Placing Reinforcing Bars.

1.3 SUBMITTALS

A. See Division 01, General Requirements.

B. Shop Drawings:
   1. Comply with requirements of ACI SP-066. Include the following:
      a. Complete bar layout.
      b. Representative sections.
      c. Details for congested conditions.
      d. Proposed layout where vertical and horizontal bars intersect.
      e. Bar schedules.
      f. Typical bending diagrams and offsets.
      g. Shapes of bent bars.
      h. Spacing of bars.
      i. Splice lengths and locations.

C. Where welding is proposed:
   1. Detail welding to conform to AWS D1.4.
   2. Submit copies of welding operator's certificate.

3. Where reinforcement complying with ASTM A615 is to be welded, chemical tests shall be performed to determine the weldability in accordance with ACI 318.
4. Weld procedure specifications (WPS):
   a. All WPS's shall be submitted to the Structural Engineer of Record (SEOR) for review and approval prior to use.
   b. For WPS's that have been qualified by test, the supporting Procedure Qualification Record (PQR) shall be submitted to the SEOR for review and approval.
   c. Included shall be WPS for repair welds.

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

1.4 QUALITY ASSURANCE

A. Comply with the pertinent provisions of Division 01, General Requirements.

B. Perform work of this Section in accordance with ACI 301.

C. Welders' Certificates: Submit certifications for welders employed on the Project, verifying AWS qualification within the previous 12 months.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Division 01, General Requirements, delivering materials in a timely manner to ensure uninterrupted progress.

B. Bundle bars, tag with identification, and transport and store so as not to damage any material. Use metal tags indicating size, length, and other marking shown on placement drawings. Maintain tags after bundles are broken.

C. Avoid exposure to dirt, moisture, or conditions harmful to reinforcement.

D. Extra Material:
   1. Provide an allowance of an additional ten percent (10%) of the total reinforced steel tonnage in addition to the quantities shown on the Drawings. This additional steel shall be installed in sizes and locations as directed by the structural Engineer.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel:
   1. ASTM A615/A615M, Grade 60 (60,000 psi):
      a. Deformed billet-steel bars.
      b. Unfinished.
      c. Only to be used for conditions where bars will not be welded.

B. Reinforcing Steel:
   1. ASTM A706/A706M, Grade 60 (60,000 psi) deformed low-alloy steel bars:
      a. Unfinished.
      b. Used in all cases where welding of bars is required.

C. Reinforcement Accessories:
   1. Tie wire: ASTM A1064, annealed copper bearing steel, minimum 16 gage, 0.0508 inch.
   2. Chairs, bolsters, bar supports, spacers:
      a. Sized and shaped for adequate support of reinforcement during concrete

placement. Standard manufactured products shall conform to the Concrete Reinforcing Institute Manual of Standard Practice, latest edition.

3. Use dense precast concrete supports with embedded wire ties for reinforcement placed on grade. Elsewhere, use wire bar supports.

D. Welding electrodes: AWS D1.4, Table 5.1 and 5.3, low hydrogen electrodes, E8018 for Grade 60 steel.

2.2 REBAR SPLICING

A. Coupler Systems: Mechanical devices for splicing reinforcing bars conforming to the requirements of ACI 318; capable of developing 1.25fy of the steel reinforcing yield strength in tension and compression.

B. For reinforcement, all mechanical splices in Special Structural Walls, Special Moment Frames, and Concrete Diaphragms shall be Type 2, conforming to the requirements of ACI 318, capable of developing 1.25fy of the steel reinforcing yield strength in tension and compression, and develop the specified tensile strength of the spliced bar:
   1. Products:
      a. Dayton Superior Corporation; Bar Lock Coupler System: www.daytonsuperior.com (ICC-ESR 2481).
      b. Lenton Lock Couplers (IAPMO-ES 129).

C. Dowel Bar Splicer with Dowel-Ins:
   1. Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.
      a. Products:
         1) Dayton Superior Corporation; Dowel Bar Splicer D101A with Straight Dowel-In: www.daytonsuperior.com.
         2) Lenton Form Savers (IAPMO-ES 129).

2.3 FABRICATION

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

B. Bending and Forming:
   1. Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials.
   2. Do not heat reinforcement for bending.
   3. Bend bars No. 6 size and larger in the shop only.
   4. Bars with unscheduled kinks or bends are subject to rejection.
   5. Use only tested and approved bar materials.

C. Welding:
   1. Use only ASTM A706 steel where welding is proposed:
      a. Perform welding where shown or approved, by the direct electric arc process in accordance with AWS D1.4 using specified low hydrogen electrodes.
      b. Preheat six inches (6") each side of joint.
      c. Protect joints from drafts during the cooling process; accelerated cooling is prohibited.
      d. Do not tack weld bars.
      e. Welding shall not be done on or within two (2) bar diameters of any bent portion of a bar that has been bent cold.
      f. Welding of crossing bars shall not be permitted for assembly reinforcement unless authorized by the SEOR.

g. Clean metal surfaces to be welded of all loose scale and foreign material.
h. Clean welds each time electrode is changed and chip burned edges before placing welds.
i. 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 to the base metal.
j. Cut out welds or parts of welds found defective with chisel and replace with proper welding.
k. Fillet welds may be considered prequalified per AWS D1.4.
l. Other welds are to be qualified per AWS D1.4.

D. Where ASTM A615 steel is to be used or occurs in existing elements and is to be welded:
1. Complete chemical analyses shall be performed to determine chemical composition and, for a new bar, provided in the mill certifications to determine weldability in accordance with ACI 318 with modifications per AWS D1.4.
2. The carbon equivalency (CE) shall be clearly defined and bars with a CE above 0.75 shall not be welded.
3. Welding Procedure Specifications and supporting PQRs with required testing per AWS D1.4 shall be provided for review and approval prior to welding.
4. These WPS and PQRs shall be specific to the CE as determined above, and shall, in addition to the other AWS requirement, include minimum and maximum preheat and interpass temperatures that are specified to the CE. This preheat and interpass temperature shall be strictly enforced in the field.
5. If separate shipments of bars vary the weldability, the process listed in the above requirements shall be repeated for these new bars.

E. Locate reinforcing splices not indicated on Drawings at point of minimum stress. Review locations of splices with SEOR.

PART 3 EXECUTION

3.1 PLACEMENT

A. Before placing bars, and again before concrete is placed, clean bars of loose rust and/or mill scale, dirt, oil, or any other coating that may be deleterious or could reduce bond with the concrete.

B. Securing in place:
1. Accurately place bars and wire tie in precise position where bars cross.
2. Bend ends of wire ties away from the forms.
3. Wire tie bars to the corners of ties and stirrups.
4. Support bars according to the Concrete Reinforcing Steel Institute (CRSI) "Placing Reinforcing Bars," using approved accessories and chairs.
5. Place precast concrete cubes with embedded wire ties to supporting reinforcing steel bars in concrete placed on grade and in footings.
6. Take adequate precautions to ensure that reinforcing bar position and spacing is maintained during concrete placement.

C. Do not displace or damage vapor barrier.

D. Maintain concrete cover around reinforcing per requirements on Drawings.

E. Splices:
1. Do not splice reinforcing bars at the points of maximum stress except where indicated.
2. Lap splices as shown or required to develop the full strength or stress of the bars.

3. Stagger splices in horizontal wall bars at least 48 inches longitudinally in alternate bars and opposite faces.

F. Field Welding: As specified for fabrication.

3.2 FIELD QUALITY CONTROL

A. Comply with all pertinent provisions of Division 01, General Requirements.

B. Supervision: Perform Work to this Section under supervision of a capable superintendent.

C. An independent testing agency, as specified in Division 01, General Requirements, shall inspect installed reinforcement for conformance to Contract Documents before concrete placement.

D. Where welding is done in the shop or at the site, perform welding of reinforcing bars under inspection of the testing laboratory welding inspector in accordance with Chapter 17 of the CBC. The welding inspector shall make a systematic record of all welds:
1. Identification marks of welders.
2. List of defective welds.
3. Manner of correction of defects:
   a. The welding inspector shall check the material, equipment details of construction and procedures, as well as the welds. The inspector shall check the ability of the welder. The welding inspector shall furnish the structural Engineer and the enforcement agency with a verified report that the welding required to be inspected is proper and has been done in conformity with the approved Plans and Specifications. The welding inspector shall use all means necessary to determine the quality of the weld. The inspector may use gamma ray, magnaflux, trepanning, sonics, or any other aid to visual inspection, which the inspector may deem necessary to assure the adequacy of the welding.

END OF SECTION 03 20 00

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings and foundation walls.
   2. Interior slabs-on-grade.
   3. Exterior slabs-on-grade.

B. Special Coordination Requirements: Coordinate with the work of the following Sections to identify the finish flooring manufacturer's concrete slab requirements. Such requirements may be over and above the requirements of the Contract Documents and may require additional materials, means, or methods, which shall be included as part of the Work.

C. Related Sections:
   1. Section 03 10 00: Concrete Forming and Accessories.
   2. Section 03 20 00: Concrete Reinforcing.
   3. Division 22: Plumbing.
   4. Division 23: Mechanical.
   5. Division 26: Electrical.

1.3 DEFINITIONS

A. Cementitious Materials:
   1. Portland cement alone or in combination with one or more of the following, subject to compliance with requirements:
      a. Blended hydraulic cement.
      b. Fly ash and other pozzolans.
      c. Ground granulated blast-furnace slag.
      d. Silica fume.

1.4 SUBMITTALS

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

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Certificates: Weighmaster's certificates.

E. Material Certificates:
   1. For each of the following, signed by manufacturers:
      a. Cementitious materials.
      b. Admixtures.
      c. Waterstops.
      d. Curing materials.
      e. Floor and slab treatments.
      f. Bonding agents.
      g. Adhesives.
      h. Vapor retarders.
      i. Semi-rigid joint filler.
      j. Joint-filler strips.
      k. Repair materials.

F. Material Test Reports:
   1. For the following, from a qualified testing agency, indicating compliance with requirements:
      a. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
      b. Vapor retarder: Provide third part documentation that all testing was performed on a single production roll and a summary of test results per ASTM E1745.

1.5 QUALITY ASSURANCE

A. Codes and Standards:
   1. Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
      a. CBC California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
      b. American Concrete Institute (ACI) Publications:
         1) Comply with the following unless modified by requirements in the Contract Documents:
            a) ACI 301, "Specifications for Structural Concrete."
            b) ACI 117, "Specification for Tolerances for Concrete Construction and Materials and Commentary."
            c) ACI 302.1R, “Guide to Concrete Floor and Slab Construction.”
            d) ACI 302.2R, “Guide for Concrete Slabs that receive Moisture-Sensitive Flooring Materials.”
            e) ACI 305R, “Guide to Hot Weather Concreting.”
            f) ACI 306R, “Guide to Cold Weather Concreting.”
            g) ACI 318, “Building Code Requirements for Structural Concrete and Commentary.”
   2. Floor leveling to be FF50 (Minimum FF35, approval by Architect) and tested per ASTM E1155 following ACI 117 using 3D laser imaging to meet requirement unless otherwise noted ono Drawings.

B. Manufacturer Qualifications:
   1. A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment:
      a. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Source Quality Control: Furnish Weighmaster’s certificates for all concrete.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

E. Concrete Testing Service: Engage a qualified independent testing agency approved by DSA to perform material evaluation tests and to design concrete mixtures.

F. Pre-Installation Meeting: Conduct meeting onsite. Include product and material manufacturers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 PRODUCTS

2.1 GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301 (ACI 301M) “Guide to Cast-in-Place Architectural Concrete Practice”.
   2. ACI 302.1-R “Guide to Concrete Floor Slab Construction”.
   3. ACI 302.2R, “Guide for Concrete Slabs that receive Moisture-Sensitive, Flooring Materials.”
   4. ACI 117 (ACI 117M) “Guide for tolerance Compatibility in Concrete Construction”.

B. Slabs on Metal Decks:
   1. Vented: Surfaces to receive adhesive applied floor coverings.
   2. Non-vented or Vented: Surfaces scheduled to remain exposed concrete finish.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete:
   1. Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in large sizes to minimize number of joints:
      a. Plywood, metal, or other approved panel materials.
      b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
         1) High-density overlay, Class 1 or better.
         2) Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
         3) Structural 1, B-B or better; mill oiled and edge sealed.
         4) B-B (concrete form), Class 1 or better; mill oiled and edge sealed.

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

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4-inch by 3/4-inch minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent:
   1. Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces:
      a. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties:

1. Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal:
   a. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60.

B. Welded Reinforcing Bars: Low-alloy-steel reinforcing bars, ASTM A706/A706M, deformed.

C. Do not use reinforcement having any of the following defects:
   1. Bar lengths, depths, or bends exceeding the specified fabricating tolerances.
   2. Bends or kinks not indicated on the Drawings or required for this Work.
   3. Bars with cross-section reduced due to excessive rust or other causes.

2.4 REINFORCEMENT ACCESSORIES

A. Bar Supports:
   1. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
      a. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. Cementitious Material:
   1. Use the following cementitious materials, of the same type, brand, and source, throughout Project:
      a. Portland Cement - ASTM C150, Type I/II. Supplement with the following:
         1) Fly Ash: ASTM C618, Class F.

B. Normal-Weight Aggregates:
   1. ASTM C33:
      a. Maximum coarse-aggregate size: Per plan.
      b. Fine aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C94 and potable.

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260.

B. Chemical Admixtures:
   1. Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride:
      a. Water-reducing admixture: ASTM C494/C494M, Type A.
      b. Retarding admixture: ASTM C494/C494M, Type B.
      c. Water-reducing and retarding admixture: ASTM C494/C494M, Type D.

d. High-range, water-reducing admixture: ASTM C494/C494M, Type F.
e. High-range, water-reducing and retarding admixture: ASTM C494/C494M, Type G.
f. Plasticizing and retarding admixture: ASTM C1017/C1017M, Type II.

C. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D448, Size 57, with 100 percent passing a 1-1/2-inch sieve and zero to five percent (0%-5%) passing a No. 8 sieve.

2.7 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately nine-ounces-per-square-yard when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.8 RELATED MATERIALS

A. Non-Shrink Grout:
1. Factory premixed grout; ASTM C1107.
2. Compressive strength: 7,000 psi at 28 days.

B. Exterior Concrete Walks: Provide a capillary break consisting of two inches (2”) of clean dry sand, ASTM C33, evenly spread on top of the compacted subgrade.

2.9 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301:
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
2. All concrete mix designs shall be prepared and stamped by a California registered civil Engineer.

B. Cementitious Materials:
1. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
a. Fly Ash: 15 to 25 percent.

C. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings and Foundation Walls, Concrete Stairs, and Concrete Walls:
1. Proportion normal-weight concrete mixture as follows:
a. Minimum compressive strength: 3,000 psi at 28 days unless otherwise noted.
b. Maximum water-cementitious materials ratio: 0.55.
c. Minimum cementitious materials content: 5.5 sacks of cement per cubic yard.
d. Slump limit: Four inches (4”), plus or minus one inch (1”).

B. Interior Slabs-on-Grade:
1. Proportion normal-weight concrete mixture as follows:

a. Minimum compressive strength: 4,000 psi at 28 days.
b. Maximum water-cementitious materials ratio: 0.45.
c. Minimum cementitious materials content: Six (6) sacks of cement per cubic yard.
d. Slump limit: Four inches (4”), plus or minus one inch (1”).

C. Exterior Slabs-on-Grade:
1. Proportion normal-weight concrete mixture as follows:
a. Minimum compressive strength: 3,000 psi at 28 days.
b. Maximum water-cementitious materials ratio: 0.55.
c. Minimum cementitious materials content: 5.5 sacks of cement per cubic yard.
d. Slump limit: Four inches (4”), plus or minus one inch (1”).

2.11 FABRICATING REINFORCEMENT

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

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete:
1. Measure, batch, mix, and deliver concrete according to ASTM C94/C94M, and furnish batch ticket information:
a. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 90 minutes to 75 minutes; when air temperature is above 90 degrees F reduce mixing and delivery time to 60 minutes.

2.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment:
1. Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces:

B. Basis-of-design product: Basis of Design: Floor Seal Technology, Inc. 1005 Ames Ave, Milpitas, CA 95035 (800) 572-2344. Contact: Michael Nicodemus, (916) 532 5115, michael.nicodemus@fstconcrete.com, www.floorseal.com.
a. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 EXECUTION

3.1 FORMWORK

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

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

C. Construct forms tight enough to prevent loss of concrete mortar.

D. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

E. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. In no case shall any bolt or anchor be stabbed in place while or after the concrete is poured:
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

A. General:
   1. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained:
      a. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
      b. Do not strip vertical concrete in less than seven (7) days.
      c. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring:
   1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders:
   1. Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions:
      a. Lap joints six inches (6”) and seal with manufacturer's recommended tape.
      b. Seal all penetrations (including pipes) per manufacturer’s tape.
      c. No penetration of the vapor barrier is allowed except for reinforcing and permanent utilities.
      d. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged

area six inches (6”) and taping all four sides with tape.
e. Do not saturate the sand cushion.
f. If sand is saturated prior to placement of concrete, remove the sand and replace.
g. Protect all installed moisture barrier construction from precipitation and water penetration by covering and providing positive drainage away from the moisture barrier.
h. Cover slab openings and block-outs around columns to prevent water penetration of moisture barrier.

3.6 STEEL REINFORCEMENT

A. General:
1. Comply with CRSI's "Manual of Standard Practice" for placing reinforcement:
a. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
b. Clean reinforcement and remove loose dust and mill scale, earth, oil, and other materials that reduce bond or destroy bond with concrete.
c. Position, support, and secure reinforcement against displacement by forms, construction, and the concrete placement operations. Provide metal chairs, dobies, or other aids manufactured for this purpose.
d. Place reinforcement to obtain the required concrete coverages for concrete protection.

3.7 JOINTS

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

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade:
1. Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one inch (1”) as follows:
a. Grooved joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
b. Sawed joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide, 1/3-inch depth joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Saw cut slab as soon as surface has hardened to where it can support the equipment and operator, normally within two (2) hours after finishing. Use saw designed for cutting fresh concrete, such as “Soff-Cut” or equal.

D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate 1/2 of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

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

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Deposit concrete continuously in one (1) layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation:
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least six inches (6”) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete:
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement:
   1. Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures:
      a. When average high and low temperature is expected to fall below 40 degrees F for three (3) successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
      b. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
      c. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement:
   1. Comply with ACI 301 and as follows:
      a. Maintain concrete temperature below 90 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
      b. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

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

B. Smooth-Formed Finish:
   1. As-cast concrete texture imparted by form-facing material, arranged in an orderly and

symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities:

a. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish:

1. Apply the following to smooth-formed finished as-cast concrete where indicated:
   a. Smooth-rubbed finish: Not later than one (1) day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
   b. Grout-cleaned finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one-part portland cement to 1-1/2-parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
   c. Cork-floated finish: Wet concrete surfaces and apply a stiff grout. Mix one-part portland cement and one-part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Except as may be shown otherwise on Drawings, provide the following finishes at the indicated locations.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction:
   a. Apply scratch finish to surfaces that are to receive concrete floor toppings or mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:

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

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface

defects that would telegraph through applied coatings or floor coverings:
a. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic, or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
b. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, ten-foot-long (10') straightedge resting on two (2) high spots and placed anywhere on the surface does not exceed 1/8 inch.
c. Contractor shall anticipate that grinding will be required as a result of curling or other slab defects. Grinding required to bring the slab surface into acceptable tolerances for finished flooring installation shall be included as part of the Work.

E. Trowel and Fine-Broom Finish:
1. Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom:
a. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

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

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.
1. Preventative Vapor-Control Curing:
a. Basis of Design: Vapor Seal 309: FST Design Build Concrete, Inc. 1566 S. 7th Street, San Jose, CA 95112. Contact Architectural Director: Michael Nicodemus, (916) 532 5115, michael.nicodemus@fstconcrete.com
b. Single-component, resin based, liquid membrane forming compound for water vapor emission control and curing.
c. Water retention 0.36 kg/sq meter in 72 hours when tested to ASTM C156
d. Alkali resistance, tolerant to 5 percent alkali solution, when tested to ASTM C1308
e. Low emission compliant with CDPH 01350 testing
f. Onsite weather station provided and controlled by manufacturer to determine accurate application time.

3.12 CONCRETE SURFACE REPAIRS

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

3.13 FIELD QUALITY CONTROL

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

B. Inspections:
1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests:
1. Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
   a. Testing frequency: Obtain one (1) composite sample for each day's pour of each concrete mixture exceeding five (5) cubic yards, but less than 25 cubic yards, plus one (1) set for each additional 50 cubic yards or fraction thereof.
   b. Testing frequency:
      1) Obtain at least one (1) composite sample for each 50 cubic yards or fraction thereof of each concrete mixture placed each day, but not less than once for each 2,000 square feet of surface area for slabs or walls:
         a) When frequency of testing will provide fewer than five (5) compressive-strength tests for each concrete mixture, testing shall be conducted from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.
   c. Slump: ASTM C143/C143M; one (1) test at point of placement for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   d. Air content: ASTM C231, pressure method, for normal-weight concrete; one (1) test for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture.
   e. Concrete temperature: ASTM C1064/C1064M; one (1) test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test (1) for each composite sample.
   f. Unit weight: ASTM C567, fresh unit weight of structural lightweight concrete; one (1) test for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture.
   g. Compression Test Specimens:
      1) ASTM C31/C31M:
         a) Cast and laboratory cure two (2) sets of two (2) standard cylinder specimens for each composite sample.
         b) Cast and field cure two (2) sets of two (2) standard cylinder specimens for each composite sample.
   h. Compressive-strength tests:
      1) ASTM C39/C39M; test one (1) set of two (2) laboratory-cured specimens at seven (7) days and one (1) set of two (2) specimens at 28 days:
         a) Test one (1) set of two (2) field-cured specimens at seven (7) days and one (1) set of two (2) specimens at 28 days.
         b) A compressive-strength test shall be the average compressive strength from a set of two (2) specimens obtained from same composite sample and tested at age indicated.
   i. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
   j. Strength of each concrete mixture will be satisfactory if every average of any three (3) consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified

compressive strength.

k. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both seven (7) and 28-day tests.
l. Nondestructive testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
m. Additional tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
n. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
o. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03 30 00

SECTION 06 10 00 ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes rough carpentry, light hardware, and miscellaneous items of work not included in another Section. This Section also includes:
   1. Structural wood supports, grounds, backing, and blocking required for wood framed structures including but not limited to flooring, wall, roof and ceiling construction.
   2. Backing/blocking for millwork and casework items that are an integral part of wall, floor, and/or ceiling construction.
   3. Backing/Blocking for Mechanical-Plumbing-Electrical work and equipment.
   4. Plywood sheathing.

B. Related Sections:
   1. Section 03 10 00: Concrete Forming and Accessories.
   2. Section 03 30 00: Cast-In-Place Concrete.
   3. Section 09 21 16: Gypsum Board Assemblies.
   4. Section 10 28 13: Toilet Accessories.

C. Reference Standards:
   1. The following references, codes, and standards are hereby made a part of this Section and carpentry work shall conform to applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained in the Drawings or these Specifications shall be construed as permitting work that is contrary to code requirements:
      a. Standard Grading and Dressing Rule #16, of the West Coast Lumber Inspection Bureau.
      b. Grading Rules for Western Lumber of the Western Wood Products Association.
      c. Standard Specifications for Grades of California Redwood Lumber of the Redwood Inspection Service.
      d. American Wood Preservers Association (AWPA) Standard C 2-77 Lumber, Timbers, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes.
      e. American Wood Preservers Bureau (AWPB) Quality Control Standards.

1.3 QUALITY ASSURANCE

A. Lumber and plywood shall be grade or quality marked by WWPA, WCLIB, APA, AWPB, or by other grading and inspection agencies acceptable to the Architect. Grade marks shall include the designation "S-DRY"(or "MC-15" as applies) where applicable. Grade and quality marks shall not be apparent on surfaces exposed in the finished work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store kiln dried materials in enclosed areas, protected from moisture and separated from contact with concrete or soil.

PART 2 PRODUCTS

2.1 MATERIALS

A. Temporary Construction: Clean lumber at Contractor's option, rough or smooth, as usage requires.

B. Lumber Not Otherwise Specified or Noted:
1. Douglas fir or larch, graded and grade-marked, according to Reference Standard 1.02 A or B, #1 grade:
   a. Boards: Construction grade.

C. Sill Plates (On Concrete): Construction grade light framing, pressure treated as hereinafter specified; as noted on Plans.

D. Plywood for Walls and Roofs; As Noted On Plans:
1. Unless glue type is otherwise specified, exterior plywood, interior plywood exposed to continuing moisture, and pressure treated plywood shall be fabricated with exterior glue. Plywood with interior glue shall be fully protected from soaking or continuing moisture at all times.

E. Rough Hardware:
1. Nails, spikes, bolts, screws, tacks, and framing connectors of standard manufacture as required. Hot dip galvanize items exposed to moisture or to exterior and those items that are in contact with wood pressure treated with waterborne salts:
   a. Bolts and nuts: ASTM A307, Grade A.
   b. Lag bolts: Fed. Spec. FF-B-561. Pre-drill per CBC.
   c. Nails: Fed. Spec. FF-N-101, common unless otherwise noted or specified.
   d. Joist hangers and framing connectors: Simpson or approved equal, unless otherwise noted.
   e. Power driven fasteners: Hilti, Ramset, or approved equal, each use and fastener type subject to prior approval of Architect.

F. Pressure Treatment (Decay and Termite Prevention):
1. Pressure treat for decay and termite prevention, Douglas fir or larch wood materials that are embedded in or set against concrete.
2. Treat in accordance with Reference Standard 1.02 E and quality mark as per Reference Standard 1.02 F.
3. Treat with any of the following processes at Contractor option. Creosote type preservatives are not permitted:
   a. Penta in an LPG carrier (Cellon) or Penta in Hydrocarbon Solvent-Type D (Dow Process) AWPB LP-4 quality marked.
   b. Ammoniacal copper arsenate (ACA) or chromated copper arsenate (CCA) in a water carrier (AWPB LP-2 quality marked).
   c. Disodium Octaborate Tetrahydrate (DOT) such as Advance Guard/Hi-bor by Osmose, Inc.
   d. Members treated with waterborne salts shall be dried to a moisture content not exceeding 19 percent after treatment.
4. Where possible, precut material before treatment.
5. Holes and cutoffs and handling and storage shall be in accordance with AWPA M-4.
6. Ensure that ferrous metal fastenings and items in contact with wood treated with waterborne salts are hot dip galvanized (1.25 oz. coating) where required by ICC reports.

G. Building Paper and Felt: Kraft waterproof building paper or 15# unperforated asphalt saturated rag felt per CBC Standard 14-1.

H. Framing Connectors: Simpson Strong Tie Corp., or equal.

2.2 MOISTURE CONTENT

A. 19 percent maximum for two times thickness and less; 19 percent maximum for thickness greater than two times and less than four times; and 22 percent maximum for thickness greater than four times.

2.3 SIZES

A. Surfaced to "DRY" sizes. Sizes noted are nominal unless shown as net.

2.4 SURFACING

A. All wood materials exposed in the finished work shall have re-sawn surfaces of clean natural color unless noted or specified otherwise. Concealed framing lumber shall be S4S.

PART 3 EXECUTION

3.1 ERECTION AND INSTALLATION

A. Framing: Conform to CBC where same covers points not indicated on Drawings. Properly lay out framing with pieces closely fitted, accurately plumbed, leveled and aligned, and rigidly secured in place.

B. Except as specifically shown on structural drawings, cutting of all wood, etc. is limited to those cuts permitted by 2022 California Building Code (CBC).

C. Bridging and Blocking: Conform to CBC. Provide two times blocking at intersections of finished surfaces for adequate bearing and at points where required to support fixtures, cabinets, hardware, and other equipment mounted on walls.

D. Plywood (General): Unless more stringent requirements are indicated on the Drawings or required by code, application of plywood shall be in accordance with recommendations of the American Plywood Association.

E. Connections and Fastenings: Conform to CBC. Unless otherwise specified or shown on the Drawings, conform to minimum nailing requirements of CBC. For bolted connections, provide washers under heads and nuts bearing on wood, and draw nuts tight. Retighten before closing in framing. Exercise care in nailing through exposed sheathing and siding and ensure that fasteners penetrate into framing members

END OF SECTION 06 10 00

SECTION 06 10 53 MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking, cants, and nailers.
4. Wood furring and grounds.
5. Wood sleepers and platform wood flooring.
6. Plywood backing panels.
7. Accessories necessary for a complete installation.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than two inches (2”) nominal (38 mm actual) size in least dimension.

B. Dimension Lumber: Lumber of two inches (2”) nominal (38 mm actual) or greater size but less than five inches (5”) nominal (114 mm actual) size in least dimension.

1.4 SUBMITTALS

A. Product Data:
1. Submit each type of process and factory fabricated product. Indicate component and materials and dimensions and include construction and application details:
a. Wood treatment:
1) Submit data for wood preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained:
a) Include data for fire retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by qualified independent testing agency.
b) For fire retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
c) For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to site.

B. Laboratory and Testing Reports:
1. Laboratory test reports:
a. Submit report for installation adhesives indicating compliance with requirements for low emitting materials.

b. Post installed anchors.
c. Metal framing anchors.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Building code: Comply with applicable requirements of CBC Chapter 23 for miscellaneous wood.
2. Fire retardant treated lumber and plywood by pressure process: Provide products with a flame spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
3. Level floor finishes to minimum requirement noted CBC Section 11B-302.1.

B. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 WOOD PRODUCTS

A. Lumber:
1. DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated:
a. Factory mark each piece of lumber with grade stamp of grading agency.
b. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
c. Dress lumber, S4S, unless otherwise indicated.
d. Maximum moisture content of lumber: 19 percent unless otherwise indicated.

B. Preservative Treatment by Pressure Process:
1. AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground:
a. Preservative chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
b. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
c. Kiln dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
d. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

e. Application - treat items indicated on Drawings and the following:
   1) Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2) Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

C. Fire Retardant Treatment:
   1. Where indicated as fire retardant treated, provide materials acceptable to authorities having jurisdiction, and with fire test response characteristics specified as determined by testing identical products per ASTM E84 by a qualified testing agency:
      a. Treatment shall not promote corrosion of metal fasteners.
      b. Exterior type: Comply with specified requirements for fire retardant treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
      c. Interior Type A: Provide treated materials with moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
      d. Design value adjustment factors:
         1) Test treated lumber according to ASTM D5664 and calculate design value adjustment factors according to ASTM D6841:
            a) For enclosed roof framing, framing in attic spaces, and where high temperature fire retardant treatment is indicated, provide material with adjustment factors of minimum 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for climatological zone.
      e. Kiln dry lumber after treatment to a maximum moisture content of 19 percent.
      f. Identify fire retardant treated wood with appropriate classification marking of qualified testing agency:
         1) For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
      g. For exposed items indicated to receive a stained or natural finish, verify chemical formulations shall not bleed through, contain colorants, or adversely affect finishes.
      h. Application:
         1) Treat items indicated on Drawings and the following:
            a) Framing for raised platforms.
            b) Concealed blocking.
            c) Roof framing and blocking.
            d) Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
            e) Plywood backing panels.
            f) Wood platform deck flooring.

D. Dimension Lumber Framing:
   1. Non load bearing interior partitions: Construction or No. 2 grade of any species.
   2. Other framing: Construction or No. 2 grade of any species.

E. Miscellaneous:
   1. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including but not limited to blocking, nailers, cants, grounds, furring, roof top equipment bases and support curbs, and utility shelving:
      a. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
      b. For blocking not used for attachment of other construction, use utility, stud, or No. 3 grade lumber of any species provided that it is cut and selected to eliminate defects that interfere with attachment and purpose.
      c. For blocking and nailers used for attachment of other construction, select and cut

lumber to eliminate knots and other defects that interfere with attachment of work.
d. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.
e. Utility shelving:
1) Lumber with 19 percent maximum moisture content of any of the following species and grades:
a) Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
b) Mixed southern pine or southern pine No. 2 grade; SPIB.
c) Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

F. Concealed Boards:
1. 19 percent maximum moisture content of any of the following species and grades:
a. Mixed southern pine or southern pine, No. 2 grade; SPIB.
b. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
c. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
d. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
e. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

G. Plywood Backing Panels (Sleepers):
1. Equipment backing panels: Plywood, DOC PS 1, Exterior, C-C Plugged or Exposure 1, C-D Plugged, fire retardant treated, in thickness not less than 3/4-inch (19 mm) nominal thickness.

H. Fasteners:
1. Provide fasteners of size and type indicated that comply with requirements:
a. Where carpentry is exposed to weather, in ground contact, pressure preservative treated, or in area of high relative humidity, provide fasteners with hot dip zinc coating complying with ASTM A153/A153M.
b. Nails, brads, and staples: ASTM F1667.
c. Screws for fastening to metal framing: ASTM C1002 drywall type or ASTM C954 nonload bearing steel stud, length recommended by screw manufacturer for material being fastened.
d. Power driven fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70. (Refer to Structural Drawings)
e. Post installed anchors: (Refer to Structural Drawings)
1) Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 mechanical, masonry, ICC-ES AC58 mechanical, concrete, ICC-ES AC193 adhesive, masonry, or ICC-ES AC308 adhesive, concrete as appropriate for the substrate:
a) Material, interior: Carbon steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
b) Material, exterior: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

I. Metal Framing Anchors:
1. Manufacturers are subject to compliance with requirements; provide products by one of

the following:
a. Cleveland Steel Specialty Co.
b. KC Metals Products, Inc.
c. Phoenix Metal Products, Inc.
d. Simpson Strong-Tie Co., Inc.

2. Galvanized steel sheet: Hot dip, zinc coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation. Use for interior locations unless otherwise indicated.
3. Hot dip, heavy galvanized steel sheet - ASTM A653/A653M; structural steel (SS), high strength low alloy steel Type A (HSLAS Type A), or high strength low alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick. Use for wood preservative-treated lumber and where indicated:
   a. Stainless steel sheet: ASTM A666, Type 304 and Type 316 for exposed application in coastal environments. Use for exterior locations and where indicated.

J. Miscellaneous Materials:
1. Adhesives for gluing to concrete or masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.
2. Flexible flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized asphalt compound, bonded to high density polyethylene film, aluminum foil, or spunbonded polyolefin to produce overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA WCD 1 Details for Conventional Wood Frame Construction unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels:
1. Install fire retardant treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim:
1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2,438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and two-inch nominal (2") (38-mm actual) thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 square feet (9.3 sq. m) and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

H. Sort and select lumber so natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative treated lumber:
1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Where wood preservative treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. Table 2304.9.1 Fastening Schedule in the International Building Code.
2. ICC-ES evaluation report for fastener.

L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

M. Wood Blocking and Nailer Installation:
1. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved:
   a. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
   b. Provide permanent grounds of dressed, pressure preservative treated, key beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.2 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality: Provide temporary ventilation during work. During and immediately after installation of treated wood, engineered wood products, and laminated wood products at interior spaces, provide temporary ventilation.

B. Waste Management:
1. Refer to Division 01, General Requirements and Construction Waste Management Plan:
   a. Select lumber sizes to minimize waste; reuse scrap lumber to the greatest extent

possible. Clearly separate scrap lumber for use onsite as accessory components, including shims, bracing, and blocking.

b. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
c. Prevent sawdust and wood shavings from entering the storm drainage system.
d. Do not burn scrap lumber that has been pressure treated.
e. Do not send lumber treated with pentachlorophenol, CCA, or ACA to cogeneration facilities or waste to energy facilities.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron treated wood becomes wet, apply EPA registered borate treatment. Apply borate solution by spraying to comply with EPA registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA registered borate treatment. Apply borate solution by spraying to comply with EPA registered label.

END OF SECTION 06 10 53

SECTION 06 16 00 SHEATHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Wall sheathing.
   2. Underlayment.
   3. Sheathing joint and penetration treatment.
   4. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data:
   1. Technical data for each type of process and factory fabricated product. Indicate component materials and dimensions and include construction and application details:
      a. Include data for wood preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
      b. Include data for fire retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
      c. For fire retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.
      d. For products receiving a waterborne treatment, include statement that moisture content of treated materials reduced to levels specified before shipment to Project site.
      e. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 QUALITY ASSURANCE

A. Fire Test Response Characteristics:
   1. For assemblies with fire resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction:
      a. Fire resistance ratings: Indicated by design designations from UL Fire Resistance Directory or GA-600 Fire Resistance Design Manual.

B. Testing Agency Qualifications: For testing agency providing classification marking for fire retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 MATERIALS

A. Plywood: DOC PS 1.

B. Oriented Strand Board: DOC PS 2.

C. Thickness: As necessary to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE TREATED PLYWOOD

A. Preservative Treatment by Pressure Process - AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground:
   1. Preservative chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 FIRE RETARDANT TREATED PLYWOOD

A. Where fire retardant treated materials are indicated, use materials complying with requirements acceptable to authorities having jurisdiction and with fire test response characteristics specified determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire Retardant Treated Plywood by Pressure Process:
   1. Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test:
      a. Use treatment that does not promote corrosion of metal fasteners.
      b. Exterior type: Treated materials shall comply with requirements specified above for fire retardant treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
      c. Design value adjustment factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high temperature fire retardant treatment is indicated, span ratings for temperatures up to 170 degrees F (76 degrees C) shall be not less than span ratings specified.

C. Kiln dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire retardant treated plywood with appropriate classification marking of qualified testing agency.

E. Application:
   1. Treat plywood indicated on Drawings and the following:
      a. Roof and wall sheathing within 48 inches (1,220 mm) of fire walls.
      b. Subflooring and underlayment for raised platforms.

2.4 WALL SHEATHING

A. Glass Mat Gypsum Wall Sheathing - ASTM C1177/C1177M:
   1. Product is subject to compliance with requirements; provide products by one of the following:
      a. CertainTeed Corporation: GlasRoc (basis of design).
      b. Georgia Pacific: Dens-Glass.
      c. National Gypsum Company: Gold Bond eXP.
      d. United States Gypsum Co.: Securock.
   2. Type and thickness: Regular, 1/2 inch (12.7 mm) thick.
   3. Size: Four feet by eight feet (1,220 mm by 2,440 mm) for vertical installation.

2.5 SUBFLOORING AND UNDERLAYMENT

A. Plywood Combination Subfloor Underlayment - DOC PS 1, Exterior, Structural I, C-C Plugged Single Floor Panels:
   1. Span rating: Not less than 20 o.c.
   2. Nominal thickness: Not less than one inch (25 mm).
   3. Edge detail: Tongue and groove.
   4. Surface finish: Fully sanded face.

B. Underlayment: Provide underlayment in nominal thickness not less than 1/4 inch (6.4 mm) over smooth subfloors and not less than 3/8 inch (9.5 mm) over board or uneven subfloors.

C. Sound Deadening Board - Class C Fire Rated, Molded, Recycled Post-Consumer Paper, Cellulose Fiber Structural Panel:
   1. Density: 26 pcf to 28 pcf (416 = 448 kg/cu.m) tested in accordance with ASTM C209.
   2. Tensile strength - when tested in accordance with ASTM C209:
      a. Parallel: 450 - 700 psi (3,100 - 4,830 kPa).
      b. Transverse: 750 - 1000 psi (5.1171 - 6.894 kPa).
   3. Hardness (Janka Ball): 230 pounds (104 kg) tested in accordance with ASTM D1037.
   4. Water absorption by volume, when tested in accordance with ASTMC209:
      a. Two-hour immersion: Maximum seven percent (7%).
   5. Expansion: 50 percent to 90 percent relative humidity, 0.25 percent in accordance with ASTM C209.
   6. Noise reduction coefficient (NCR): 0.20.
   7. Flame spread: Maximum 75 tested in accordance with ASTM E84 Class C.
   8. Thickness: 3/4 inch (19 mm).

2.6 FASTENERS

A. Provide fasteners of size and type indicated that comply with requirements specified for material and manufacture. Provide fasteners with hot dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Gypsum Sheathing to Cold Formed Metal Framing:
   1. Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic polymer or corrosion protective coating having salt spray resistance of more than 800 hours according to ASTM B117:
      a. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C1002.

2.7 SHEATHING JOINT AND PENETRATION TREATMENT MATERIALS

A. Sealant for Glass Mat Gypsum Sheathing:
   1. Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass fiber sheathing tape and for covering exposed fasteners:
      a. Sheathing tape: Self-adhering glass fiber tape, minimum two inches (50 mm) wide, ten by ten or ten by 20 threads/inch (390 by 390 or 390 by 780 threads/m) of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass mat gypsum sheathing and with history of successful in-service use.

2.8 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

B. Dry-Rot Repair: For existing Wood Frame Studs, Glue-Lam Beams and Plywood Sheathing.
   1. Use Clear Penetrating Epoxy Sealer Products – Field applied
   2. Do NOT thin any product used unless the manufacturer suggest. Follow instructions.
   3. Replace with new frame and sheathing where damage exceeds 15% or as inspected and recommended.
   4. Replace ALL structural members where dry-rot is present.

PART 3 EXECUTION

3.1 INSTALLATION

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three (3) support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint sealant installation so materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions. Fasten gypsum sheathing to cold formed metal framing with screws. Install boards with a 3/8-inch (9.5 mm) gap where non-load bearing construction abuts structural elements. Install boards with a 1/4-inch (6.4 mm) gap where they abut masonry or similar materials that retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Vertical Installation:
   1. Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud:
      a. Space fasteners approximately eight inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

D. Seal sheathing joints according to sheathing manufacturer's written instructions. Apply glass fiber sheathing tape to glass mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal penetrations and openings.

END OF SECTION 06 16 00

SECTION 06 40 00 ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
1. Plastic laminate cabinets.
2. Plastic laminate and solid surface countertops.
3. Plastic laminate panels.
4. Standing and running trim.
5. Closet and utility shelving.
6. Shop finishing.
7. Accessories necessary for a complete installation.

B. Related Sections:
1. Section 06 10 00: Rough Carpentry.
2. Section 09 90 00: Painting and Coating.

1.3 DEFINITIONS

A. Architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

A. Product Data:
1. Technical data for each type of product indicated including cabinet hardware and accessories:
a. Include data for fire retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings:
1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components:
a. Show details full size.
b. Show locations and sizes of furring, blocking, and hanging strips including concealed blocking and reinforcement specified in other Sections.
c. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in architectural woodwork.

C. Samples:
1. Lumber with or for transparent finish, not less than five inches (125 mm) wide by 24 inches (600 mm) long, for each species and cut, finished on one (1) side and one (1) edge.
2. Veneer faced panel products with or for transparent finish, eight inches by ten inches (200 by 250 mm), for each species and cut. Include at least one (1) face veneer seam and finish as specified.
3. Lumber and panel products with shop applied finish, 50 square inches (300 sq. cm) for

lumber and eight inches by ten inches (200 mm by 250 mm) for panels, for each finish system and color, with 1/2 of exposed surface finished.
4. Plastic laminates, eight inches by ten inches (200 mm by 250 mm), for each type, color, pattern, and surface finish and specified edge material applied to one (1) edge.
5. Quartz surfacing materials, six inches (6”) square.
6. Corner pieces:
   a. Cabinet front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by six inches (150 mm) deep.
7. Exposed cabinet hardware and accessories, one (1) unit for each type and finish.

D. Qualification Data: For fabricator/installer.

E. Woodwork Quality Standard Compliance Certificates: Woodwork Institute (WI) Quality Certification Program certificates (CCP).

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Building code: Comply with applicable requirements of CBC Chapter 8 for Interior Finishes.
2. Accessibility:
   a. 2022 California Building Code; Section 11B-309 for Casework, Section 11B-404 Doors and Hardware and Section 11B-703 for Signage (where applicable).
   b. ADA Accessibility Guidelines (ADAAG) for Buildings and Facilities; final guidelines and revisions.
3. Quality standard: Unless otherwise indicated, comply with WI for premium grade architectural woodwork indicated for construction, finishes, installation, and requirements. Provide certified compliance labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.
4. Fire test response characteristics: Where fire retardant materials or products are indicated, provide materials and products with specified fire test response characteristics determined by testing identical products per test method indicated by UL. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

B. Fabricator Qualifications: Shop having minimum five (5) years’ documented experience who employs skilled workers who custom fabricate products similar to those required and who is a participating member of WI.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence matched wood veneers and transparent finished wood doors that are required to be of same species as woodwork.

D. Quality Standard: Unless otherwise indicated, comply with North American Architectural Woodwork Standards, meeting or exceeding ANSI A161.1, for grades of architectural woodwork indicated for construction, finishes, installation, and requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork is completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide materials that comply with requirements of WI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Products:
1. Hardboard: AHA A135.4.
2. Medium density fiberboard:
   a. ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde; minimum 48 pcf density except that minimum for screw holding capacity on face shall be 300 pounds; minimum 3/4 inches (19 mm) thick, edged and faced as specified:
      1) Arauco; Trupan MDF, VESTA Technology.
      2) Roseburg Forest Products, Inc.; Roseburg MDF products.
      3) Approved equal.
3. Particleboard: Unless otherwise noted by District, particleboard is not to be used.
4. Softwood plywood: DOC PS 1, medium density overlay.

C. Lumber:
1. Comply with applicable provisions for grading and workmanship of WI Quality Standards, and requirements specified. Provide lumber surfaced 4 sides (S4S) and fabricated to profiles shown. Kiln dry lumber to 19 percent moisture content:
   a. Furring, blocking, and shims: No. 1 Common; Southern Pine.
   b. Solid hardwood for opaque finish: Plain sawn Yellow Poplar, free from checks, splits, and sound knots.

D. Drawer Locks
1. Compx National Security Products

E. Thermoset Decorative Panels:
1. Particleboard or medium density fiberboard finished with thermally fused, melamine impregnated decorative paper complying with LMA SAT-1:
   a. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semi-exposed edges.

F. High Pressure Decorative Laminate - NEMA LD 3, grade indicated or as required by woodwork quality standard:
1. Manufacturer is subject to compliance with requirements; provide high pressure decorative laminates by one of the following:
   a. Abet Laminati, Inc.
   b. Formica Corporation.
   c. Panolam Surface Systems by Panolam Industries International Incorporated.
   d. Wilsonart LLC.

2.2 FIRE RETARDANT TREATED MATERIALS

A. Where fire retardant treated materials are indicated, use materials complying with requirements acceptable to authorities having jurisdiction, and with fire test response characteristics specified:
1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or defective.
2. Use fire retardant treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from

untreated materials.

3. Identify fire retardant treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire Retardant Particleboard:
   1. Panels complying with requirements, made from softwood particles and fire retardant chemicals mixed together at time of panel manufacture to achieve flame spread index of 25 or less and smoke developed index of 50 or less per ASTM E84:
      a. For panels 3/4 inch (19 mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: Modulus of rupture, 1,600 psi 11 MPa; modulus of elasticity, 300,000 psi 2,070 MPa; internal bond, 80 psi 550 kPa; and screw-holding capacity on face and edge, 250 and 225 lbf 1,100 and 1,000 N, respectively.
      b. For panels 13/16 inch to 1-1/4 inches (20 to 32 mm) thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: Modulus of rupture, 1,300 psi 9 MPa; modulus of elasticity, 250,000 psi 1,720 MPa; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf 1,100 and 780 N, respectively.
      c. Product: Subject to compliance with requirements, provide Duraflake FR by Arauco.

C. Fire Retardant Fiberboard: Medium density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire retardant chemicals mixed together at time of panel manufacture to achieve flame spread index of 25 or less and smoke developed index of 200 or less in accordance with ASTM E84.

2.3 CABINET HARDWARE AND ACCESSORIES

A. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers of items referenced to this standard. Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Frameless Concealed Hinges (European Type) - BHMA A156.9, B01602, Self-Closing:
   1. Provide 170-degree minimum opening capabilities. For end doors perpendicular to walls, provide 90-degree type.
   2. For doors 32 inches high or less, provide two (2) pairs of hinges, add 1/2 pair for every additional 20 inches.
   3. Products are subject to compliance with requirements; provide from one of the following:
      a. Hafele North America Co.
      b. Julius Blum, Inc.
      c. Mepla-Alfit, Inc.

C. Wire Pulls: Back mounted, solid metal, five inches (127 mm) long, 2-1/2 inches (63.5 mm) deep, and 5/16 inch (8 mm) in diameter.

D. Catches - Magnetic, Complying with BHMA A156.9 and B03161:
   1. Rockwood 901 by Assa Abloy.
   2. Comparable product.

E. Cabinet Shelf Rests - Nickel plated, 7 mm diameter shelf support pegs in brass sockets, complying with BHMA A156.9, B04013:
   1. Hafele 282.01.701 x 282.50.704 or comparable product.

F. Closet Rods and Flanges: 1-1/2-inch diameter, satin finished chrome plated steel or satin finished stainless steel with matching end flanges.

G. Adjustable Shelf Standards and Brackets for Wall Hung Open Shelving - BHMA A156.9, B04071; With Shelf Rests, B04081:
   1. Standards: Model No. 87ANO Super Duty 87/186/187 Steel Series; lengths as indicated, by Knape & Vogt or comparable product.
   2. Brackets: Model No. 187 LL ANO 12 to 24 for 12-inch to 24-inch (300 mm to 600 mm) deep shelves by Knape & Vogt or comparable product.
   3. Shelf rests: Model No. 210 ANO End Rest and Model No. 211 ANO Center Rest with Model No. 129 RUB Rubber Cushions or comparable product.

H. Shelf Rests: BHMA A156.9, B04013; metal, two pin type with shelf hold down clip.

I. Silencers:
   1. Provide rubber silencers on jamb and/or head and sill strike areas of all cabinet doors and drawers, two (2) for paired doors, and three (3) for single doors:
      a. Size: Approximately 1/4-inch (6.4 mm) diameter.
      b. Color: Compatible with adjacent finish.

J. Drawer Slides - BHMA A156.9, B05091:
   1. Provide positive stop, self-closing side mounted, full extension, zinc plated steel drawer slides with steel ball bearings:
      a. Pencil drawer slides: Grade 1; for drawers not more than three inches (75 mm) high and 24 inches (600 mm) wide; Accuride 2006 having 3/4 extension carburized steel ball bearing, side mounting, 45-pound capacity medium duty load rating, cold rolled steel slide members and ball retainers, bright electro zinc plate finish.
      b. Box drawers (less than eight inches [8”] deep): Grade 1HD-100; for drawers not more than six inches (150 mm) high and 24 inches (600 mm) wide. Provide Accuride 4034; up to 24 inches wide, full extension carburized steel ball bearing, side mounting, 150-pound capacity medium duty load rating, cold rolled steel slide members and ball retainers, cushioned in and out stops, detent-in, progressive action, positive stop, clear zinc finish.
      c. Pedestal drawers (greater than eight inches [8”] deep): Accuride 4032; up to 24 inches wide, full extension carburized steel ball bearing, rail mounting, minimum 150-pound capacity heavy duty load rating, cold rolled steel slide members and ball retainers, cushioned in and out stops, detent-in, progressive action, positive stop, bright electro zinc plate finish.
      d. Lateral file drawer slides: For drawers more than six inches (150 mm) high or 24 inches (600 mm) wide; heavy-duty, up to 42 inches wide, 3640A by Accuride.
      e. Keyboard slide: Model No. 2109, color black, by Accuride, Inc.
      f. Refuse cabinets: Accuride C3600-201D, full extension carburized steel ball bearing, bracket mounting, heavy-duty, cold rolled steel slide members and ball retainers, cushioned in and out stops, progressive action, positive stop, clear zinc plate finish.

K. Door and Drawer Locks:
   1. Provide locks for each cabinet door and drawer as indicated on Drawings. Finish exposed portions of locks to match cabinet pull finish. Furnish two (2) keys with each lock and key locks inside one room alike and provide master key for locks in Project. Selections to meet BHMA A156.11 and E07041 (for drawers) or E07121 (for doors):
      a. Cam lock similar to Hafele 235.20.20x, chrome plated, with offset cam 219.13.9xx, sized to fit opening.
      b. Cam lock similar to Hafele 235.20.20x, chrome plated, with surface mounted strike 251.60.703.
      c. Pairs of doors:

1) Inactive leaf: Furniture bolt similar to Hafele 252.02.644, polished chrome, with strike 251.60.703.
2) Active leaf: Single door lock assembly.

L. Grommets for Cable Passage through Countertops:
1. Two-inch (51 mm), black, molded plastic grommets and matching plastic caps with slot for wire passage:
a. Product: Subject to compliance with requirements, provide TG series by Doug Mockett & Company, Inc.

M. Trash Grommet Through Countertop: TM1B, six-inch by two-inch (6” x 2”) polished stainless-steel grommet by Doug Mockett and Co., Inc.

N. Exposed Hardware Finishes:
1. For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated:
a. Satin chromium plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

O. Concealed Hardware: Provide finish complying with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire retardant treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot dip galvanized anchors and inserts on inside face of exterior walls and as required for corrosion resistance. Provide toothed steel or lead expansion sleeves for drilled in place anchors.

C. Hanging (Zee Clip) Strips: Extruded aluminum zee type interlocking clips; type, size and quantity for the condition of use.

D. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

E. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

F. Blind Splines: Specialty devices, as required for tight butt joining, types and size as recommended by woodwork fabricator.

G. Covercaps: Where mortises of fastener heads or drawdowns are exposed (blind holes) in finished work, provide black plastic covercaps.

H. Adhesive for Bonding Plastic Laminate:
1. Resorcinol:
a. Adhesive for bonding edges: Hot melt adhesive.

I. Stone Seam Adhesive:
1. Two-part, epoxy resin stone adhesive with an initial set time of not more than two (2) hours at 70 degrees F (21 degrees C), and with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Color: Clear.
b. Products: Subject to compliance with requirements, provide Bonstone Materials Corporation - Duproxi or Akemi North America - Akepox.

J. Stone Sealer:
1. Colorless, nonstaining, single component, neutral curing silicone sealant that does not affect color or physical properties of stone surfaces, recommended by stone producer for application indicated. Subject to compliance with requirements, provide products by one of the following:
a. Bostik, Inc.
b. Custom Building Products.
c. Hillyard, Inc.

K. Stone Cleaner: Cleaner specifically formulated for stone types, finishes, and applications indicated, recommended by stone producer and by sealer manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

2.5 FABRICATION

A. Woodwork Grade:
1. WI Custom Grade woodwork complying with referenced quality standard:
a. Complete fabrication, including assembly, finishing, and hardware application, before shipment to site to the maximum extent possible. Disassemble components as necessary for shipment and installation. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting. The width of scribe and filler panels shall not exceed 1/2 inch or 1/2-inch clear dimension from adjacent wall to outside face of cabinet door in a 90-degree position, whichever is greater.
b. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify various parts fit as intended and check measurements of assemblies against field measurements indicated on shop drawings before disassembling for shipment.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire retardant treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
1. Corners of cabinets and edges of solid wood (lumber) members 3/4 inch (19 mm) thick or less: 1/16 inch (1.5 mm).
2. Corners of cabinets and edges of solid wood (lumber) members 3/4 inch (19 mm) thick or less: 1-1/2 inch (38 mm).
3. Corners of cabinets and edges of solid wood (lumber) members and rails: 1/16 inch (1.5 mm).

E. Shop cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs:
1. Seal edges of openings in countertops with a coat of varnish.

F. Plastic Laminate Faced Wood Paneling - WS Premium Grade:
1. Plastic laminate - high pressure decorative laminate complying with NEMA LD 3:
   a. Faces: Grade SGF.
   b. Backs: Grade BKH.
   c. Exposed edges: Same as faces.
2. Colors, patterns, and finishes:
   a. Wood grains, matte finish:
      1) Grain direction: Vertical.
3. Panel core - particleboard or medium density fiberboard:
   a. Thickness: 3/4 inch (19 mm).
4. Exposed panel edges:
   a. Applied solid wood banding 11/16 inch (18 mm) thick by depth of panels.
5. Adhesive for bonding edges: Hot melt adhesive or adhesive for faces.
6. Assemble panels by gluing and concealed fastening.

G. Plastic Laminate Cabinets - WS Premium Grade:
1. WI type of cabinet construction: Flush overlay.
2. Materials:
   a. Laminate cladding for exposed surfaces - high pressure decorative laminate:
      1) Horizontal surfaces other than tops: Grade HGS.
      2) Post formed surfaces: Grade HGP.
      3) Vertical surfaces: Grade VGS.
      4) Edges: Grade HGS.
   b. Semi-exposed surfaces:
      1) Surfaces other than drawer bodies - thermoset decorative panels:
         a) Edges of plastic laminate shelves: Grade HGS, matching laminate in color, pattern, and finish.
         b) For semi-exposed backs of panels with exposed plastic laminate surfaces, provide surface of high pressure decorative laminate, Grade VGS.
      2) Drawer sides and backs: Solid hardwood lumber.
      3) Drawer bottoms: Hardwood plywood.
   c. Concealed backs of panels with exposed plastic laminate surfaces: High pressure decorative laminate, Grade BKL.
3. Colors, patterns, and finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces indicated in Finish Schedule.
4. Provide dust panels of 1/4 inch (6.4 mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.
5. Fabrication:
   a. Join case body members using concealed dado or dowel methods utilizing glue and pressure. Reinforce dado method with nailing or screws. Mechanical fasteners are not permitted:
      1) Base cabinet bottoms and subtops: Bottoms, 3/4-inch particleboard with low pressure laminate finish on interior side and phenolic backing sheet on concealed side. Subtops, 3/4-inch particleboard with phenolic backing sheet both sides. Fabricate all base cabinets with subtops.
      2) Wall cabinet tops and bottoms: Tops, one-inch (1”) particleboard with low pressure laminate finish on interior side and phenolic backing sheet on concealed side. Bottoms, one-inch (1”) particleboard with manufacturer's low pressure laminate finish both sides.
      3) Cabinet ends: 3/4-inch particleboard with low pressure laminate finish on interior side and phenolic backing sheet on concealed side. Install high pressure plastic laminate on exposed sides of cabinet ends.
      4) Cabinet backs - 1/4-inch hardboard with low pressure laminate finish for standard unexposed backs:
         a) Fabricate with continuous hot melt glue joint between sides, tops,

bottoms, and back on concealed side.
b) Exposed backs: 3/4-inch particleboard with low pressure laminate finish on interior side and high pressure plastic laminate on exterior, exposed side.

5) Cabinet shelves (adjustable, semi-concealed): 3/4-inch particleboard with low pressure laminate finish on both sides. Provide one-inch (1") particleboard for shelves for unsupported spans over 36 inches.
6) Cabinet doors: 3/4-inch particleboard with high pressure plastic laminate on exterior side and heavy gauge balancing sheet on interior side.
7) Drawer fronts: 3/4-inch particleboard with high pressure plastic laminate on exterior side and heavy gauge balancing sheet on interior side.
8) Drawer construction - 1/2-inch solid hardwood back, sides, and subfront; tongued and dadoed into back and subfront, joints glued and pinned; 1/4-inch hardboard bottom tongued and dadoed in all four sides, back, and subfront. Provide additional support with continuous hot melt glue joint on underside of drawers between sides, back, subfront, and bottom:
   a) Reinforce drawer bottoms as required with spreaders.
   b) Apply drawer front to subfront in accordance with manufacturer's standard procedures.
   c) Dividers: 3/4-inch particleboard with manufacturer's low pressure laminate finish on both sides. Secure to inside of cabinet with manufacturer's standard plastic clips.
   d) Dust panels: Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers except where located directly under tops.
   e) Finish exterior exposed surfaces with high pressure plastic laminate. Laminate plastic to particleboard core with balancing sheet using urea resin formaldehyde glue. Fabricate using cold press method with regulated pressure for minimum eight hours at minimum 70 degrees F.

H. Countertops - WI Premium Grade:
1. Solid surface:
   a. Solid surfacing material thickness: 3/4 inch (19 mm).
   b. Colors, patterns, and finishes: Provide materials and products resulting in colors of solid surfacing material indicated on Drawings.
2. Quartz countertops:
   a. Seams:
      1) Fabricate countertops without seams to the extent possible. When seams are necessary, fabricate countertops in sections indicated for joining in field, with sealant filled seams 1/16 inch (1.5 mm) in width.
   b. Fittings: Drill countertops in shop for fittings and similar items.
   c. Fabricate with four-inch (4") backsplashes. Sand minor scratches and stains with #400 then #600 sandpaper.
3. Fabrication:
   a. Fabricate tops in one piece, unless otherwise indicated. Comply with solid surfacing material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing:
      1) Fabricate tops with shop applied edges of materials and configuration indicated.
      2) Fabricate tops with loose backsplashes for field application.
   b. Drill holes in countertops for plumbing fittings and soap dispensers in shop.
4. Countertop construction tolerances:
   a. Variation from plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches (1.5 mm in 1,200 mm).
   b. Variation from level: Do not exceed 1/8 inch in 96 inches (3 mm in 2,400 mm), 1/4 inch (6 mm) maximum.

c. Variation in joint width: Do not vary joint thickness more than 1/4 of nominal joint width.
d. Variation in plane at joints (lipping): Do not exceed 1/64-inch (0.4 mm) difference between planes of adjacent units.
e. Variation in line of edge at joints (lipping): Do not exceed 1/64-inch (0.4-mm) difference between edges of adjacent units, where edge line continues across joint.

2.6 SHELVING

A. Closet and Utility Shelving:
1. Grade: WI Custom.
2. Shelf material: 3/4 inch (19 mm) medium density fiberboard with solid lumber edge.
3. Cleats: 3/4-inch (19 mm) solid lumber.

2.7 SHOP FINISHING

A. Grade: WI Premium grade.

B. Shop finish architectural woodwork at fabrication shop. Defer final touchup, cleaning, and polishing until installation.

C. Produce finish architectural woodwork at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

D. Preparations for Finishing:
1. Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work:
a. Back priming: Apply one (1) coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two (2) coats to back of paneling and to end grain surfaces. Concealed surfaces of plastic laminate clad woodwork do not require back priming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.

E. Exposed Surfaces - WI Premium Grade:
1. Plastic laminate finish: Use hot plate method for gluing of plastic laminate surfacing materials; glued surfaces shall be in close contact throughout. Glue stains are not permitted.
2. Solid surfacing finish: As scheduled.

F. Unexposed Wood Finish: Water based alkyd type primer/sealer.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements:
1. Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work:

a. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on shop drawings.
b. Established dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

3.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork will be supported and installed as indicated.

3.3 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas. Before installing architectural woodwork, examine shop fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.4 INSTALLATION

A. Grade: Install woodwork to comply with requirements for grade specified for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2,400 mm). Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

C. Fire Retardant Treated Wood: Handle, store, and install fire retardant treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails (or finishing screws) for exposed fastening, countersunk, and filled flush with woodwork and matching final finish if transparent finish is indicated.

E. Plastic Laminate Paneling:
1. Install paneling to comply with same grade as paneling to be installed:
a. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2,400 mm). Install with no more than 1/16 inch in 96 inches (1.6 mm in 2,400 mm) vertical cup or bow and 1/8 inch in 96 inches (3 mm in 2,400 mm) horizontal variation from a true plane.
b. Anchor paneling to supporting substrate with blind nailing. Do not use face fastening unless covered by trim.

F. Cabinets:
1. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide

unencumbered operation. Complete installation of hardware and accessory items as indicated:

a. Install cabinets with no more than 1/8 inch in 96 inches (3 mm in 2,400 mm) sag, bow, or variation from a straight line.
b. Maintain veneer sequence matching of cabinets with transparent finish.
c. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer head screws sized for 1 inch (25 mm) penetration into wood framing, blocking, or hanging strips or toggle bolts through metal backing or metal framing behind walls.

G. Countertops:
1. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop:
a. Install countertops with no more than 1/8 inch in 96 inches (93 mm in 2,400 mm) sag, bow, or variation from a straight line.
b. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
c. Caulk space between backsplash and wall with silicone sealant.

H. Solid Surface and Stone Countertop:
1. Install components plumb and level scribed to adjacent finishes. Fabricate with backsplashes. Sand minor scratches and stain:
a. Align adjacent stone and solid surfacing material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
b. Do not cut in field unless otherwise indicated. If countertops or splashes require additional fabrication not specified to be performed at site, return to fabrication shop for adjustment.
c. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
d. Set stone and solid surface materials to comply with requirements indicated on Drawings and shop drawings. Shim and adjust to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and attachments indicated or necessary to secure countertops in place.
e. Where backsplash is indicated, install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive and to countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
f. Adhesive top mount sinks/bowls to countertops using manufacturer's recommended adhesives and color matched silicone sealants.
g. Keep components clean during installation. Remove adhesives, sealants, and stains. Replace stained components.
h. Apply sealant to joints and gaps; comply with Division 07: Thermal and Moisture Protection. Remove temporary shims before applying sealant.
i. Make plumbing connections to sinks in accordance with plumbing requirements.
j. Protect surfaces from damage. Repair work or replace damaged work that cannot be repaired to Architect's satisfaction.

I. Closet and Utility Shelving:
1. Cut shelf cleats at ends of shelves about 1/2 inch (13 mm) less than width of shelves and sand exposed ends smooth:
a. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners maximum 16 inches (400 mm) o.c.
b. Install shelf brackets according to manufacturer's written instructions, spaced

maximum 36 inches (900 mm) o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

c. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners maximum 12 inches (300 mm) o.c.
d. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced maximum 36 inches (900 mm) o.c. and within six inches (150 mm) of end of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
e. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports:
    1) Fasten shelves to cleats with finish nails or trim screws, set flush.
    2) Fasten shelves to brackets to comply with bracket manufacturer's written instructions.

J. Touch up finishing work. Fill nail holes with matching filler where exposed.

K. Construction Tolerances:
1. Variation from plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches (1.5 mm in 1,200 mm).
2. Variation from level: Do not exceed 1/8 inch in 96 inches (3 mm in 2,400 mm), 1/4-inch (6 mm) maximum.
3. Variation in joint width: Do not vary joint thickness more than 1/4 of nominal joint width.
4. Variation in plane at joints (lipping): Do not exceed 1/64-inch (0.4 mm) difference between planes of adjacent units.
5. Variation in line of edge at joints (lipping): Do not exceed 1/64-inch (0.4 mm) difference between edges of adjacent units, where edge line continues across joint.

3.5 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality: Provide temporary ventilation during work.

B. Waste Management:
1. Comply with requirements of Section 01 74 19: Construction Waste Management and Disposal:
    a. Select wood sizes to minimize waste; reuse scrap to the greatest extent possible. Clearly separate scrap for use on site as accessory components, including shims, bracing, and blocking.
    b. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
    c. Prevent saw dust and wood shavings from entering the storm drainage system.
    d. Do not burn scrap lumber that has been pressure treated.
    e. Do not send lumber treated with pentachlorophenol, CCA, or ACA to cogeneration facilities or waste to energy facilities.

3.6 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.

D. Countertops:
   1. Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately:
      a. In-progress cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
      b. Remove and replace countertops that are:
         1) Broken, chipped, stained, or otherwise damaged. Stone may be repaired if methods and results are approved by Architect. Repair solid surface in accordance with manufacturer recommendations when approved by Architect.
         2) Defective countertops.
         3) Defective joints, including misaligned joints.
      c. Replace complying with requirements and showing no evidence of replacement.

E. Stone: Clean stone countertops not less than six (6) days after completion of sealant installation, using clean water and soft rags. Do not use wire brushes, acid type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.

F. Stone Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions.

3.7 PROTECTION

A. Provide final protection and maintain conditions, acceptable to manufacturer and installer, ensuring woodwork is without damage or deterioration at time of Substantial Completion.

END OF SECTION 06 40 00

SECTION 07 21 00 THERMAL 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 requirements including but not limited to:
1. Polyisocyanurate foam plastic board.
2. Glass fiber blanket.
3. Acoustical Insulation.
4. Accessories necessary for a complete installation.

B. Related Sections:
1. Section 06 10 53: Miscellaneous Rough Carpentry.
2. Section 09 21 16: Gypsum Board Assemblies.

1.3 SUBMITTALS

A. Product Data: Technical data and installation instructions for each type of insulation product specified.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Fire performance characteristics - Identify products with appropriate markings of applicable testing and inspecting organization:
a. Surface burning characteristic: ASTM E84.
b. Flame spread index: Maximum 25.
c. Smoke developed index: Maximum 450.
d. Fire resistance ratings: ASTM E119.
e. Combustion characteristics: ASTM E136.
2. Underwriter's Laboratories (UL) 723 Tests for Surface Burning Characteristics of Building Materials.
3. XXAQMD – X X Air Quality Management District Regulations Rules for Adhesive and Sealant Applications.
4. Greenguard Children and Schools (http://www.greenguard.org/).

B. Single Source Responsibility for Insulation Products: Obtain each type of building insulation from single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of Work.

C. Environmental Requirements:
1. Manufacture extruded polystyrene with HCFC or other CFC free blowing agents. Mark insulation boards and packages with manufacturer's name and product designation. Unmarked boards and packages will be rejected:
a. Wherever possible, provide boards from manufacturers who recycle insulation materials.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam plastic board insulation:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 PRODUCTS

2.1 POLYISOCYANURATE FOAM PLASTIC BOARD

A. Polyisocyanurate Board, Foil Faced - ASTM C1289, Foil Faced, Type I, Class 1 or 2:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Atlas Roofing Corporation.
      b. Hunter Panels.
      c. DuPont.
      d. Firestone Building Products.
      e. Rmax, Inc.
      f. Approved equal.
   2. Fire propagation characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS FIBER BLANKET

A. Glass Fiber Blanket, Unfaced - ASTM C665, Type I; with maximum flame spread and smoke developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Johns Manville (Basis of Design).
      b. CertainTeed Corporation.
      c. Guardian Building Products, Inc.
      d. Owens Corning.
      e. Approved equal.

B. Glass Fiber Blanket, Polypropylene Scrim Kraft Faced - ASTM C665, Type II (non-reflective faced), Class A (faced surface with a flame spread index of 25 or less); Category 1 (membrane is a vapor barrier):
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Johns Manville (Basis of Design).
      b. CertainTeed Corporation.
      c. Owens Corning.
      d. Approved equal.

2.3 ACOUSTICAL INSULATION

A. Glass Fiber Noise Reducer Blanket, Kraft-faced - ASTM C665, Type II; with maximum flame spread and smoke developed indexes of 25 and 50, respectively, per ASTM E84;

combustion characteristics. To be installed on interior wood stud framing:

1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
   a. CertainTeed Corporation (Basis of Design).
   b. Guardian Building Products, Inc.
   c. Johns Manville; a Berkshire Hathaway company.
   d. Owens Corning.
   e. Approved equal.

2.4 INSULATION FASTENERS

A. Adhesively Attached, Spindle Type Anchors:
   1. Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place:
      a. Plate: Perforated, galvanized carbon steel sheet, 0.030-inch (0.762 mm) thick by two inches (50 mm) square.
      b. Spindle: Copper coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

B. Adhesively Attached, Angle Shaped, and Spindle Type Anchors:
   1. Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place:
      a. Angle: Formed from 0.030-inch (0.762 mm) thick, perforated, galvanized carbon steel sheet with each leg two inches (50 mm) square.
      b. Spindle: Copper coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

C. Insulation Retaining Washers:
   1. Self-locking washers formed from 0.016-inch (0.41 mm) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter:
      a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
         1) Crawl spaces.
         2) Ceiling plenums.
         3) Attic spaces.

D. Insulation Standoff: Spacer fabricated from galvanized mild steel sheet for fitting over spindle of insulation anchor to maintain air space of two inches (50 mm) between face of insulation and substrate to which anchor is attached.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

F. All other materials such as wire supports, fasteners, and retainers not specifically described but required to complete the work shall be as recommended by approved manufacturer, provided and installed by Contractor.

2.5 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Glass fiber insulation: ASTM C764, Type II, loose fill; with maximum flame spread and smoke developed indexes of 5, per ASTM E84.
   2. Spray polyurethane foam insulation: ASTM C1029, Type II, closed cell, with maximum flame spread and smoke developed indexes of 75 and 450, respectively, per

ASTM E84, and shall conform to all XXAQMD and EPA air quality regulations.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

B. Sequence work to ensure fireproofing and firestop materials are in place before beginning work.

3.2 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

B. Foam in Place Insulation:
   1. Verify that substrates are clean, dry, and free of substances that are harmful to insulation:
      a. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Board and Batt Insulation:
   1. Install insulation that is undamaged, dry, and unsoiled and has not been exposed to ice, rain, or snow at any time:
      a. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
      b. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

C. Cavity Wall Insulation:
   1. Foam plastic board insulation:
      a. Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both

directions. Press units firmly against inside substrates:
1) Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in.

D. Framed Construction - Blanket Insulation:
1. Install in cavities formed by framing members according to the following requirements:
a. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
b. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
c. Maintain three-inch (76 mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
d. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
e. For metal framed wall cavities where cavity heights exceed 96 inches (2,438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
f. For wood framed construction, install blankets according to ASTM C1320 and as follows:
1) With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
g. Miscellaneous voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1) Glass fiber insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2) Spray polyurethane insulation: Apply according to manufacturer's written instructions.

E. Reflective Insulation:
1. Install sheet reflective insulation according to ASTM C727:
a. Install sheet radiant barriers according to ASTM C1744.
b. Install interior radiation control coating system according to ASTM C1321.

F. Continuous Insulation for Exterior Walls (Polyisocyanurate Board):
1. Install continuous insulation board according to manufacturer's written instructions:
a. Fastener components shall include a minimum two-inch diameter plastic plate/washer and self-taping screws attached directly to stud framing.
b. All joints, penetrations, and flashings shall be taped and/or otherwise sealed with manufacture’s recommended products.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 21 16 BATT INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section is related to batt Insulation and includes information regarding the provision of fiberglass batt thermal insulation for exterior envelope assemblies.

B. Reference Standards:
   1. Materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
      a. American Society for Testing of Materials (ASTM):
         1) ASTM C423 Test Method for Sound Absorption Coefficient by the Reverberation Room Method.
         2) ASTM C518 Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter.
         3) ASTM C665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
         4) ASTM C1320 Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
         5) ASTM E84 Test Method for Surface Burning Characteristics of Building Materials.
         6) ASTM E119 Test Methods for Fire Tests of Building Construction and Materials.

1.3 SUBMITTALS

A. Product Data: Submit data on product characteristics, performance criteria, and limitations, including installation instructions.

1.4 QUALITY ASSURANCE

A. Sustainable Design:
   1. Provide products which have received the following certifications:
      a. UL Certified Environmental Product Declaration in accordance with ISO 14025. Applies to EcoTouch® Faced and Unfaced Insulation.
      b. UL Environment EcoLogo CCD-106, applies to EcoTouch® Faced and Unfaced Insulation.
      c. GREENGUARD Indoor Air Quality Certified® and GREENGUARD Children & Schools Certified℠, applies to EcoTouch® Unfaced Batts and EcoTouch® Faced Batts and Rolls.
      d. GREENGUARD Formaldehyde Free, applies to EcoTouch® Unfaced and EcoTouch® Faced Batts and Rolls.
      e. Scientific Certification Systems SCS-MC-01025, SCS Certified minimum 65 percent recycled glass content (with at least 41 percent post-consumer recycled and the balance of pre-consumer recycled glass content), applies to EcoTouch® Unfaced Batts and Rolls.
      f. Scientific Certification Systems SCS-MC-02676, SCS Certified minimum 58

percent recycled glass content (with at least 36 percent post-consumer recycled and the balance of pre-consumer recycled glass content), applies to EcoTouch® Faced Batts and Rolls.

g. USDA Certified Biobased Products: EcoTouch® unfaced – 98 percent; EcoTouch® Kraft-faced – 57 percent; EcoTouch® FSK-faced – 78 percent.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original packaging.

B. Store and protect products in accordance with manufacturer's instructions. Store in a dry indoors location. Protect insulation materials from moisture and soiling.

C. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

D. Do not install insulation that has been damaged or wet; remove it from jobsite:
1. An exception may be allowed in cases where Contractor is able to demonstrate that wet insulation when fully dried out (either before installation or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 BASIS OF DESIGN

A. Thermal Insulation: EcoTouch® PINK® FIBERGLAS™ Insulation with PureFiber® Technology by Owens-Corning, Toledo, OH 43659; www.owenscorning.com.

2.2 MATERIALS

A. EcoTouch® FS-25 Batt Insulation - ASTM C665, Type II (PSK facing), Class A and Type III (FSK facing), Class A preformed formaldehyde free glass fiber batt, poly/scrim/Kraft (PSK) or foil/scrim/Kraft (FSK) faced on one side:
1. Flame spread less than 25, smoke developed index less than 50 per ASTM E84.
2. ICC building construction classification: All types.
3. Perm rating: 0.02 maximum per ASTM E96.

B. Accessories:
1. Provide accessories per insulating system manufacturer's recommendations, including the following:
a. Tape: Polyethylene self-adhering type for Kraft faced insulation and bright aluminum self-adhering type for foil faced insulation.
b. Insulation fasteners: Impale clip of galvanized steel; type recommended by insulation manufacturer for particular use intended.
c. Mechanical insulation fasteners: FM approved, corrosion resistant, size required to suit application.
d. Wire mesh: Galvanized steel, hexagonal wire mesh.
e. Spindle fasteners: Corrosion-resistant wire spindles.
f. Ventilation baffles: Formed plastic, metal, or cardboard sized to fit full width of rafter spaces.

2.3 PERFORMANCE CRITERIA

A. Wood Frame Construction - Walls, R-Value - Per ASTM C518:
   1. R-21, 5-1/2-inch (139 mm) thickness, 15-inch (381 mm) or 23-inch (584 mm) width, 93-inch (2,362 mm) length at six-inch (6”) studs.
   2. R-25, 15-inch (381 mm) or 23-inch (584 mm) width, 93-inch (2,362 mm) length at eight-inch (8”) and 10-inch (10”) studs.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify mechanical and electrical services within walls have been tested and inspected.

B. Provide written report listing conditions detrimental to performance of work in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's installation instructions and ASTM C1320.

B. Friction-fit blanket insulation in place, until the interior finish is applied. Install batts to fill entire stud cavity, with no gaps, voids, or areas of compression. If stud cavity is less than eight feet (8’) in height, cut lengths to friction fit against floor and ceiling tracks. Walls with penetrations require that insulation be carefully cut to fit around outlets, junction boxes, and other irregularities:
   1. Do not install insulation on top of or within three inches (3”) of recessed light fixtures unless the fixtures are approved for such use.

C. Within exterior wall framing, install insulation between pipes and backside of sheathing. Cut or split insulation material as required to fit around wiring and plumbing.

D. Where showers and bathtubs are located on exterior walls, install insulation and vapor retarder air barrier between units and exterior.

E. If eave ventilation baffles are required, install ventilation baffles at eaves to hold insulation down from roof sheathing and provide positive ventilation from eave to attic space.

F. Fluff insulation to full thickness for specified R-value before installation. Do not compress insulation in the cavity during installation, creating gaps or voids that could diminish thermal value.

G. Trim insulation neatly to fit spaces. Fill miscellaneous gaps and voids with insulation.

H. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

I. For unfaced batt insulation, install with friction fit or retain in place with manufacturer’s recommended fasteners or mesh.

J. For batt insulation with factory-applied facing, install with vapor retarder membrane facing warm in the winter side of building spaces or as specified by local building code. Lap ends and side flanges of membrane over or between framing members. Tape to seal tears, cuts, or misalignments in membrane.

K. Secure insulation in place using one of the following methods: Friction fit; staple or nail facing flanges in place as needed, tape in place, retain in place with spindle fasteners, retain in place with wire mesh secured to framing members.

3.3 PROTECTION

A. Protect installed insulation from damage due to weather and physical abuse until protected by permanent construction.

END OF SECTION 07 21 16

SECTION 07 84 00 FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
1. Penetration firestop systems.
2. Fire resistive joint systems.
3. Repair of firestop assemblies disturbed by the work.
4. Smoke barriers.
5. Accessories necessary for a complete installation.

B. Related Sections:
1. Division 23: Heating, Ventilating & Air Conditioning (HVAC).
2. Division 26: Electrical.

C. Reference Standards:
1. Part 1 2022 California Administrative Code, Title 24 C.C.R.
2. Part 2 2022 California Building Code, Title 24 C.C.R.
3. Part 3 2022 California Electrical Code, Title 24 C.C.R.
4. Part 4 2022 California Mechanical Code, Title 24 C.C.R.
5. Part 5 2022 California Plumbing Code, Title 24 C.C.R.
6. Part 6 2022 California Energy Code, Title 24 C.C.R.
7. Part 8 2022 California Historical Code, Title 24 C.C.R.
8. Part 9 2022 California Fire Code, Title 24 C.C.R.
9. Part 10 2022 California Existing Building Code, Title 24 C.C.R.
10. Part 11 2022 California Green Building Standards Code (CALGreen Code), Title 24 C.C.R.
11. Part 12 2022 California Referenced Standards Code, Title 24 C.C.R.
12. NFPA 13-22 Standard for the Installation of Sprinkler (California Amended), Current Edition.
13. NFPA 14-19 Standard for the Installation of Standpipe and Hose Systems (California Amended), Current Edition.
14. NFPA 17-21 Dry Chemical Extinguishing Systems, Current Edition.
15. NFPA 20-19 Standard for the Installation of Stationary Pumps for Fire Protection, Current Edition.
16. NFPA 24-19 Standard for Installation of Private Fire Service Mains and Their Appurtenances (California Amended), Current Edition.
17. NFPA 72-22 National Fire Alarm and Signaling Code (California Amended), Current Edition
18. NFPA 80-19 Standard for Fire Doors and Other opening Protectives, Current Edition
19. NFPA 253-19 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
20. NFPA 2001-18 Standard on Clean Agent Fire Extinguishing Systems (California Amended), Current Edition.
21. Americans with Disabilities Act (ADA), Title II.
22. Fire Test Response Characteristics:
    a. Provide firestop systems complying with requirements:
        1) Penetration firestop systems are identical to those tested in accordance with

UL. Provide rated systems complying with requirements:
a) Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
b) Penetration firestop system products bear classification marking of qualified testing and inspecting agency.
c) Penetration firestop systems correspond to those indicated by reference to penetration firestop system designations listed by UL in its Fire Resistance Directory and FM Global in its Building Materials Approval Guide.

b. Fire Resistive Joints:
1) Perform fire resistance tests by UL with follow up inspection services for fire resistive joint systems acceptable to authorities having jurisdiction:
a) Fire resistive joint system products bear classification marking of qualified testing and inspecting agency.
b) Fire resistive joint systems correspond to those indicated by reference to penetration firestop system designations listed by UL in its Fire Resistance Directory.

1.3 SUBMITTALS

A. Product Data: Technical data including installation recommendations, construction conditions, and applicable UL assemblies.

B. Shop Drawings:
1. For each penetration firestop or fire resistive joint system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetration. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated:
a. Submit documentation, including illustrations, from qualified testing and inspecting agency, applicable to each firestop system configuration for construction and penetrating items.

C. Product Certificates: For penetration firestop system products, signed by product manufacturer.

D. Product Test Reports: From a qualified testing agency indicating penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.4 PERFORMANCE REQUIREMENTS

A. Penetration Fire Resistance Systems:
1. For penetrations through vertical and horizontal fire resistance rated constructions, including both empty openings and openings containing penetrating items, provide firestop systems produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and gases, and maintain original fire resistance rating of construction penetrated.
2. Rated systems:
a. Provide penetration firestop systems with ratings determined in accordance with UL 1479 for C-AJ, C-BJ, C-BK, F-A, F-B, F-C, W-J, W-K, and W-L classified systems:
1) F rated systems: Provide penetration firestop systems with F ratings indicated, but not less than that equaling or exceeding fire resistance rating of constructions penetrated.
2) T rated systems: For specified conditions, provide penetration firestop systems with T ratings indicated, as well as F ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in

occupiable floor areas.

3) L rated systems: Where penetration firestop systems are indicated in smoke barriers, provide penetration firestop systems with L ratings of not more than 3.0 cfm/sq. ft (0.01524cu. m/s x sq. m) at both ambient temperatures and 400 degrees F (204 degrees C).
4) For penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to conditions both during and after construction.
5) For piping penetrations for plumbing and wet pipe sprinkler systems, provide moisture resistant penetration firestop systems.
6) For penetrations involving insulated piping, provide penetration firestop systems not requiring removal of insulation.

3. For penetration firestop systems exposed to view, provide products with flame spread and smoke developed indexes of less than 25 and 450, respectively, determined in accordance with ASTM E84.

B. Fire Resistive Joint Systems:
1. System produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and gases, and maintain original fire resistance rating of assembly in which fire resistive joint systems are installed:
a. Joint systems in and between fire resistance rated constructions: Provide systems with assembly ratings equaling or exceeding fire resistance ratings of construction that are joined, with movement capabilities and L ratings indicated determined by UL 2079.
b. Perimeter fire resistive joint systems: For joints between edges of fire resistance rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated, determined by NFPA 285 and UL 2079.
c. For fire resistive systems exposed to view, provide products with flame spread and smoke developed indexes of less than 25 and 450, respectively, determined in accordance with ASTM E84.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. A firm experienced in installing firestop systems and who has been approved by FM Global according to FM Global 4991 Approval of Firestop Contractors or been evaluated by UL and found to comply with UL Qualified Firestop Contractor Program Requirements and has minimum five (5) years' documented experience in installing firestopping assemblies:
a. Manufacturer's willingness to sell its penetration firestop system products to Contractor or to installer engaged by Contractor does not qualify buyer/installer.

B. Installation Responsibility: Assign installation of penetration firestop systems and fire resistive joint systems to a single qualified installer.

C. Source Limitations: Obtain firestop systems for each kind of penetration and construction condition indicated; one (1) source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestop system products to site in original, unopened containers or packages with intact and legible manufacturer labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for penetration firestop systems to prevent their deterioration or

damage due to moisture, temperature changes, contaminants, or other causes.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturer:
   1. Subject to compliance with requirements, provide firestop systems by one of the following for each application required:
      a. Specified Technologies Inc
      b. Hilti, Inc.
      c. 3M; Fire Protection Products Division.
      d. USG Corporation.
      e. Tremco Commercial Sealants and Waterproofing.

B. Compatibility: Provide firestop systems compatible with each other; with substrates forming openings; and with items penetrating penetration firestop systems, under conditions of service and application, demonstrated by penetration firestop system manufacturer based on testing and field experience.

C. Accessories:
   1. Provide components for each firestop system necessary to install fill materials. Use components specified by penetration firestop or fire resistive joint system manufacturer and UL. Accessories include, but are not limited to:
      a. Penetration firestop systems: Provide penetration firestopping produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and gases, and maintain original fire resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with substrates forming openings, and with penetrating items if any.
      b. Accessories - Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated:
         1) Permanent forming/damming/backing materials, including the following:
            a) Slag wool fiber or rock wool fiber insulation.
            b) Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
            c) Fire rated form board.
            d) Fillers for sealants.
         2) Temporary forming materials.
         3) Substrate primers.
         4) Collars.
         5) Steel sleeves.

D. Fill Materials:
   1. Penetration firestop systems containing types of fill materials indicated. Fill materials are those referenced in directories of referenced testing and inspecting agencies as fill, void, or cavity materials:
      a. Cast in place firestop devices: Factory assembled devices for use in cast in place concrete floors and consisting of an outer metallic sleeve lined with intumescent strip, radial extended flange attached to one end of sleeve for fastening to concrete formwork, and neoprene gasket.
      b. Latex sealants: Single component latex formulations that after cure do not reemulsify during exposure to moisture.
      c. Firestop devices: Factory assembled collars formed from galvanized steel and

lined with intumescent material sized to fit specific diameter of penetrant.

d. Intumescent composite sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.
e. Intumescent putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
f. Intumescent wrap strips: Single component intumescent elastomeric sheets with aluminum foil on one side.
g. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at site to form non-shrinking, homogeneous mortar.
h. Pillows/bags: Reusable heat expanding pillows/bags consisting of glass fiber cloth cases filled with combination of mineral fiber, water insoluble expansion agents, and fire-retardant additives.
i. Silicone foams: Multicomponent, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
j. Silicone sealants - single component, silicone based, neutral curing elastomeric sealants of grade indicated:
    1) Grade: Pourable (self-leveling) formulation for openings in floors and horizontal surfaces, and non-sag formulation for openings in vertical and surfaces requiring nonslumping, gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.

E. Fire Resistive Joint Systems: Sealants complying with UL 1479 including F, T, and L ratings.

F. Fire Safing Insulation:
1. Semi-refractory blanket: Semirigid blankets designed for use as fire stops at openings between edge of slab and exterior wall panels, glass mat faced, low density; having nominal density of 4 lb/cu. ft. (64 kg/cu. m); complying with ASTM C612, Type 1A and 1B and ASTM E136 for combustion characteristics; thermal resistivity of four (4) degrees F x h x sq. ft./Btu x in. at 75 degrees F (27.7 K x m/W at 24 degrees C); with maximum flame spread and smoke developed values of 10 and 5. Use for floor perimeter fire and smoke containment. Install blanket with 20-gauge impaling clips recommended by manufacturer.
2. Caulking compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.
3. Safing clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.

G. Duct Wrap for Ducts: Materials listed in the UL Fire Resistance Directory under File R8418, Category CAJ7009, File R14229 Categories CAJ 7013, CAJ 7015, CAJ 7020, CAJ 7022, YYET, and grease duct enclosures and having minimum two (2) hour fire resistive rating for grease or air duct enclosure materials.

H. Composition Edge Banding: Materials listed in UL Fire Resistance Directory UL 10C standard.

2.2 FIRE STOPPING SYSTEMS

A. Penetration System:
1. Penetrations in fire resistance rated walls - provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa):
    a. Fire resistance rated walls include fire walls, fire barrier walls, smoke barrier walls, and fire partitions.
    b. F Rating: Minimum fire resistance rating of constructions penetrated.

2. Penetrations in horizontal assemblies - provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa):
   a. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
   b. F rating: At least one (1) hour, but not less than the fire-resistance rating of constructions penetrated.
   c. T rating: At least one (1) hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. Penetrations in smoke barriers:
   a. Provide penetration firestopping with ratings determined per UL 1479:
      1) L rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
      2) W rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
4. Exposed penetration firestopping: Provide products with flame-spread and smoke developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

B. Joint Resistive Systems:
1. Joints in smoke barriers:
   a. Provide fire resistive joint systems with ratings determined per UL 2079:
      1) L rating: Not exceeding 5.0 cfm/ft (0.00775 cu. m/s x m) of joint at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
2. Exposed fire resistive joint systems: Provide products with flame-spread and smoke developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.
3. Exposed fire-resistive joint systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

2.3 MIXING

A. For products requiring mixing before application, comply with penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Environmental Limitations: Do not install firestop systems when ambient or substrate temperatures are outside limits permitted by firestop system manufacturer or when substrates are wet due to rain, frost, condensation, or causes.

B. Install and cure fire resistive joint systems in accordance with manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced air circulation.

C. Ventilate firestop systems per manufacturer's written instructions by natural means or, where inadequate, forced air circulation.

3.2 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that firestop resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core drilled holes, or cut openings to accommodate penetration firestop systems.

C. Joint System: Coordinate sizing of joints to accommodate fire resistive joint systems.

D. Do not cover up penetration firestop system or fire resistive joint system installations that will become concealed behind other construction until building inspector of authorities having jurisdiction have examined each installation.

3.3 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and conditions affecting performance of work. Proceed with installation after unsatisfactory conditions have been corrected.

3.4 PREPARATION

A. Surface Cleaning:
   1. Clean out openings immediately before installing penetration firestop systems complying with firestop system manufacturer's written instructions and with the following requirements:
      a. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestop systems.
      b. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestop systems. Remove loose particles remaining from cleaning operation.
      c. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended in writing by penetration firestop system manufacturer complying with manufacturer's recommended. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of work and that would be permanently stained or damaged by contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.5 INSTALLATION

A. Penetration Firestop System:
   1. Install penetration firestop systems to comply with requirements and with firestop system manufacturer written installation instructions and published drawings for products and applications indicated:
      a. Install forming/damming/backing materials and accessories of types required to support fill materials during application and in the position needed to produce cross sectional shapes and depths required to achieve fire ratings indicated. After installing fill materials and allowing them to fully cure, remove combustible forming materials and accessories not indicated as permanent components of firestop systems.

b. Install fill materials for firestop systems by proven techniques to produce results:
   1) Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire resistance ratings indicated.
   2) Apply materials for full contact and adhere to substrates formed by openings and penetrating items.
   3) For fill materials that remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

B. Fire Resistive Joint System:
   1. Install fire resistive joint systems to comply with requirements and manufacturer's written installation instructions for products and applications indicated:
      a. Install forming/packing/backing materials and accessories of types required to support fill materials during application and in position needed to produce cross sectional shapes and depths required to achieve fire ratings indicated.
      b. Install fill materials for joint systems by proven techniques to produce the following results:
         1) Fill voids and cavities formed by openings and forming/packing/backing materials required to achieve fire resistance ratings indicated.
         2) Apply fill materials to contact and adhere to substrates formed by joints.
         3) For fill materials remaining exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.6 IDENTIFICATION

A. Identify firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within six inches (150 mm) of edge of the firestop systems so labels are visible at removal:
   1. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces and, in combination with label material, resulting in partial destruction of label if removal is attempted. Include information on labels:
      a. The words Warning - Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage.
      b. Contractor's name, address, and phone number.
      c. Firestop system designation of applicable testing and inspecting agency.
      d. Date of installation.
      e. Penetration firestop system manufacturer's name.
      f. Installer's name.

3.7 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire resistive joint systems are damaged or removed due to testing, repair or replace fire resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire resistive joint systems with construction after inspection reports are issued and installations comply with requirements.

D. Provide where required by code annual inspection of all fire resistive joint systems and recommendations for improvements. Include reporting with final documentation at end of project.

3.8 CUTTING AND PATCHING

A. Cut, patch, and repair firestopping to accommodate work. Repair cracks and indented surfaces. Repair surfaces around items built into or that penetrate surfaces. Repair and replace work to eliminate blister, buckles, dry outs, and similar imperfections. Repair and replace work required to comply with fire resistance ratings.

B. After completion of work in and around the areas of firestopping, repair and replace damaged firestopping.

3.9 CLEANING AND PROTECTION

A. Clean excess fill materials adjacent to openings as work progresses by methods and with cleaning materials approved in writing by penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation ensuring penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce systems complying with requirements.

END OF SECTION 07 84 00

SECTION 08 11 13 HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCULENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide items shown on the Drawings and specified, including, but not limited to the following:
   1. Standard and fire rated steel doors.
   2. Steel frames for doors, sidelites, transoms, and windows.
   3. Louvers and vision lites in steel doors, if shown or required.
   4. Sound rated steel doors.
   5. Thermally rated steel doors.

B. Related Sections:
   1. Section 09 21 16: Gypsum Board Assemblies.
   2. Section 09 90 00: Painting and Coating.

C. Reference Standards:
   1. ASTM International (ASTM)
      a. A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
      b. A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
      c. A1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
      d. A1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
      e. C1363 Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
      f. E283 Standard Test Method for Determining the rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
      g. E413 Standard Classification for Rating Sound Insulation.
   2. Hollow Metal Manufacturers Association (HMMA):
      a. HMMA 802 Manufacturing of Hollow Metal Doors and Frames.
      b. HMMA 810 Hollow Metal Doors.
      c. HMMA 830 Hardware Preparation and Locations for Hollow Metal Doors and Frames.
      d. HMMA 840 Installation and Storage of Hollow Metal Doors and Frames.
      e. HMMA 850 Fire Rated Hollow Metal Doors & Frames.
      f. HMMA 890 Technical Summary of Hollow Metal by HMMA.
   3. National Fire Protection Association (NFPA):
      a. 80 Fire Doors and Fire Windows.
      b. 252 Fire Tests of Door Assemblies.
   4. Steel Door Institute – Current Standards: Technical Data Series.
   5. Underwriters Laboratories Inc. (UL):
      a. Building Materials Directory.

b. Listing and Labeling.
c. 10B and 10C Fire Tests of Door Assemblies.
d. 1784 Air Leakage Tests of Door Assemblies.

6. Intertek Testing, Services (Warnock Hersey, Inc. (WHI): Listing and Labeling.

1.3 SUBMITTALS

A. Product Data:
1. Manufacturer's standard details and catalog data demonstrating compliance with specifications and referenced standards.
2. Manufacturer's installation instructions.

B. Shop Drawings:
1. Indicate complete schedule in detail for each steel door and frame using the same reference number for details and openings as those on the contract Drawings. If any door is not by the steel door manufacturer, only the door opening number should be shown along with the type of door (wood, plastic laminate faced, etc.):
a. Show details of construction, installation, connections, anchors, hardware reinforcement, hardware preparation, louvers, and floor and threshold clearances.

C. Samples are required from non-Steel Door Institute members:
1. 12-inch by 12-inch sample of a fire-rated and non-rated door, cut from corner of door, showing door construction.
2. 12-inch by 12-inch sample of each type of door louver specified or required, showing louver construction.
3. Six-inch (6”) long sample of a fire-rated, non-rated frame, and each type of glass stop specified or required, showing corner and construction.

D. Certificates: Manufacturer’s certification that oversized openings are in compliance with specifications.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: If other than a manufacturer listed under Paragraph 2.1 is proposed for use on the Project, it shall be a company specializing in the manufacturer of steel doors and frames of the type specified for this Project with a minimum of five (5) years’ experience.

B. All steel doors and frames shall be by a single manufacturer, shop drawings to be submitted with manufacturer’s insignia, which is being supplied.

C. Furnish steel doors and frames to meet current ANSI/Steel Door Standards.

D. ANSI A250.13 Testing and Rating of Sever Windstorm Resistant Components for Swing Door Assemblies.

E. ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

F. Comply with ASTM E283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

G. Regulatory Requirements:
1. Fire-Rated Assemblies:

a. Fire-rated door, panel, frame, and fire window construction shall conform to NFPA 252, or UL 10B, as applicable, and acceptable to the code of authorities having jurisdiction.
b. Fire-rated door construction:
    1) Notwithstanding any other requirements of this Section, provide gauge of metal, method of construction, hardware preparation, reinforcement, and placement, glass opening size, and other specifics required to obtain the specified or required label. The label shall contain the fire resistance rating (20-minute, 45-minute, 1-hour, 1-1/2-hour, 3-hour, etc.) and the designation (A, B, C, D, or E); doors with B Label shall be 1-1/2 hour.
    2) Fire-rated doors used in a stairway enclosure, shall be so constructed so that the maximum transmitted temperature shall not exceed 450 degrees F above ambient temperature at the end of 30 minutes of the Standard Fire Exposure Test and shall be so noted on the label.
c. Fire-rated openings:
    1) Conform to NFPA 80 for fire-rated class shown or required by code of authorities having jurisdiction:
        a) Units shall be identical to assemblies whose fire resistance characteristics have been determined in accordance with requirements specified above, and shall be labeled and listed by UL, WHI, or other inspection and testing agency acceptable to the code of authorities having jurisdiction.
        b) Fire-rated steel doors, panels, frames, and fire windows shall bear permanent labels attesting to fire resistance. At stairway enclosures, provide units listed for 450 degree F maximum temperature rise rating for 30 minutes of exposure.
        c) Oversized openings shall be constructed in accordance with all applicable requirements for labeled door construction.
        d) Fire rated door assemblies with gaps in excess of 1/8 inch between door and frame will not comply with NFPA 80.
        e) Locate label on hinge side of doors and frames so that when door is closed, label is not visible.
        f) Caution shall be taken to ensure that labels are not removed, damaged, or painted over.
        g) Glass panes shall not exceed sizes allowed whether indicated or not on the Drawings.

H. Wind Loads: Provide hollow metal and door hardware assemblies approved by DSA, including anchorage, capable of withstanding wind load design pressures that are calculated for this Project by a registered Architect or Engineer and is part of the construction documents per CBC.

I. Hurricane-Resistance Test Performance:
1. Provide hollow metal and door hardware approved assemblies that pass large missile-impact tests, as required by authorities having jurisdiction:
    a. Impact resistance: Hollow metal with approved door hardware assemblies must satisfy Division of the State Architect and CBC for protection from windborne debris. The assemblies must have passed the large missile impact test, which equates to Missile Level D specified in ASTM E1996. The assemblies may be installed at any height on the structure as long as the design pressure rating for the assemblies is not exceeded. These assemblies will and do not need to be protected with an impact protective system when installed in areas where windborne debris protection is required.

J. Accessibility Requirements:
1. Comply with applicable requirements:

a. Americans with Disability Act of 1990, as amended: 2010 ADA Standards.
b. 2022 California Building Code (CBC). CCR Title 24, Part 2, as adopted and amended by DSA.

K. Pre-Installation Conference: Refer to Division 01, General Requirements.

1.5 WARRANTY

A. Warrant the work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.

B. Defects shall include, but not be limited to:
1. Use of incorrect materials in opening.
2. Incorrect labeled components installed within opening.
3. Noisy, rough, or difficult operation.
4. Failure to meet specified quality assurance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in accordance with manufacturer’s instructions, and as follows:
1. In manufacturer's original, clearly labeled, undamaged containers or wrappers.
2. Containers or wrappers shall list the name of the manufacturer and product.

B. Deliver materials to allow for minimum storage time at the Project site. Coordinate delivery with the scheduled time of installation.

C. Protect products from moisture, construction traffic, and damage:
1. Store under cover in a clean, dry place, protected from weather and abuse.
2. Store in a manner that will prevent rust or damage.
3. Store doors in a vertical position, spaced with blocking to permit air circulation.
4. Do not use non-vented plastic or canvas shelters.
5. Should containers or wrappers become wet, remove immediately.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed below whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must comply with Manufacturer Qualifications, must manufacture equivalent products to those specified, and comply with requirements of Division 01, General Requirements, regarding substitutions to be considered:
1. CECO Door Products, Brentwood, TN; (615) 661-5030.
2. Curries Company, Mason City, IA; (515) 423-1334.
3. Pioneer Industries, Inc., Kewanee, IL; (309) 856-6000.
4. Republic Builders Products Company, McKenzie, TN; (800) 733-3667.
5. Steelcraft Mfg. Co., Cincinnati, OH; (513) 745-6400.
6. Stiles Co.
7. Approved equal.

2.2 MATERIALS, GENERAL

A. Steel requirements, all frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM A1008 general requirements. Internal reinforcing may

be manufactured of hot rolled pickled and oiled steel per ASTM A1011. Exterior frames and interior frames where shown on approved Drawings or required in damp, moist, humid, and wet areas, i.e., toilets, locker rooms, showers, etc., to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel and galvannealed to A-60 minimum coating weight standard per ASTM A653 and A924, with coating weight of not less than 0.60 ounce per square foot (0.30 ounce per square foot per side).

2.3 FRAME FABRICATION

A. Minimum Gauges:
   1. Interior openings:
      a. Less than four feet (4') width: 16 gauge.
      b. Four feet (4') in width and greater: 14 gauge.
   2. Exterior openings: 14 gauge

B. Design and Construction:
   1. Frames shall be custom made, welded units with integral trim of sizes and shapes shown on approved shop drawings. Hinge jambs that butt adjacent 100-degree walls shall have at least four-inch (4") wide frame face to assure the door trim will not strike the wall prior to the door opening at least 100 degrees. Frame profile shall match wall thickness where practical, i.e., 4-3/4-inch at four-inch (4") CMU, 6-3/4-inch at six-inch (6") CMU, and 8-3/4-inch at eight-inch (8") CMU. At masonry wall openings, fabricate frames to suite masonry opening with two-inch (2") head member.
   2. Frames shall be strong and rigid, neat in appearance, square, true, and free of defects, warp, and buckle. Molded members shall be clean cut, straight, and of uniform profile throughout their length.
   3. Jamb depths, trim, profile, and backbends shall be as shown on approved shop drawings.
   4. Corner joints, including face and inside corners, shall have contact edges closed tight, with trim faces mitered and continuously welded, and stops butted. The use of gussets shall not be permitted. Face of frame shall be ground smooth. Knockdown (KD) frames are not permitted.
   5. Minimum depth of stops shall be 5/8 inch, except at fire windows where minimum depth of stops shall be 3/4 inch.
   6. Frames for multiple openings shall have mullion and rail members that are closed tubular shapes having no visible seams or joints. Joints between faces of abutting members shall be securely welded and finished smooth. Mullions shall be key locked removable type. Keys shall be master keyed to Owner's Best system.
   7. High frequency hinge reinforcement: Provide high frequency hinge reinforcements at door openings 48-inch and wider with mortise/butt type hinges only at top hinge location to deter against hinge reinforcement sag.
   8. Continuous hinge reinforcement: Provide welded continuous 12-gage strap for continuous hinges specified in hardware sets in Division 08 Openings.
   9. Provide countersunk flat or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops; provide security head screws at exterior locations.
   10. Provide A60 galvannealed coating at frames in restrooms and locker rooms with showers/Jacuzzi, clean areas such as kitchen rooms.
   11. Electrical knock out boxes:
      a. Factory weld 18-gage electrical knock out boxes to frame for electrical hardware preps; included but not limited to electric thru wire hinges, electrical raceways, door position switches, electric strikes, jamb mount card readers, and magnetic licks as noted in door hardware sets in Division 08 Openings:
         1) Electrical knock out boxes are required at door position switches, electric strikes, card readers, and middle hinge locations.
         2) Provide electrical knock out boxes with 3/4-inch knockouts.

3) Conduit to be coordinated and installed in field from middle hinge box and strike box to door position box.
4) Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Openings.
5) Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
6) Provide field installed conduit per Division 28: Electronic Safety & Security Section for standardized plug connectors to accommodate up to twelve (12) wires as required for electrified door hardware specified in hardware sets in Division 08 Openings. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.

12. Hardware reinforcements:
    a. Frames shall be mortised, reinforced, drilled, and tapped at factory for fully template mortised hardware in accordance with approved hardware schedule and templates provided by Section 08 71 00: Door Hardware. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates only.
    b. Minimum thickness of hardware reinforcing plates shall be as follows:
        1) Hinge and pivot reinforcements (1-1/4-inch x 10-inch minimum size): Seven (7) gauge.
        2) Strike reinforcements: 12-gauge stiffeners.
        3) Flush bolt reinforcements: 12-gauge.
        4) Closer reinforcements: 12-gauge.
        5) Reinforcements for surface-mounted hardware, hold-open arms, and surface panic devices: 12-gauge.
13. Floor anchors: Minimum 14-gauge, securely welded inside each jamb, with holes for floor anchorage.
14. Jamb anchors:
    a. Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the T-strap type. Anchors shall be not less than 16-gauge steel. The number of anchors provided at each jamb shall be as follows:
        1) Frames up to seven-feet-six-inches (7’-6”) in height: Three (3) anchors.
        2) Frames seven-feet-six-inches (7’-6”) to eight feet (8’) in height: Four (4) anchors.
        3) Frames over eight feet (8’) in height: One (1) anchor for each two feet (2’) or fraction thereof in height.
    b. Frames for installation in wood or metal stud partitions shall be provided with steel anchors of suitable approved design, not less than 16-gauge thickness, securely welded inside each jamb as follows:
        1) Frames up to seven feet six inches (7’-6”) in height: Four (4) anchors.
        2) Frames seven feet six inches (7’-6”) to eight feet (8’) in height: Five (5) anchors.
        3) Frames over eight feet (8’) in height: Four (4) anchors plus one (1) additional for each two feet (2’) or fraction thereof over eight feet (8’).
    c. Frames to be anchored to previously placed concrete, masonry, or structural steel shall be provided with anchors of suitable design as shown on approved shop drawings.
15. Dust cover boxes: Shall be of not less than 26-gauge steel and shall be provided at all mortised hardware items. Eight-inch (8”) CMU walls with face brick shall have dual offset jamb anchors.
16. Steel spreader: Shall be provided on all frames, temporarily attached to bottoms of both jambs for bracing during shipping and handling.
17. Loose glazing stops: Shall be of cold rolled steel, not less than 20 gauge, butted at corner joints and secured to the frame with countersunk cadmium or zinc-plated screws. Loose stops at exterior frames shall be placed on the interior side of the

frames.

18. Unless otherwise noted on Drawings, ALL doors coat inside of frame profile with corrosion resistant coating to minimum thickness of 1/16 inch.

C. Frame Color: Field painted under Section 09 90 00: Painting and Coating to match face of door unless otherwise indicated on drawings.

2.4 DOOR FABRICATION

A. Minimum Gauges
   1. Interior doors: 0.047 inch or 18 gauge (16 gauge for high frequency doors).Exterior doors: 0.059 inch or 16 gauge (14 gauge for windstorm rated doors).Design and Construction:
   2. Types: Doors shall be custom fabricated, of types and sizes shown on approved shop drawings, and shall be seamless face construction with no visible seams or joints on vertical edges with fully welded seams free from blemishes and defects. Thickness shall be 1-3/4 inch, unless specifically noted or shown otherwise. Exterior doors: Provide doors with 22-gage steel z-channels placed at six inches (6”) apart with foamed in place polyurethane core, with a thermal insulation calculated R factor of 11.01 per ASTM C518 Standards.
   3. Fabrication:
      a. Doors shall be strong, rigid, and neat in appearance, free from warpage and buckle.
      b. Corner bends shall be true and straight and of minimum radius for gage of metal used.
      c. Provide stiffeners with polystyrene core spaced maximum six inches (6”) on center and extending full height of door.
      d. Fill interior with noncombustible fiberglass insulation. Use mineral board filler as required for labeled doors.
      e. Faces shall be joined at vertical edges of door by a continuous weld extending full height of door. Welds shall be ground, filled, and dressed smooth to provide a smooth flush surface.
      f. Top and bottom edges of doors shall be closed with a continuous recessed steel channel not less than 16 gauge, extending full width of door and spot weld to both faces. Exterior doors shall have an additional flush closing channel at top and bottom edges. Openings shall be provided in the bottom closure channel at top and bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.
      g. Continuous hinge reinforcement: Provide welded continuous 12-gage strap for continuous hinges specified in hardware sets in Division 08: Openings.
      h. Electrical raceways: Provide raceways for standardized plug connectors to accommodate up to 12 wires as required for electrified door hardware specified in hardware sets in Division 08: Openings. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.
      i. Doors in wet or humid areas shall have a top cap and solid foam interior core to prevent internal moisture accumulation and galvannealed.
      j. Edge profile shall be provided on both vertical edges of door as follows:
         1) Single-acting swing doors: Beveled 1/8 inch in two inches (2”).
      k. Hardware reinforcements:
         1) Doors shall be mortised, reinforced, drilled, and tapped at factory for fully template hardware, in accordance with the approved hardware schedule and templates provided by Section 08 71 00: Door Hardware. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only.
         2) Minimum gauges for hardware reinforcing plates shall be as follows:

a) Hinge and pivot reinforcements: Seven (7) gauge.
b) Reinforcements for lock face, flush bolts, concealed holders, concealed or surface-mounted closers: 12 gauge.

4. Glass moldings and stops: Loose stops shall be not less than 20-gauge steel, with butt corner joints, secured to frame opening by countersunk screws. Snap-on attachments will not be acceptable.
5. Louvers: Shall be inverted "V" blade, sight-proof type, unless noted otherwise.
6. Edge clearances:
   a. Between door and frame at head and jambs: 1/8 inch.
   b. At doorsills with no threshold: 5/8-inch to 3/4-inch above finished floor.
   c. At doorsills with threshold: As required to suit threshold.
   d. Between meeting edges of double doors: 1/8 inch.

B. Finish:
1. Shop paint steel (whether galvanized or ungalvanized) stops and accessories as follows:
   a. Clean surfaces free of mill scale, rust, oil, grease, dirt, and other foreign matter.
   b. Chemically treat surfaces and apply one (1) coat of an approved baked-on rust-inhibitive primer paint to provide a minimum 0.5 mil dry film thickness.

2. Field painted under Section 09 90 00: Painting and Coating.

C. Sound Rated Door: STC of 32, measured in accordance with ASTM E413.

D. Thermal Insulated Door: Total insulation R-Value of 44 measured in accordance with ASTM C1363, unless otherwise noted on Drawings.

2.5 LABELED DOORS AND FRAMES

A. Labeled doors and frames shall be provided for openings requiring fire protection ratings as scheduled and to comply with NFPA 80. Such doors and frames shall be constructed as tested and approved by UL, WHI, or other nationally recognized testing agency having a factory inspection service and approved by code authorities having jurisdiction and shall bear the appropriate permanent label.

B. If any door or frame scheduled to be fire-rated cannot qualify for appropriate labeling because of its size, design, hardware, or other reason, the Architect shall be so advised before fabrication work on that item is started. Indicate and highlight on shop drawing.

PART 3 EXECUTION

3.1 COORDINATION

A. Coordinate the work of this Section.

B. Coordinate hardware installation with opening construction. Finish hardware is specified in Section 08 71 00: Door Hardware.

C. Coordinate doors, frames, and windows with glazing specified in Section 08 80 00: Glazing.

D. Coordinate doors and frames with painting specified in Section 09 90 00: Painting and Coating.

3.2 INSTALLATION

A. Separate dissimilar metals. Protect against galvanic action.

B. Frames:
   1. Anchorage and connections: Secure to adjacent construction. Where practical, interior door frames shall be flush with the pull side wall to minimize or eliminate the reveal and allow full 180-degree door swing.
   2. Install frames in accordance with manufacturer’s instructions and install labeled frames in accordance with NFPA 80.
   3. Frame spreader bars: Leave intact until frames are set perfectly square and plumb and anchors are securely attached.
   4. Remove hardware, with the exception of prime-coated items, tag box, and reinstall after finish paint work is completed. Do not remove or paint over labels on labeled frames.

C. Doors:
   1. Install hardware in accordance with hardware manufacturer's templates and instructions.
   2. Install doors in accordance with manufacturer’s instructions and install labeled doors in accordance with NFPA 80.
   3. Adjust operable parts for correct function.
   4. Remove hardware, with the exception of prime-coated items, tag, box, and reinstall after finish paint Work is completed. Do not remove or paint over labels on labeled doors.

3.3 ADJUST AND CLEAN

A. Adjust doors for proper operation, free from binding or other defects.

B. Clean and restore soiled surfaces.

C. Remove scraps and debris, and leave site in clean condition.

END OF SECTION 08 11 13

SECTION 08 31 13 ACCESS DOORS AND FRAMES

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 access doors in gypsum board, masonry partitions, and plaster/stucco soffits, where shown or required.

B. Related Sections:
1. Section 06 10 00: Rough Carpentry.
2. Section 08 11 13: Hollow Metal Doors and Frames.
3. Section 09 21 16: Gypsum Board Assemblies.
4. Section 09 51 00: Acoustical Ceiling Panels.

1.3 SUBMITTALS

A. Product Data:
1. Manufacturer's literature, including schedules, charts, installation instructions, and illustrations to indicate the performance, fabrication, procedures, product variations, and accessories.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years' experience manufacturing access doors meeting or exceeding the specifications and comply with Division 01 requirements regarding substitutions in order to be considered:
1. J. L. Industries, Commerce, CA (basis of design for rated floors).
2. Karp Associates, Inc., Melville, NY (basis of design).
3. The Bilco Company, New Haven, CT.
4. Babcock-Davis, San Lorenzo, CA.
5. Larsen's Manufacturing Co., Minneapolis, MN.
6. Milcor, Grand Rapids, MI.
7. Approved equal.

2.2 PRODUCTS

A. Standard type flush steel access door for plaster/stucco soffit construction:
1. Size: As shown on the Drawings.
2. Hinges: Concealed continuous piano type hinges.
3. Finish: Phosphate dipped and prime coated for field painting per Section 09 90 00: Painting and Coating.
4. Frames: 16-gauge galvanized steel with 22-gauge galvanized plaster casing bead.
5. Doors: 14-gauge galvanized steel.
6. Lock: Flush screwdriver operated cam.

B. Fire Rated, Two-Hour, Floor Access Door - Flush steel door for wallboard construction:
   1. Listing: UL listed, compliant to NFPA 288.
   2. Size: As shown on the Drawings.
   3. Hinges: Heavy-duty Type 316 stainless steel butt hinge.
   4. Finish: 20-gauge galvanized metal with gray primer on exterior frame; field painting per Section 09 90 00: Painting and Coating.
   5. Frames: Extruded aluminum.
   6. Doors: Single leaf.
   7. Lock: Knurled knob/key operated latch bolt.
   8. Insulation: Two-inch (2”) thick fire rated mineral fiber

C. Non-Rated Floor Access Door:
   1. Listing: Not required.
   2. Size: As shown on the Drawings.
   3. Hinges: Heavy-duty Type 316 stainless steel butt hinge.
   4. Finish: 20-Gauge galvanized finish with gray primer on exterior frame; field painting per Section 09 90 00: Painting and Coating.
   5. Frames: 20-Gauge galvanized steel. Anchor to wood floor.
   6. Doors: Single leaf.
   7. Lock: Knurled knob/key operated latch bolt.
   8. Hold open door.

D. Ceiling Access Door:
   1. Listing: Not required.
   2. Size: As shown on the Drawings.
   3. Hinges: Heavy-duty Type 316 stainless steel butt hinge.
   4. Finish: 20-gauge galvanized finish with gray primer on exterior frame; field painting per Section 09 90 00: Painting and Coating.
   5. Frames: Extruded aluminum. Anchor to wood floor.
   6. Doors: Single leaf.
   7. Lock: Knurled knob/key operated latch bolt.
   8. Hold open door.

PART 3 EXECUTION

3.1 INSTALLATION

A. Locate and provide access doors in walls (and floors) to construct the wall as indicated on Drawings and provide access doors and panels to fit the wall condition. Maintain designated wall types as indicated on Drawings.

3.2 LOCATIONS

A. Provide where required by code and where needed to service and maintain equipment.

B. If not shown on the Drawings, consult the Architect before locating in finished spaces.

END OF SECTION 08 31 13

SECTION 08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Exterior and interior storefront framing.
   2. Exterior and interior manual swing entrance doors.
   3. Accessories necessary for a complete installation.

B. Related Sections:
   1. Division 07: Thermal and Moisture Protection.

1.3 SUBMITTALS

A. Product Data: Technical data for each type of product indicated including construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum framed systems.

B. Shop Drawings:
   1. Submit aluminum storefront framing and entrances shop drawings including plans, elevations, sections, full size details, and attachments to other work:
      a. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
      b. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

D. Engineer’s calculations of performance requirements.

E. Maintenance Data: For aluminum framed systems to include in maintenance manuals.

1.4 PERFORMANCE REQUIREMENTS

A. Aluminum framed systems shall withstand the effects of specified performance requirements without exceeding performance criteria or fail due to defective manufacture, fabrication, installation, or other defects in construction:
   1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
   2. Dimensional tolerances of building frame and other adjacent construction.
   3. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferring to building structure.

c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
d. Noise or vibration created by wind and by thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units.

B. Structural Loads:
1. Wind loads: Ultimate wind speed gust 115 mph; exposure D. These criteria are conservative, could be reduced to 100 mph with exposure C to match the site-specific requirements.

C. Deflection of Framing Members:
1. Deflection normal to wall plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection parallel to glazing plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

D. Structural Test Performance - Provide aluminum framed systems tested according to ASTM E330 as follows:
1. When tested at positive and negative wind load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test durations: As required by design wind velocity, but not fewer than ten (10) seconds.

E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft.0.03 L/s per sq. m of fixed wall area when tested according to ASTM E283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa.)

F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa.

G. Windborne Debris Impact Resistance:
1. Pass missile impact and cyclic pressure tests when tested according to ASTM E1886 and testing information in ASTM E1996 for Wind Zone 4:
a. Large missile test: For glazed openings located within 30 feet (9.1 m) of grade.

H. Thermal Movements:
1. Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss:
a. Temperature change (range): 120 degrees F (67 degrees C, ambient; 180 degrees F, 100 degrees C, material surfaces.
b. Interior ambient-air temperature: 75 degrees F (24 degrees C).

I. Condensation Resistance: Provide aluminum framed systems with fixed glazing and framing

areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.

J. Thermal Conductance: Provide aluminum framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x degrees F3.23 W/sq. m x K when tested according to AAMA 1503.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Accessibility requirements:
      a. 2022 California Building Code: Section 11B-404.3 accessible route.
      b. 2022 California Building Code: Section 11B-309.4 operable parts interior usage.
      c. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG).
      d. ICC/ANSI A117.1 Accessible and Useable Building and Facilities.

B. Installer Qualifications: Installer having minimum ten (10) years' documented experience who is an authorized representative of the manufacturer and is trained and approved for installation of units required.

C. Engineering Responsibility: Prepare data for aluminum framed systems, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated.

D. Product Options:
   1. Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in service performance:
      a. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

E. Source Limitations: Obtain aluminum framed entrances from single source from single manufacturer.

F. Pre-Installation Conference: Conduct conference at site.

1.6 WARRANTY

A. Written warranty signed by manufacturer, Contractor, and installer in which manufacturer agrees to repair or replace components of aluminum framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration caused by thermal movements.
      c. Water leakage through fixed glazing and framing areas.
      d. Failure of operating components.
   2. Warranty period: Two (2) years from date of Substantial Completion.

B. Written warranty signed by manufacturer in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or

workmanship within specified warranty period. Warranty does not include normal weathering:

1. Warranty period: Ten (10) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Basis of Design:
   1. **Kawneer Trifab 451/451T** (Product Evaluation CWSF-34), And/or the **Trifab 601/601T**, impact resistant system, maximum design pressure +/- 45 psf. Refer to Drawings for frame size and locations. Subject to compliance with requirements, provide comparable storefront system by one of the following:
      a. Tubelite, Inc.
      b. US Aluminum Corporation.
      c. Vistawall.
      d. YKK America AP, Inc.

B. Aluminum:
   1. Alloy and temper recommended by manufacturer for type of use and finish indicated:
      a. Sheet and plate: ASTM B209ASTM B209M.
      b. Extruded bars, rods, profiles, and tubes: ASTM B221ASTM B221M.
      c. Extruded structural pipe and tubes: ASTM B429.

C. Framing Members:
   1. Extruded aluminum framing members of thickness required and reinforced necessary to support imposed loads:
      a. Construction: Thermal.
      b. Glazing system: Retained mechanically with gaskets on four sides.
      c. Glazing plane: Center.

D. Accessories:
   1. Brackets and reinforcements: High strength aluminum with nonstaining, nonferrous shims for aligning system components.
   2. Fasteners and accessories:
      a. Corrosion resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials:
         1) Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
         2) Reinforce members as required to receive fastener threads.
   3. Concrete and masonry inserts: Hot dip galvanized cast iron, malleable iron, or steel inserts, complying with ASTM A123/A123M or ASTM A153/A153M.
   4. Concealed flashing: Corrosion resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
   5. Framing system gaskets and sealants: Recommended by manufacturer for joint type.

E. Glazing:
   1. Refer to Section 08 80 00: Glazing for impact resistant laminated insulating glass with low-e coating on Number 2 surface:
      a. Glazing gaskets: Compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
      b. Spacers and setting blocks: Elastomeric type.

F. Accessories:
   1. Joint sealants: For installation at perimeter of aluminum framed systems, refer to

Division 07, Thermal and Moisture Protection.

2. Bituminous paint: Cold applied, asphalt mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil 0.762 mm thickness per coat.

2.2 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Framing Members:
   1. Fabricate components that, when assembled, have specified characteristics:
      a. Profiles that are sharp, straight, and free of defects or deformations.
      b. Accurately fitted joints with ends coped or mitered.
      c. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
      d. Physical and thermal isolation of glazing from framing members.
      e. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
      f. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
      g. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
      h. Provide sill receptors with end dams at all sill conditions.

C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

D. Storefront Framing: Fabricate components for assembly using screw spline system.

E. Entrance Door Frames:
   1. Reinforce as required to support loads imposed by door operation and for installing entrance door hardware:
      a. At exterior doors, provide weather stripping at fixed stops.
      b. At interior doors, provide weather stripping at stops to prevent metal to metal contact.

F. Entrance Doors:
   1. Reinforce doors as required for installing entrance door hardware:
      a. At pairs of exterior doors, provide compression type weather stripping retained in adjustable strip and mortised into door edge.
      b. At exterior doors, provide weather sweeps applied to door bottoms.

G. After fabrication, clearly mark components to identify their locations in Project according to shop drawings.

2.3 ALUMINUM FINISHES

A. Class I, Clear Anodic Finish (#14): AA-M10C21A41 / AA-M45C22A41, 0.018 mm or thicker.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum framed systems by field measurements before fabrication and indicate measurements on shop drawings.

3.2 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and conditions affecting performance of the work. Proceed with installation after correcting unsatisfactory conditions.

3.3 INSTALLATION

A. Comply with aluminum framed storefront manufacturer recommended installation instructions. Coordinate installation with curtain wall work:
   1. Do not install damaged components.
   2. Fit joints to produce hairline joints free of burrs and distortion.
   3. Rigidly secure nonmovement joints.
   4. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
   5. Seal joints watertight unless otherwise indicated.
   6. Min anchorage #8 with two-inch (2”) minimum embedment; minimum two inches (2”) from edges. Refer to shop drawings.

B. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07, Thermal and Moisture Protection to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing specified in Section 08 80 00: Glazing.

G. Entrance Doors and Hardware:
   1. Install doors to produce smooth operation and tight fit at contact points:
      a. Exterior doors: Install to produce weathertight enclosure and tight fit at weather stripping.
      b. Field installed entrance door hardware: Install surface mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07, Thermal and Moisture Protection to produce weathertight installation.

3.4 ERECTION TOLERANCES

A. Install aluminum framed systems to comply with the following maximum erection tolerances:
   1. Location and plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
   2. Alignment:
      a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).

b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.5 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer:
   1. For entrance doors accessible to people with disabilities, adjust closers to provide a three (3) second closer sweep period for doors to move from a 70-degree open position to three inches (75 mm) from the latch, measured to the leading door edge.

3.6 MAINTENANCE SERVICE

A. Entrance Door Hardware:
   1. Maintenance tools and instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
   2. Initial maintenance service: Beginning at Substantial Completion, provide six (6) months full maintenance by skilled employees of entrance door hardware installer. Include quarterly preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

END OF SECTION 08 41 13

SECTION 08 71 00 DOOR HARDWARE

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 commercial door hardware for the following:
   1. Swinging doors.

B. Related Sections:
   1. Section 08 11 13: Hollow Metal Doors and Frames.

C. Reference Standards:
   1. Comply with the version year adopted by the Authority Having Jurisdiction.
      a. CBC – California Building Code 2022 ed.: Section 11B-404.
      b. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
      c. NFPA 70 - National Electrical Code.
      d. NFPA 80 - Fire Doors and Windows.
      e. NFPA 101 - Life Safety Code.
      f. NFPA 105 - Installation of Smoke Door Assemblies.
      g. State Building Codes, Local Amendments, if applicable.
   2. Standards: All hardware specified herein shall comply with the following industry standards:
      a. ANSI/BHMA Certified Product Standards - A156 Series
      b. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 DEFINITIONS

A. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.

1.4 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
   3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

D. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.6 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: Two years from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
1. Locksets; Three (3) years
2. Extra Heavy Duty Cylinder Locks: Seven (7) years
3. Exit Devices: Three (3) years mechanical, one (1) year electrical.
4. Closures: Ten (10) years mechanical, One (1) year electrical.
5. Hinges: One (1) year.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.8 REGULATORY REQUIREMENTS:

A. Doors and doorways as part of an accessible route shall comply with CBC Sections 11B-404.

B. Locate latching hardware between 34 inches to 44 inches above the finished floor, per 2022 California Building Code, Section 11B-404.2.7.
   1. Panic hardware: locate between 36 inches to 44 inches above the finished floor.

C. 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. 2022 California Building Code Section 11B-309.4.
   2. Force required to activate the operable parts: 5.0 pounds maximum, per 2022 California Building Code Section 11B-309.4.

D. 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 2022 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.

E. Low-energy powered doors: comply with ANSI A156.19. Reference: 2022 California Building Code Section 11B-404.2.9, Exception 2.
   1. Where powered door serves an occupancy of 150 or more, provide back-up battery power or stand-by generator power, capable of supporting a minimum of 100 cycles.
   2. Actuators, vertical bar type: minimum 2-inches wide, 30-inches high, bottom located minimum 5-inches above floor or ground, top located minimum 35-inches above floor or ground. Displays International Symbol of Accessibility, per 2022 California Building Code Section 11B-703.7.
   3. Actuators, plate type: use two at each side of the opening. Minimum 4-inches diameter or 4-inches square. Displays International Symbol of Accessibility, per 2022 California Building Code Section 11B-703.7. Locate centerline of lower plate between 7- and 8-inches above floor or ground, and upper plate between 30- and 44-inches above floor or ground.
   4. Actuator location: conspicuously located, clear and level floor/ground space for forward or parallel approach.

F. 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 2022 California Building Code Section 11B-404.2.8.
1. Spring hinges: adjust for 1.5 seconds minimum for 70 degrees to fully-closed.

G. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2022 California Building Code Section 11B-404.2.10.
1. Applied kickplates 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.

H. 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. 2022 California Building Code Section 11B-404.2.3.
1. Exception: In alterations, a projection of 5/8 inch (15.9 mm) maximum into the required clear width shall be permitted for the latch side stop.
2. Door closers and overhead stops: not less than 78 inches above the finished floor or ground, per 2022 California Building Code 11B-307.4.

I. Thresholds**:** floor or landing no more than 0.50 inches below the top of the threshold of the doorway, per 2022 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). 2022 California Building Code Section 11B-303.2 & ~.3.

J. Floor stops**:** Do not locate in path of travel. Locate no more than 4 inches from walls.

K. 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 2022 California Building Code Section 11B-703.4.2.

L. Door and door hardware encroachment**:** when door is swung fully-open into means-of-egress path, the door may not encroach/project more than 7 inches into the required exit width, with the exception of door release hardware such as lockset levers or panic hardware. These hardware items must be located no less than 34-inches and no more than 48-inches above the floor/ground. 2022 California Building Code, Section 1005.7.1.
1. In I-2 occupancies, latch release hardware is not permitted to project in the required exit width, regardless of its mounting height, per 2022 California Building Code, Section 1005.7.1 at Exception 1.

PART 2 PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers'

names are abbreviated in the Door Hardware Schedule.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Continuous Hinges – ANSI 156.26 for 150 pounds/UL10C certified.
   1. Ives - 224HD (at all locations).
      a. Finish: CL.
      b. For 1 ¾” doors, 48” maximum door width. For doors weighing up to 450 pounds without reinforcing, 600 pounds with reinforcing.
      c. 12-24 x ¾” steel stelf-drilling/self-tapping Philips head screw.
      d. 5/16” clearance for square edge door.
      e. 11/32” clearance for beveled edge door.

2.3 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years’ experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, Schlage; unless otherwise indicated.

C. Cylinders - Original manufacturer cylinders complying with the following:
   1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
   2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
   4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
   5. Keyway: Match Facility Standard.

D. Keying System: Schlage Primus Patented (Verification and Keying by District).
   1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
   2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by District.
   3. Existing System: Key locks to Owner's existing system.

E. Key Quantity - Provide the following minimum number of keys:
   1. Change Keys per Cylinder: Two (2)
   2. Master Keys (per Master Key Level/Group): Five (5).
   3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):
   1. Provide keying transcript list to District representative in the proper format for importing into key control software.
   2. Provide transcript list in writing or electronic file as directed by the District.

2.4 MECHANICAL LOCKS AND LATCHING DEVICES

A. Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
   1. Acceptable Manufacturers:
      a. Schlage:
         1) ND Series x Rhodes:
            a) ND10S Passage Lock.
            b) ND40S Privacy Lock.
            c) L9485x06AxL283-722 Faculty Restroom Lock (Faculty – single compartment toilet) – Finish: 626.
            d) ND91PD Office Lock.
            e) ND96PD at IDF/Cust/Fire Riser/Elec. Rooms.
            f) ND95PD Classroom Security Lock: At Middle and High Schools.

2.5 PADLOCK

A. Schlage: KS43D2200 (Padlock) – Finish: Brass.

2.6 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
   3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
   4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards - Comply with the following:
   1. Strikes for Mortise Locks and Latches: ANSI/BHMA A156.13.
   2. Strikes for Bored Locks and Latches: ANSI/BHMA A156.2.
   3. Strikes for Auxiliary Deadlocks: ANSI/BHMA A156.36.
   4. Dustproof Strikes: ANSI/BHMA A156.16.

2.7 FLUSH BOLTS

A. Approved Manufacturer – Ives - Finish: US26D.
   1. FB31P: Automatic, metal doors, storage and utility rooms.
   2. FB51P: Manual, metal doors, storage and utility rooms.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
   1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
   2. Where exit devices are required on fire rated doors, provide devices complying with

NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
6. Vertical Rod Exit Devices: Where concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
7. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
8. Rail Sizing: Provide exit device rails factory sized for proper door width application.
9. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Approved Products – Von Duprin:
   1. CD-AX-99NLx910NL Ives "Vandal Resistant Trim Pull" – Finish: US26D.
   2. CD-AX-99NLx910NL Ives "Trim Pull" x AX-99DTx910DT "Pull" x SNB x KR4954 Mullion x 154 (at pairs) – Finish: US26D.
   3. AX-99L-2-F-996L (F-rated single doors) – Finish: US26D.
   4. AX-99L-2-F-996L x AX99EO-F x KR9954 Mullion x 154 (F pairs) – Finish: US26D.

2.9 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:
   1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
   2. Standards: Closers to comply with UL 10C for Positive Pressure Fire Test and be UL listed for use of fire rated doors.
   3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
   4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ICC/ANSI A117.1.
   5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
   6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
   7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
   8. Door closers to comply with 11B-404.2.8.1.

B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 certified surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and

opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard. Furnish and install all door closers with thru bolts. All door frames to be reinforced for soffit shoe:

1. Acceptable Manufacturers - Basis of Design:
   a. LCN: 4040 Super Smoothie RW/PA/TB.
      1) Finish: 689.

C. Coordinator Use coordinator only where required by fire code.
   1. Ives – COR x FL x MB (Storage & Utility Rooms) – Finish: USP.

2.10 DOOR STOPS AND HOLDERS

A. Stop Holders – Ives:
   1. FS43 (Automatic Door Stops and Holders) – Finish: US26D.
   2. FS436/R435 (Interior Floor Stop) – Finish: US26D.

2.11 PROTECTIVE PLATES AND TRIM

A. Kick Plate – Ives -8400 Series. Finish: US26D.

B. Mop Plate – Ives – 8400 Series. Finish: US26D.

C. Push/Pull Plates – Ives – 8200/8300 Series. Finish: US26D.

D. Latch Protector – Ives – LG12. Finish: US32D.

E. Door Silencer – Ives – SR64. Finish: Gray.

2.12 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
   1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL 10C.
   1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Weatherstripping:
   1. Manufacturer: Pemco.
      a. Alternate: Zero.

2. Model: 319N
3. Finish: Clear Anodized w/ Black EPDM insert.

F. Thresholds - Must comply “Path of Travel” requirements and CBC Section 11B-404.2.5:
1. Manufacturer: Pemko.
   a. Alternate: Zero.
2. Model Series: 170
3. Finish: Aluminum.

G. On all exterior doors exposed to weather (No cover) provide Rain Guard full width of door.

2.13 ACCESSORIES

A. Automatic Door Bottom – Pemko –. Finish: Clear.

B. Door Sweep – Pemko – Finish: Clear.

C. Meeting Stiles – Pemko 319N:
1. Finish: Clear.

D. Head and Jamb – Pemko 319N – Clear alum finish.

E. Rain Edge – Pemko 346 (Rain drip) Clear alum finish.

2.14 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 EXECUTION

3.1 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field

modifications.

3.2 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
   1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. Where indicated to comply with accessibility requirements, CBC Section 11B-404.2.7 and 11B-309.4 for mounting heights, and/or comply with ICC/ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
   3. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds in full bed of butyl-rubber or polyisobutylene mastic sealant, complying with requirements in Division 07: Thermal and Moisture Protection. Use ¼ inch fasteners, red-head flat-head sleeve anchors (SS/FHSL).

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to

ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

3.9 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

HARDWARE GROUP NO. 01 (SINGLE OCCUPANCY RESTROOMS)

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

DESCRIPTION	CATALOG NUMBER		
CONT. HINGE	IVES 224XY-83”	US28	
LOCKSET	SCHLAGE L9485P 06A LH L283-722	626	
SURFACE CLOSER	LCN 4040XP RW/PA AL	AL	
KICK PLATE	IVES 8400 10X34	US32D	
FLOOR DOOR STOP	IVES FS438	US26D	
THRESHOLD	PEMKO 2716	A	
GASKETING	188SBK PSA	BK	ZER

HARDWARE GROUP NO. 02 (GANG RESTROOMS)

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

DESCRIPTION	CATALOG NUMBER

CONT. HINGE	IVES 224XY-83” US28	US28	
DEAD LOCK	SCHLAGE B663P 626	626	
DOOR PULL	IVES 8302-4”X16” (0 DOOR THICKNESS)	US32D	
PUSH PLATE	IVES 8200 4”X16” (0 DOOR THICKNESS)	US32D	
SURFACE CLOSER	LCN 4040XP RW/PA AL	AL	
KICK PLATE	IVES 8400 10X34	US32D	
FLOOR DOOR HOLDER	IVES FS43	US26D	
THRESHOLD	PEMKO 2716	A	
GASKETING	188SBK PSA	BK	ZER

END OF SECTION 08 71 00

SECTION 08 80 00 GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
1. Float glass.
2. Tempered glass.
3. Reflective glass.
4. Spandrel coated glass.
5. Insulated glass.
6. Laminate glass.
7. Fire resistive glazing.
8. Spandrel glazing.
9. Glazing sealants.
10. Glass film overlay.
11. Insulated metal panel.
12. Accessories necessary for a complete installation.

1.3 DEFINITIONS

A. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C1036.

B. Interspace: Space between lites of an insulating glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design glass panels including comprehensive engineering analysis by a qualified professional engineer lawfully licensed in the State of California, using performance requirements and design criteria indicated.

B. Installed Glazing: Design glazing systems to withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

C. Structural Performance:
1. Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the CBC and ASTM E1300:
a. Design Wind Pressures: Indicated on Structural Drawings.
b. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE 7, based on heights above grade indicated on Drawings:
1) Wind Design Data: As indicated on Drawings.
2) Basic Wind Speed: 100 mph.
3) Importance Factor: 1.0.
2. Exposure Category: C.

3. Design Snow Loads: Indicated on Drawings.
4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
5. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
6. Maximum Lateral Deflection: For glass supported on all four edges, limit center of glass deflection at design wind pressure to not more than 1/50 times the short side length or 1-inch, whichever is less.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II. Safety glazing shall have permanent ID per CBC 2406.3 (it not already indicated).

E. Thermal and Optical Performance Properties:
1. Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
a. For monolithic glass lites, properties are based on units with lites 6 mm thick.
b. For laminated glass lites, properties are based on products of construction indicated.
c. For insulating glass units, properties are based on units of thickness indicated for overall unit and for each lite.
d. U-Factors: Center of glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
e. Solar Heat Gain Coefficient and Visible Transmittance: Center of glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
f. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

1.5 SUBMITTALS

A. Product Data: Technical data for each type of product including recommended installation and cleaning procedures.

B. Glass Samples: For each type of glass required. Prepare samples from same material to be used for Work.

C. Glazing Schedule: List glass types and thickness for each size opening and location. Use same designations indicated on Drawings.

D. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Product Certificates:
1. Submit glass product certificates required by Code:
a. Glass Manufacturer Certificate: The glass manufacturer shall submit a letter certifying it has reviewed the glazing details proposed for the project, including the use of gaskets and sealants, and that each product furnished is recommended for the application shown and compliance with the Code.

F. Thermal Stress and Wind Load Analyses:
1. Submit the following from the glass manufacturer:
a. Thermal stress analysis for each exterior glass unit type, each building elevation. The analysis shall clearly indicate the expected service temperature ranges and

the effects of partial and full shading on the glass:

1) Attach to the thermal stress analysis a statement from the glass manufacturer that based upon this analysis that the resulting thermal stresses will not reduce the specified statistical probability of breakage.

2. Wind load analysis for each glass unit type, each building elevation. The analysis shall indicate the statistical probability of breakage at the design wind pressure does not exceed the specified statistical probability of breakage.

G. Product Test Reports:
   1. Submit test reports for insulating glass and glazing sealants, for tests performed by a qualified testing agency:
      a. Glazing Sealants: Provide test reports based on testing current sealant formulations within previous 36 month period.
      b. Glazing Sealants: Preconstruction adhesion and compatibility test report.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with applicable requirements of the CBC for glazing.
   2. Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies:
      a. As a minimum provide Category II materials complying with testing requirements in 16 CFR 1201 (Consumer Product Safety Commission *Safety Standard for Architectural Glazing Materials*, published in the Code of Federal Regulations) and ANSI Z97.1.
      b. Permanently mark safety glass with certification label of Safety Glazing Certification Council.
   3. Insulating Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
   4. Comply with published recommendations of glass product organizations:
      a. GANA: Glazing Manual.
      b. IGMA: SIGMA TM-3000 Vertical Glazing Guidelines.
      c. GANA: Laminated Glazing Reference Manual.
      d. AAMA: AAMA GDSG-1 Glass Design for Sloped Glazing.
      e. AAMA: TIR A7 Sloped Glazing Guidelines.
      f. IGMA for Sloped Glazing: IGMA TB-3001 Guidelines for Sloped Glazing.
      g. IGMA for Insulating Glass: SIGMA TM-3000 North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use.
   5. Fire Rated Door Assemblies: Assemblies complying with NFPA 80 listed and labeled by UL for fire ratings indicated, based on testing according to NFPA 252.
   6. Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated:
      a. Minimum Glass Thickness for Exterior Lites: 1/4 inch (6 mm).
      b. Thickness of Tinted Glass: Provide same thickness for each tint color indicated.
   7. Where annealed float glass is indicated, provide annealed float glass, heat strengthened float glass, or fully tempered float glass necessary to comply with performance requirements:
      a. Where heat strengthened float glass is indicated, provide heat strengthened float glass or fully tempered float glass necessary to comply with performance requirements.
      b. Where fully tempered float glass is indicated, provide fully tempered float glass.

B. Manufacturer Qualifications for Insulating Glass Units with Sputter Coated, Low E Coatings: Insulating glass manufacturer who is approved and certified by coated glass manufacturer.

C. Installer Qualifications, Glazer: Experience entity having minimum 5 years documented experience and who employs glass installers certified under the National Glass Association's Certified Glass Installer Program.

D. Installer Qualifications, Decorative Film: Experience entity having minimum 5 years documented experience in the installation of glass films.

E. Source Limitations for Glass and Glass Accessories: Obtain each type of glass and glass accessories from a single source.

F. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

G. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

H. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

I. Install glazing in mockups specified to match glazing systems required for Project, including glazing methods:
   1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

J. Preconstruction Adhesion and Compatibility Testing:
   1. Test each glass product, tape sealant, gasket, glazing accessory, and glass framing member for adhesion to and compatibility with elastomeric glazing sealants:
      a. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
      b. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
      c. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
      d. Schedule enough time for testing and analyzing results to prevent delaying the Work.
      e. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

K. Pre-installation Conference: Conduct conference at site.

1.7 WARRANTY

A. Written warrant, executed by glass manufacturer agreeing to repair or replace **glass** units that fail in materials and workmanship or deteriorate within warranty period. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to decorative glass manufacturer's published instructions:
   1. Warranty Period: Five (5) years from date of Substantial Completion.

B. Written warranty signed by manufacturer in which glass manufacturer agrees to replace **coated glass** units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in

coating:
1. Warranty Period: Ten (10) years from date of Substantial Completion.

C. Written warranty signed by manufacturer in which manufacturer agrees to replace **laminated glass** units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard:
1. Warranty Period: Ten (10) years from date of Substantial Completion.

D. Written warranty signed by manufacturer in which manufacturer agrees to replace **insulating glass** units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass:
1. Warranty Period: Ten (10) years from date of Substantial Completion.

E. Written warranty signed by **glass film** manufacturer and installer in which manufacturer and installer agree to replace glass film that crack, peel, delaminate, discolor, change appearance, or failure to meet solar criteria within specified warranty period:
1. Warranty Period: Five (5) years from date of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by manufacturer.

D. Exercise exceptional care to prevent edge damage to glass, and damage/deterioration to coating on glass.

E. Comply with insulating glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
1. Glass:
   a. Vitro Architectural Glass (Basis of Design).
   b. AGC Glass Company North America, Inc.
   c. Cardinal Glass Industries.
   d. Guardian Industries Corp.;
   e. Pilkington North America.
   f. Viracon.

2. Fire Protection Rated Glazing:
   a. AGC Glass Company North America, Inc.
   b. Pilkington North America.
   c. SAFTI FIRST Fire Rated Glazing Solutions.
   d. Schott North America, Inc.
   e. Technical Glass Products.
3. Fire Resistive rated glazing
   a. AGC Pyrobel by McGrory Glass
4. Security Glazing
   f. DefendED by McGrory Glass
5. Glass Film:
   a. 3M Construction Markets Division. http://www.3m.com
   b. Bekaert Specialty Films. http://www.solargard.com
   c. Madico.http://www.madico.com

B. Ultraclear Float Glass: ASTM C1036, Type I, Class I (clear), Quality-Q3.

C. Fully Tempered Float Glass:
   1. ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3:
      a. Fabrication Process: By horizontal (roller hearth) process with roll wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Pyrolytic Coated, Low Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.

E. Ceramic Coated Vision Glass: ASTM C1048, Condition C, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3; and complying with Specification No. 95-1-31 in GANA *Engineering Standards Manual*.

F. Adhered Backing:
   1. Adhered scrim backing to ceramic coated surface; provide backed units identical to materials which, while possibly developing cracks and fissures, show no shear nor develop any openings large enough for the unobstructed penetration of 3 inch diameter sphere when tested by approved independent testing laboratory:
      a. Mount test specimens consisting of 3 glass assemblies, 34" x 76" (plus zero or minus 3/16 inch), for testing as specified in ANSI Z-97.1.
      b. Expose specimens to 100 cycles of the following conditions:
         1) 1 hour at 0 degrees F, ambient humidity.
         2) 3 hours increase from 0 degrees F to 140 degrees F, 95 to 100 percent relative humidity.
         3) 1 hour at 140 degrees F, 95 to 100 percent relative humidity.
         4) 3 hours decrease from 140 degrees F to 0 degrees F, ambient humidity.
      c. Break glass by spring loaded prick punch at midpoint of either vertical edge.
      d. After breaking glass, subject it to pressure of 4 lbf per sq. ft. for 5 minutes to simulate wind load.
      e. Inorganic Opacifier: Provide polyethylene opacifier where no insulation and other backing material is applied directly to spandrel glass. Use polyester where direct attachment does occur.
      f. Fallout Resistance: Provide spandrel units identical to those passing fallout resistance test for spandrel glass specified in ASTM C1048.

2.2 LAMINATED GLASS

A. ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or

lose physical and mechanical properties after fabrication and installation:

1. Construction: Laminate glass with cast in place and cured transparent resin interlayer to comply with interlayer manufacturer's written instructions.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Thickness: 0.090-inch.
4. Interlayer Color: Clear unless otherwise indicated.

B. Windborne Debris Impact Resistant Laminated Glass: Comply with requirements for laminated glass except laminate glass with ionomeric polymer interlayer to comply with interlayer manufacturer's written instructions:

2.3 INSULATING GLASS

A. Factory assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190.

B. Performance Properties:

1. Basis of Design Product: Vitro Architectural Glass: Tint Color **Solargray**
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 1/4 inch.
4. Outdoor Lite: Fully tempered float glass.
5. Interspace Content: Air.
6. Indoor Lite: Fully tempered float glass.
7. Safety glazing required.

C. Sealing System:

1. Dual seal, with polyisobutylene and silicone primary and secondary sealants:
   a. Spacer: Aluminum with black, color anodic finish. Thermally broken aluminum.
   b. Manufacturers: Subject to compliance with requirements, provide products by Technoform Glass Insulation NA, Inc.
   c. Desiccant: Molecular sieve or silica gel, or a blend of both.

D. Fire Protection Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire protection ratings indicated, based on positive pressure testing according to NFPA 257 or UL 9, including the hose stream test, and complying with NFPA 80. For ratings 60 minutes or greater, glazing shall meet the test requirements of ASTM E119 or UL 263.

E. Fire Protection Rated Glazing Labeling: Permanently mark fire protection rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction indicating manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 degrees F (250 degrees C) temperature rise limitation; and the fire resistance rating in minutes.

F. Film Faced Ceramic Glazing: Clear, ceramic flat glass; 5 mm thickness; faced on one surface with a clear glazing film; and complying with 16 CFR 1201, Category II.

2.4 GLAZING ACCESSORIES

A. Compatibility: Provide glazing sealants compatible with one another and with other materials in contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of service and application, demonstrated by sealant manufacturer based on testing and field experience.

B. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

C. Colors of Exposed Glazing Sealants: Selected by Architect.

D. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Dow Corning Corporation.
      b. GE Construction Sealants; Momentive Performance Materials Inc.
      c. May National Associates, Inc.; a subsidiary of Sika Corporation.
      d. Pecora Corporation.
      e. Sika Corporation.

E. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. BASF Corporation; Construction Systems.
      b. Dow Corning Corporation.
      c. GE Construction Sealants; Momentive Performance Materials Inc.
      d. May National Associates, Inc.; a subsidiary of Sika Corporation.
      e. Pecora Corporation.
      f. Polymeric Systems, Inc.
      g. Sika Corporation.

F. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use NT:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Bostik, Inc.
      b. Dow Corning Corporation.
      c. GE Construction Sealants; Momentive Performance Materials Inc.
      d. May National Associates, Inc.; a subsidiary of Sika Corporation.
      e. Polymeric Systems, Inc.
      f. Schnee-Morehead, Inc., an ITW company.
      g. Sika Corporation.

G. Glazing Sealant - Acid curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use NT:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. BASF Corporation; Construction Systems.
      b. Bostik, Inc.
      c. Dow Corning Corporation.
      d. GE Construction Sealants; Momentive Performance Materials Inc.
      e. May National Associates, Inc.; a subsidiary of Sika Corporation.
      f. Pecora Corporation.
      g. Polymeric Systems, Inc.
      h. Schnee-Morehead, Inc., an ITW company.
      i. Sika Corporation.

H. Glazing Sealants for Fire rated Glazing Products - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and

glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated:

1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
   a. Dow Corning Corporation.
   b. GE Construction Sealants; Momentive Performance Materials Inc.
2. Colors of Exposed Glazing Sealants: Selected by Architect.

I. Back Bedding Mastic Glazing Tapes:

1. Preformed, butyl based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
   a. Tape, where indicated.
   b. Tape, for glazing applications in which tape is subject to continuous pressure.
   c. Tape, for glazing applications in which tape is not subject to continuous pressure.

J. Expanded Cellular Glazing Tapes:

1. Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
   a. Type 1, for glazing applications in which tape acts as the primary sealant.
   b. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

K. Miscellaneous Glazing Accessories:

1. Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with proven record of compatibility with surfaces contacted in installation:
   a. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
   b. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
   c. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
   d. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
   e. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
   f. Perimeter Insulation for Fire Resistive Glazing: Product approved by testing agency listed and labeled fire resistant glazing product with which it is used for application and fire protection rating indicated.

2.5 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements:

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components:
   a. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.
2. Edge and Surface Conditions: Comply with the recommendations of AAMA *Structural Properties of Glass* for clean cut edges, except comply with manufacturer's recommendations.

3. Exposed Glass Edges and Surface Condition: Finish edges flat with an arrissed edge profile (small bevel of uniform width not exceeding 1.5 mm at an angle of approximately 45 degrees to the surface of the glass) with polished (surface is reflective in appearance similar to the major surface of the glass) surface.

B. Cutting: Wheel cut or sawed edges and seamed at manufacturer's option. For site cut glass, provide glass 2 inches larger than required in both dimensions to facilitate cutting of clean cut edges without the necessity of seaming or nipping. Do not cut, seam, nip or abrade heat treated glass.

C. Butt Glazing: Clean cut or flat grind vertical edges of butt glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

D. Edges: Grind smooth and polish exposed glass edges and corners.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Environmental Limitations:
1. Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes:
   a. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 degrees F (4.4 degrees C).

B. Field Measurements: Verify actual dimensions of openings and construction contiguous with decorative glass by field measurements before fabrication.

3.2 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

3.3 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation after correcting unsatisfactory conditions.

3.4 PREPARATION

A. Clean glazing channels and framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates:
1. Comply with manufacturer instructions for wiping of surfaces immediately before application of primers.
2. Wipe metal surfaces with IPA (isopropyl alcohol) unless otherwise required by compatibility and adhesion testing results.

B. Inspect each piece of glass immediately before installation. Do not install pieces improperly sized or with damaged edges, scratches, abrasion, or evidence damage. Remove labels from glass immediately after installation.

C. Examine glazing units to locate exterior and interior surfaces. Label or mark units so exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

D. Seal vent (breather or capillary) tubes in insulating glass units in accordance with insulating glass manufacturer written recommendations.

E. Glass Film Preparation:
   1. Remove particulate matter on the glass surface using a scraping blade.
   2. Place an absorbent towel on window sill or sash to absorb moisture generated by the film application.

3.5 GLAZING

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm):
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8 inch (3 mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when

installation is subjected to movement:

1. Square cut wedge shaped gaskets at corners and install gaskets as recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

K. Tape Glazing:
   1. Position tapes on fixed stops so that, when compressed by glass, the exposed edges are flush with or protrude slightly above sightline of stops:
      a. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make tapes fit opening.
      b. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
      c. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
      d. Do not remove release paper from tape until right before each glazing unit is installed.
      e. Apply heel bead of elastomeric sealant.
      f. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
      g. Apply cap bead of elastomeric sealant over exposed edge of tape.

L. Gasket Glazing (Dry):
   1. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation:
      a. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
      b. Installation with Drive in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
      c. Installation with Pressure Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
      d. Install gaskets to protrude past face of glazing stops.

M. Sealant Glazing (Wet):
   1. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance:
      a. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
      b. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

N. Erection Tolerances:
1. Maximum Deviation from Vertical: 1/8 inch in any story and 1/4 inch in any 45 foot run.
2. Maximum Deviation from Horizontal: 1/8 inch in any 30 foot run.
3. Maximum Deviation from True Alignment: 1/32 inch for any two (2) abutting units. Allow no edge projections.
4. Maximum Joint Gap: 1/32 inch.

O. Insulating-Glass Units
1. Location: Storefront Window A
2. Double Glazed Tinted Solar Control Insulating Glass Unit [Solarban®70 on Solexia® 1/4" | Air 1/2" (12.7mm) | Clear 1/4"
   a. Conformance: ASTM E2190.
   b. Outdoor Lite: Solexia® Tinted Float Glass as manufactured by Vitro Architectural Glass:
      1) Conformance: ASTM C1036, Type 1, Class 2, Quality q3.
      2) Glass Thickness: 1/4"
      3) Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C1376.
      4) Coating: Solarban® 70 on Surface # 2
      5) Heat-Treatment: Tempered; ASTM C1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201
      6) Interspace Content: Air 1/2"
   c. Indoor Lite:
      1) Clear float glass as manufactured by Vitro Architectural Glass:
         a) Conformance: ASTM C1036, Type 1, Class 1, Quality q3.
         b) Heat-Treatment: Tempered; ASTM C1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201
         c) Glass Thickness: 1/4"
   d. Performance Requirements:
      1) Visible Light Transmittance: 56 percent minimum.
      2) Winter Nighttime U-Factor: 0.28 (Btu/hr*ft2*°F) maximum.
      3) Solar Heat Gain Coefficient: 0.25 maximum.
      4) Outdoor Visible Light Reflectance: 11 percent maximum.
      5) Indoor Visible Light Reflectance: 14 percent maximum.

P. Insulating-Glass Units
1. Location: Storefront Window B (Clerestory)
2. Double Glazed Tinted Solar Control Insulating Glass Unit [Solarban® 90 on Solexia® 1/4" (2) | Air 1/2" (12.7mm) | Clear 1/4"
   e. Conformance: ASTM E2190.
   f. Outdoor Lite: Solexia® Tinted Float Glass as manufactured by Vitro Architectural Glass:
      1) Conformance: ASTM C1036, Type 1, Class 2, Quality q3.
      2) Glass Thickness: 1/4"
      3) Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C1376.
      4) Coating: Solarban® 90 on Surface # 2
      5) Heat-Treatment: Tempered; ASTM C1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201
      6) Interspace Content: Air 1/2"
   g. Indoor Lite:
      1) Clear float glass as manufactured by Vitro Architectural Glass:
         a) Conformance: ASTM C1036, Type 1, Class 1, Quality q3.

b) Heat-Treatment: Tempered; ASTM C1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201]
c) Glass Thickness: 6mm 1/4"

h. Performance Requirements:
1) Visible Light Transmittance: 44 percent minimum.
2) Winter Nighttime U-Factor: 0.29 (Btu/hr*ft2*°F) maximum.
3) Solar Heat Gain Coefficient: 0.22 maximum.
4) Outdoor Visible Light Reflectance: 10 percent maximum.
5) Indoor Visible Light Reflectance: 19 percent maximum.

3.6 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains:
1. If contaminating substances come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

PART 4 SCHEDULE

4.1 GLAZING SCHEDULE (REMOVE UNSELECTED GROUPS FROM SECTION)

A. G-1 Insulated Glass: 1 inch (25 mm) sealed insulated unit consisting of an exterior lite of 1/4 inch (6 mm) low-e tinted tempered float glass, 1/2 inch gas filled air space, and 1/4 inch (6 mm) clear tempered float glass interior lite. (Refer to section 3.5O)

B. G-2 Insulated Glass (Clerestory): 1 inch (25 mm) sealed insulated unit consisting of an exterior lite of 1/4 inch (6 mm) low-e tinted tempered float glass, 1/2 inch gas filled air space, and 1/4 inch (6 mm) clear tempered float glass interior lite. (Refer to section 3.5P)

END OF SECTION 08 80 00

SECTION 09 21 16 GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Gypsum Board.
   2. Reinforced Gypsum Board Sheathing (Tile Backer Board).
   3. Cementitious Backer Units.
   4. Impact Resistant Gypsum Board.
   5. Accessories necessary for a complete installation.

B. Related Sections:
   1. Section 06 10 00: Rough Carpentry.
   2. Section 08 11 13: Hollow Metal Doors and Frames.
   3. Section 08 31 13: Access Door and Frames.
   4. Section 09 90 00: Painting and Coating.

1.3 PERFORMANCE REQUIREMENTS

A. Comply with manufacturer's load tables and the following design pressures and deflections:
   1. Stairs, Elevator Hoistways, and Vertical Shafts: 1/120 at 10 psf.
   2. Ground Floor Lobbies: 1/120 at 15 psf.
   3. Partitions Receiving Lath and Plaster, or Plaster Veneer: 1/360 at 15 psf.
   4. Partitions Receiving Monitors, Televisions, Heavy Audio/Visual Equipment: 1/360 at 15 psf.
   5. Typical Partitions: 1/240 at 5 psf.
   6. Other Partitions: 1/240 at 5 psf.
   7. Maximum Deflection:
      a. L/240 at 5 lbf per sq. ft.
      b. L/120 at 5 lbf per sq. ft.
      c. L/120 at 7.5 lbf per sq. ft.
      d. L/120 at 10 lbf per sq. ft.

B. Fire Resistance Rated Assemblies: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

C. STC Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

1.4 SUBMITTALS

A. Product Data: Submit For each type of drywall including calculations for loadings and stresses of exterior walls and specially fabricated framing based on manufacturer’s load tables.

B. Shop Drawings: Indicate locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

C. Samples:
1. Trim Accessories: Full size Sample in 12-inch (300 mm) long length for each trim accessory indicated.
2. Textured Finishes: 12 inches by 12 inches (300 mm by 300 mm) for each textured finish indicated and on same backing indicated for Work.

D. Calculations: Submit calculations verifying steel partition stud minimum base metal thickness and depth compliance with Code and ASTM C645 for height, load, and deflection.

E. Evaluation Reports: ICC-ES reports for dimpled steel studs and runners and firestop tracks.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
1. California Building Code (CBC) (CCR Title 24, Part 2, as adopted and amended by DSA):
   a. CBC– Chapter 7, Fire Resistant Materials and Construction
   b. CBC – Chapter 19A, Concrete
   c. CBC – Chapter 25, Gypsum Board and Plaster.
2. Division of the State Architect, Interpretation of Regulations (DSA-IR):
   a. DSA-IR 25-3, Drywall Ceiling Suspension Conventional Construction-One Layer.
   b. DSA-IR 25-2.13, Metal Suspension Systems for Lay in Panel Ceilings.
3. Fire Resistance Rated Assemblies: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
4. Fire Resistance Rated Assemblies: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. Single Source Responsibility:
1. Wood Framing Members: Refer to drawing S0.03 Standard General Notes.
2. Steel Framing Members: Obtain steel framing members from single manufacturer.
3. Panel Products: Obtain each type of gypsum board and other panel products from single manufacturer.
4. Finishing Materials: To the extent possible, obtain finishing materials from same manufacturer supplying gypsum board products. When not possible, obtain materials from manufacturer acceptable to gypsum board manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
   1. Gypsum Board.
   2. Cementitious Board:
      a. USG Corporation; Durock Brand Cement Board.

B. Gypsum Board - ASTM C1396/C1396M, applicable to type of gypsum board indicated and whichever is more stringent:
   1. Core - Use Type X throughout:
      a. Thickness: 5/8 inch (15.9 mm).
      b. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
   2. Ceiling Type - Manufactured for sag resistance:
      a. Thickness: 1/2 inch (13mm).
      b. Long Edges: Tapered.
   3. Moisture and Mold Resistant Type - Type X with moisture and mold resistant core and surfaces. Core:
      a. Thickness: 5/8 inch (15.9 mm).
      b. Long Edges: Tapered.

C. Impact Resistant Gypsum Board - ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M:
   1. Core and Thickness: 5/8 inch (15.9 mm), Type X.
   2. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
   3. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
   4. Soft Body Impact: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
   5. Hard Body Impact: ASTM C1629/C1629M, meets or exceeds Level 1 requirements according to test in Annex A1.
   6. Long Edges: Tapered.
   7. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

D. Acoustically Enhanced Gypsum Board - ASTM C1396/C1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. National Gypsum Company.
      b. Quiet Solution.
   2. Core: 1-3/8 inch (35 mm), regular type.
   3. Long Edges: Tapered.

E. Reinforced Gypsum Sheathing (Tile Backer Board) - ASTM C1278/C1278M, standard edges. Cellulose fiber reinforced panels may be used in lieu of cementitious board:
   1. Core and Thickness: 1/2 inch (12.7 mm) or 5/8 inch (15.9 mm) to match conditions, Type X.
   2. Long Edge: Tapered.
   3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

F. Glass Mat Gypsum Sheathing Board - ASTM C1177/C1177M, with fiberglass mat laminated to both sides and with standard edges:
   1. Core: Type X
   2. Thickness: 5/8 inch (15.9 mm).
   3. Size: 48 inches by 96 inches (1219 mm by 2438 mm).
   4. Long Edges: Tapered.

G. Cementitious Backer Units - ASTM C1288 or ASTM C1325:
   1. Thickness: 1/2 inch (12.7 mm) and 5/8 inch (15.9 mm) to match conditions.

2. Long Edges: Standard.
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

H. Exterior Gypsum Board For Ceilings and Soffits:
1. Glass Mat Gypsum Sheathing Board: ASTM C1177/C1177M, with fiberglass mat laminated to both sides and with standard edges.
2. Core: 5/8 inch (15.9 mm), Type X.

I. Exterior Trim - ASTM C1047, hot dip galvanized steel sheet, plastic, or rolled zinc:
1. Shapes:
   a. Cornerbead.
   b. LC Bead: J shaped; exposed long flange receives joint compound.
   c. Expansion (Control) Joint: One piece, rolled zinc with V shaped slot and removable strip covering slot opening.

J. Interior Trim - ASTM C1047, galvanized or aluminum coated steel sheet, rolled zinc, plastic, or paper faced galvanized steel sheet:
1. Shapes:
   a. Cornerbead.
   b. Bullnose bead.
   c. LC Bead: J shaped; exposed long flange receives joint compound.
   d. L Bead: L shaped; exposed long flange receives joint compound.
   e. U Bead: J shaped; exposed short flange does not receive joint compound.
   f. Expansion (control) joint.

2. Manufacturers are subject to compliance with requirements; provide products by one of the following:
   a. Pittcon Industries.
   b. Fry Reglet Corp.
   c. Gordon, Inc.

K. Continuous Corner - Extruded Aluminum, continuous integral fin for surface contact with gypsum board; 7/8-inch (22 mm) wide, tapered to edge; punched with holes staggered to accept screw fastening. Prime with corrosion resistant primer. Provide Pittcon Softforms (Basis of Design) or Schluter:
1. Subject to compliance with requirements, provide basis of design or comparable by one of the following:
   a. Pittcon Industries.
   b. Fry Reglet Corporation.
   c. Schluter.

L. Joint Treatment - ASTM C475/C475M:
1. Joint Tape:
   a. Exterior Gypsum Soffit Board: USG Sheetrock Brand Paper Tape.
   b. Glass Mat Gypsum Sheathing Board Exterior Applications: USG Sheetrock Brand Paper Tape.
   c. Interior Gypsum Board: USG Sheetrock Brand Paper Tape.
   d. Cementitious Board: USG Durock Tape.
2. Joint Compound:
   a. Gypsum Board – Prefilling - At open joints, rounded or beveled panel edges, and damaged surface areas, use setting type taping compound: USG Sheetrock Brand Easy Sand Setting-Type Joint Compound:
      1) Embedding and First Coat - For embedding tape and first coat on joints, fasteners, and trim flanges, use setting type taping compound. USG Sheetrock Brand All Purpose Joint Compound:
         a) Use setting type compound for installing paper faced metal trim

accessories: USG Sheetrock Brand All Purpose Joint Compound.
2) Fill Coat: For second coat, use setting type, sandable topping compound: USG Sheetrock Brand Topping Joint Compound.
3) Finish Coat: For third coat, use setting type, sandable topping compound: USG Sheetrock Brand Topping Joint Compound.
4) Skim Coat: For final coat of Level 4 finish, use setting type, sandable topping compound: USG Sheetrock Brand Topping Joint Compound.

b. Cementitious Units: USG Sheetrock Brand Easy Sand Setting-Type Joint Compound.
c. Tile Backing Panels: USG Sheetrock Brand Easy Sand Setting-Type Joint Compound.
d. Water Resistant Gypsum Backing Board: Use setting type taping compound and setting-type, sandable topping compound: USG Sheetrock Brand Easy Sand Setting-Type Joint Compound.
e. Glass Mat Sheathing Board: USG Sheetrock Brand Easy Sand Setting-Type Joint Compound.

M. Auxiliary Gypsum Materials - Comply with referenced installation standards and manufacturer's written recommendations:
1. Steel Drill Screws: ASTM C1002, use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112-inch (0.84 to 2.84 mm) thick.
2. Sound Attenuation Blankets:
a. ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool:
1) Fire Resistance Rated Assemblies: Comply with mineral-fiber requirements of assembly.
3. Acoustical Sealant:
a. Nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90:
1) USG Corporation; Sheetrock Brand Acoustical Sealant

N. Ceiling Suspension Components:
1. Tie Wire Ceiling Grid:
a. USG Corporation; Drywall Suspension System.
b. ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.0625-inch (1.59 mm) diameter wire, or double strand of 0.0475-inch (1.21 mm) diameter wire.
2. Hanger Attachments to Concrete:
a. Anchors: Postinstalled, chemical anchor or postinstalled, expansion anchor fabricated from corrosion resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E488 by an independent testing agency.
b. Powder Actuated Fasteners: Suitable for application indicated, fabricated from corrosion resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E1190 by an independent testing agency.
3. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12 mm) diameter.
4. Carrying Channels: Cold rolled, commercial steel sheet with base metal thickness of 0.0538-inch (1.37 mm) and minimum 1/2-inch (12.7 mm) wide flanges. Depth indicated on Drawings.
5. Furring Channels (Furring Members):

a. Cold Rolled Channels: 0.0538-inch (1.37 mm) bare steel thickness, with minimum 1/2-inch (12.7 mm) wide flanges, 3/4 inch (19.1 mm) deep.
b. Hat Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch (22.2 mm) deep; Minimum base metal thickness of 0.0312 inch (0.79 mm).

6. Resilient Furring Channels: 1/2 inch (12.7 mm) deep members designed to reduce sound transmission. Configuration: Hat shaped.
7. Grid Suspension System for Ceilings: ASTM C645, direct hung system composed of main beams and cross furring members that interlock.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Environmental Limitations:
1. Comply with ASTM C840 for gypsum board manufacturer's written instructions, whichever are more stringent:
a. Do not install paper faced gypsum panels until installation areas are enclosed and conditioned.

B. Room Temperatures: Maintain minimum 40 degrees F (4 degrees C). For adhesive attachment and finishing of gypsum board, maintain minimum 50 degrees F (10 degrees C) for 48 hours before application and continuously after until dry. Do not exceed 95 degrees F (35 degrees C) when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

D. Do not install panels that are wet, moisture damaged, and mold damaged:
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.2 EXAMINATION

A. Examine areas and substrates including welded hollow metal frames, cast in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.4 INSTALLATION

A. Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated.

B. Gypsum Board Assemblies: Comply with requirements in ASTM C840 applicable to framing installation.

C. Suspension System:
   1. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement:
      a. Suspend hangers from building structure:
         1) Install hangers plumb and free from contact with insulation or objects within ceiling plenum that are not part of supporting structural or suspension system. Splay hangers where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
         2) Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices:
            a) Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
         3) Do not attach hangers to steel roof deck.
         4) Do not attach hangers to permanent metal forms. Furnish cast in place hanger inserts that extend through forms.
         5) Do not attach hangers to rolled in hanger tabs of composite steel floor deck.
         6) Do not connect or suspend steel framing from ducts, pipes, or conduit.
      b. Fire Resistance Rated Assemblies: Wire tie furring channels to supports.
      c. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross furring members to each other and butt cut to fit into wall track.

E. Sound Insulation: Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

F. Gypsum Panels:
   1. Comply with ASTM C840. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged:
      a. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
      b. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
      c. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
      d. Form control and expansion joints with space between edges of adjoining gypsum panels.
      e. Cover both faces of support framing with gypsum panels in concealed spaces, except in chases braced internally:
         1) Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
         2) Fit gypsum panels around ducts, pipes, and conduits.
         3) Where partitions intersect structural members projecting below underside of

floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4-inch to 3/8-inch (6.4 mm to 9.5 mm) wide joints to install sealant.

f. Isolate perimeter of gypsum board applied to nonload bearing partitions at structural abutments, except floors. Provide 1/4-inch to 1/2-inch (6.4mm to 12.7mm) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

g. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Gypsum Board:

1. Install interior gypsum board where indicated on drawings:
   a. Single Layer Application:
      1) On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
      2) On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire resistance rated assembly, and minimize end joints. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      3) Fastening Methods: Apply gypsum panels to supports with steel drill screws.
2. Multilayer Application:
   a. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   b. On Z shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
   c. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

H. Backing Panels:

1. Cementitious Backer Units: ANSI A108.11; install where indicated with 1/4-inch (6.4 mm) gap where panels abut other construction or penetrations. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

I. Exterior Gypsum Board Soffits:

1. Apply panels perpendicular to supports, with end joints staggered and located over supports:
   a. Install with 1/4-inch (6.4 mm) open space where panels abut other construction or structural penetrations.
   b. Fasten with corrosion-resistant screws.

J. Trim Accessories:

1. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Attach trim according to manufacturer's written instructions:
   a. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
   b. Exterior Trim: Install in the following locations:
      1) Cornerbead: Use at outside corners.
      2) LC Bead: Use at exposed panel edges.

c. Interior Trim - Install in the following locations:
   1) Cornerbead: Use at outside corners, unless otherwise indicated.
   2) Bullnose Bead: Use at outside corners.
   3) LC Bead: Use at exposed panel edges.
   4) L Bead: Use where indicated or necessary.
   5) U Bead: Use at exposed panel edges.

K. Gypsum Board Finishing:
   1. Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces:
      a. Prefill open joints, rounded or beveled edges, and damaged surface areas.
      b. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
      c. Gypsum Board Finish Levels - Finish panels to levels indicated below and according to ASTM C840:
         1) Level 1: Ceiling plenum areas, concealed areas, and where indicated.
         2) Level 2: Panels that are substrate for tile.
         3) Level 3: Surfaces be coated with drywall primer prior to final finishes. Heavy or medium texture finishes before final painting, or where heavy-grade wall coverings are to be applied as the final decoration. This level of finish is not recommended where smooth painted surfaces, or light to medium weight wall coverings as specified.
         4) Level 4: For surfaces receiving wall covering and flat paints.
         5) Level 5: For surfaces receiving gloss or semigloss paint and surfaces subjected to severe lighting. To be used in Kitchen areas and food service areas only.
      d. Glass Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
      e. Glass Mat Faced Panels: Finish according to manufacturer's written instructions.

L. Installation Tolerances:
   1. Suspension System: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.
   2. Installation Tolerances, Suspension System: Install suspension systems level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged:
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 21 16

SECTION 09 24 10 CEMENT PLASTERING (PATCH AND REPAIR)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Requirements including but not limited to:
   1. Exterior cement plaster repair.
   2. Metal lath and furring.
   3. Accessories necessary for a complete installation.

B. Related documents:
   1. Section 02 41 19: Selective Demolition.
   2. Section 06 10 00: Rough Carpentry.
   3. Section 09 90 00: Painting and Coatings.

1.3 SUBMITTALS

A. Product Data: Submit technical data for product and accessory, including construction details and material descriptions.

B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Building Code: Comply with applicable provisions of the California Building Code (CBC) (CCR Title 24, Part 2, as adopted and amended by DSA).
   2. Fire Resistance Ratings: Where indicated, provide cement plaster assemblies identical to those of assemblies tested for fire resistance according to ASTM E 119 by a qualified testing agency.

B. Preinstallation Conference: Conduct conference at site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver cementitious materials in original packages, containers, or bundles, labeled with manufacturer's name, product brand name, and lot number.

B. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.6 PROJECT CONDITIONS

A. Comply with applicable requirements of ASTM C 926.

B. Environmental Requirements: Comply with requirements of referenced plaster application

standards and recommendations of plaster manufacturer for environmental conditions before, during, and after plaster application.

C. Cold Weather Requirements: Provide heat and protection, temporary or permanent, as required to protect each coat of plaster from freezing for at least 24 hours after application. Distribute heat uniformly to prevent concentration of heat on plaster near heat sources; provide deflection or protective screens.

D. Warm Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.

E. Exterior Plasterwork:
1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
2. Apply plaster when ambient temperature is greater than 40 degrees F (4.4 degrees C).
3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

F. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and take precautions necessary to minimize spattering of plaster on adjacent work.

G. Factory Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
1. Metal Lath and Accessories:
   a. Alabama Metal Industries (AMICO).
   b. CEMCO.
   c. ClarkDietrich Building Systems.
   d. Marino/WARE.
   e. Phillips Manufacturing.
2. Plastic Accessories:
   a. Alabama Metal Industries (AMICO).
   b. Phillips manufacturing.
   c. Plastic Components.
   d. Vinyl Corp.
3. Ready Mixed Finish Coat Plaster:
   a. California Stucco Product.
   b. El Rey Solutions.
   c. Omega Products International.
   d. Quikrete.
   e. Shamrock Stucco.

4. Acrylic Based Finish Coat:
   a. California Stucco Product.

b. Dryvit Systems.
c. El Rey Solutions.
d. Finestone, BASF Corp.
e. LaHabra, a brand of Parex USA, Inc.
f. Omega Products International.
g. Senergy, BASF Corp.
h. Sto Corp.

B. Metal Lath:
1. Expanded Metal Lath: ASTM C 847, cold rolled carbon steel sheet with ASTM A 653/A 653M, G60 (Z180), hot dip galvanized zinc coating.
a. Diamond Mesh Lath: Self furring, 3.4 lb/sq. yd. (1.8 kg/sq. m).
b. Comply with DSA IR 25-4 for the installation of Self-Furring Metal Lath.

C. Accessories: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
1. Metal Accessories:
a. Foundation Weep Screed: Fabricated from hot dip galvanized steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating.
b. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot dip galvanized-zinc coating.
c. Outside Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot dip galvanized zinc coating.
d. Cornerbeads: Fabricated from zinc or zinc coated (galvanized) steel.
1) Smallnose cornerbead with expanded flanges; use unless otherwise indicated.
2) Smallnose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing unit masonry corners.
e. Casing Beads: Fabricated from zinc or zinc coated (galvanized) steel; square edged style; with expanded flanges.
f. Control Joints: Fabricated from zinc or zinc coated (galvanized) steel; one piece type, folded pair of unperforated screeds in M shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
g. Expansion Joints: Fabricated from zinc or zinc coated (galvanized) steel; folded pair of unperforated screeds in M shaped configuration; with expanded flanges.
h. Two Piece Expansion Joints: Fabricated from zinc or zinc coated (galvanized) steel; formed to produce slip joint and square edged reveal adjustable from 1/4 to 5/8 inch (6 to 16 mm) wide; with perforated flanges.
2. Plastic Accessories: Manufactured from high impact PVC.
a. Cornerbeads: With perforated flanges.
1) Smallnose cornerbead; use unless otherwise indicated.
2) Bullnose cornerbead, radius 3/4 inch (19 mm) minimum; use at locations indicated on Drawings.
b. Casing Beads: With perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated.
1) Square edge style; use unless otherwise indicated.
2) Bullnose style, radius 3/4 inch (19 mm) minimum; use at locations indicated on Drawings.
c. Control Joints: One piece type, folded pair of unperforated screeds in M shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
d. Expansion Joints: Two piece type, formed to produce slip joint and square edged 1 inch (25 mm) wide reveal; with perforated concealed flanges.

3. Aluminum Reveals and Moldings: Where applicable.
a. Manufacturer: Fry Reglet

b. Width: 2 inch
c. Material: Extruded 6063 T5 Aluminum
d. Finish: Kynar - Silver Satin.
e. Provide all required accessories, moldings, and prefabricated intersection/corner transition pieces for a complete installation.

4. Aluminum Soffit Vents: Where applicable.
   a. Manufacturer: Fry Reglet
   b. Width: 3 inch
   c. Material: Extruded 6063 T5 Aluminum
   d. Finish: Kynar - Silver Satin
   e. Provide all required accessories, moldings, and prefabricated intersection/corner transition pieces for a complete installation.

D. Miscellaneous Materials:
   1. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
   2. Fiber for Base Coat: Alkaline resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in cement plaster.
   3. Bonding Compound: ASTM C 932.
   4. Fasteners for Attaching Metal Lath to Substrates: ASTM C 1063.
   5. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475 inch 1.21 mm diameter unless otherwise indicated.
   6. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
      a. Fire Resistance Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Plaster Materials:
   1. Portland Cement: ASTM C 150/C 150M, Type II.
      a. Color for Finish Coats: Integral color plaster shall match exterior paint color as indicated, provide sample/mock-up for approval by Architect.
   2. Colorants for Job Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color selected by Architect.
   3. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
   4. Sand Aggregate: ASTM C 897.
      a. Color for Job Mixed Finish Coats: White**.**
   5. Exposed Aggregates for Finish Coats: Match existing.
   6. Ready Mixed Finish Coat Plaster: Mill mixed portland cement, aggregates, coloring agents, and proprietary ingredients.
      a. Color: Integral color plaster shall match exterior paint color as indicated, provide sample/mock-up for approval by Architect.
   7. Acrylic Based Finish Coatings: Factory mixed acrylic emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic based finishes.
      a. Color: Integral color plaster shall match exterior paint color as indicated, provide sample/mock-up for approval by Architect.

2.2 PLASTER MIXES

A. Comply with ASTM C 926 for applications indicated.
   1. Fiber Content: Add fiber to base coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. (0.6 kg of fiber/cu. m) of cementitious materials.

B. Base Coat Mixes for Use over Metal Lath: Scratch and brown coats for three coat plasterwork:
   1. Portland Cement Mix:
      a. Scratch Coat: For cementitious material, mix 1 part portland cement and **3/4 to 1-1/2** parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
      b. Brown Coat: For cementitious material, mix 1 part portland cement and **3/4 to 1-1/2** parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

C. Job Mixed Finish Coat Mixes:
   1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and **3/4 to 1-1/2** parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.

D. Factory Prepared Finish Coat Mixes: For ready mixed finish coat plasters or acrylic based finish coatings, comply with manufacturer's written instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the work. Proceed with installation after correcting unsatisfactory conditions.

3.2 PREPARATION

A. Remove plaster to nearest joint where possible. Saw cut joint for patch at location agreed upon with Architect prior to work.

B. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

C. Prepare smooth, solid substrates for plaster according to ASTM C 926.

3.3 INSTALLATION

A. Metal Lath: Install according to ASTM C 1063.
   1. Partition Framing and Vertical Furring: Flat diamond mesh lath.
   2. Horizontal Framing: Flat diamond mesh lath.

B. Accessories: Install according to ASTM C 1063 and at locations indicated on Drawings.
   1. Reinforcement for External (Outside) Corners:
      a. Install cornerbead at exterior corner locations.
      b. Install cornerbead at interior corner locations.
   2. Control Joints: Locate as approved by Architect for visual effect where not illustrated on drawings.
      a. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
         1) Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
         2) Horizontal and Other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).
      b. At distances between control joints of not greater than 12 feet o.c.
      c. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
      d. Where control joints occur in surface of construction directly behind plaster.
      e. Where plasterwork areas change dimensions, to delineate rectangular shaped

areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

f. Where plasterwork repair involves any of the above referenced conditions.

3.4 PLASTER APPLICATION

A. Comply with ASTM C 926.
   1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6 mm in 3 m) from a true plane in finished plaster surfaces when measured by a 10-foot (3-m) straightedge placed on surface.
   2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
   3. Provide plaster surfaces ready to receive field applied finishes indicated.

B. Flat Surface Tolerances: Do not deviate more than plus or minus 1/8 inch in 10 feet (3 mm in 3 m) from a true plane in finished plaster surfaces, measured by a 10 foot (3m) straightedge placed at any location on surface.

C. Walls; Base Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three coat plasterworks with 3/4 inch (19 mm) total thickness:
   1. Portland cement mixes.

D. Plaster Finish Coats: Apply to provide dash finish.

E. Acrylic Based Finish Coatings (Contractor Option to Plaster Finish Coat): Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

F. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered finishes, omit finish coat.

3.5 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

B. Cut, patch, replace, repair, and point up plaster as necessary to accommodate other work. Repair cracks and indented surfaces. Point up finish plaster surfaces around items that are built into or penetrate plaster surfaces. Repair or replace work to eliminate blisters, buckles, check cracking, dry outs, efflorescence, excessive pinholes, and similar defects. Repair or replace work as necessary to comply with required visual effects.

3.6 TOLERANCES

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet (3mm in 3 m).

B. Maximum Variation from True Position: 1/8 inch (3mm).

3.7 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be

plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

B. Remove unused materials, containers, equipment, and plaster debris.

C. Protect plaster and maintain conditions ensuring finished plaster is without damage or deterioration at time of Substantial Completion.

END OF SECTION 09 24 00

SECTION 09 65 13.13 RESILIENT BASE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Rubber base.
   2. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data: Technical data for each type of product including manufacturer's installation instructions.

B. Samples: Sample of Base Selected or Color Chart if none selected.

C. Maintenance Data: Submit for inclusion in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Entity having minimum 5 years documented experience who employs workers competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store base and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F (10 degrees C) or more than 85 degrees F (29 degrees C). Store floor tiles on flat surfaces.

PART 2 PRODUCTS

2.1 MATERIALS

A. Basis of Design Product:
   1. Manufacturers and tile series, pattern, and color selections are indicated in the Finish Schedule and are a basis of design. Subject to compliance with requirements, provide product indicated in Finish Schedule or comparable product by one of the following:
      a. Flexco Floors.
      b. Johnsite, a division of Tarkett Group.
      c. Mannington Commercial.
      d. Roppe.

B. Rubber Base - ASTM F1861:
   1. Material: Rubber, vulcanized, Type TS, Group I, Styles A and B.
   2. Manufacturing Method: Group I (solid, homogeneous).
   3. Style: Topset cove; minimum 100 foot coil, cut to length required.

4. Minimum Thickness: 0.125 inch (3.2 mm).
5. Color: Selected by Architect.
6. Height: 4 inches, unless otherwise indicated on drawings.
7. Outside Corners: Job formed.
8. Inside Corners: Job formed.

C. Adhesives: Water resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F (21 degrees C) or more than 85 degrees F (29 degrees C), in spaces to receive floor tile during the following time periods:
1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 degrees F (13 degrees C) or more than 95 degrees F (35 degrees C).

C. Close spaces to traffic for 48 hours after installation.

3.2 EXAMINATION

A. Examine substrates for compliance with requirements for maximum moisture content and other conditions affecting performance of the work:
1. Verify that finishes of substrates comply with tolerances and other requirements specified for other work and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation after correcting unsatisfactory conditions. Installation of resilient flooring and accessories indicates acceptance of surfaces and conditions.

3.3 PREPARATION

A. Immediately before installation, sweep clean substrates to be covered by resilient base.

3.4 INSTALLATION

A. Comply with manufacturer's written instructions for installing flooring. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Extend flooring into toe spaces, door reveals, closets, and similar openings.

B. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.

C. Resilient Base:
1. Comply with manufacturer's written instructions for installing resilient base. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and

other permanent fixtures in rooms and areas where base is required:

a. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
b. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
c. Do not stretch resilient base during installation.
d. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
e. Preformed Corners: Install preformed corners before installing straight pieces.
f. Job Formed Corners:
    1) Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
    2) Form without producing discoloration (whitening) at bends.
    3) Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length:
        a) Miter or cope corners to minimize open joints.

END OF SECTION 09 65 13.13

SECTION 09 67 23 RESINOUS FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes resinous flooring system.
   1. Installed at restrooms.

B. Related Sections
   1. Section 03 30 00: Cast-In-Place Concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct pre job conference with representatives of Owner, Contractor, Applicator and Material Manufacturer in attendance. The agenda shall include a review and clarification of this specification, application procedures, quality control, inspection and acceptance criteria, and production schedules.

B. Contractor is not authorized to proceed until this meeting is held or waived by Owner.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include manufacturer’s technical data, application instructions, and recommendations for each resinous flooring component required.

B. LEED Submittals
   1. Product data for Cred IEQ 4.2: For liquid applied flooring components, documentation including printed statement of VOC content
   2. Laboratory Test Reports for Credit IEQ 4.2: For resinous flooring systems, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Samples for Initial Selection: For each type of exposed finish required.

D. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

1.5 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

B. Material Certificates: For each resinous flooring component, from manufacturer.

C. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Reference Standards
   1. California Building Standards Administrative Code, Part 1, Title 24 CBSC

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

C. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Apply full-thickness mockups on 96-inch- (2400-mm-) square floor area selected by Architect. Include 96-inch length of integral cove base with inside and outside corner.
   2. Simulate finished lighting conditions for Architect's review of mockups.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

PART 2 PRODUCTS

2.1 2.1 PERFORMANCE REQUIREMENTS

A. VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Flammability: Self-extinguishing according to ASTM D 635.

D. Flame Spread Index: Smoke-developed index in accordance to ASTM E84 or UL723

E. Interior wall and ceiling finish materials testing in accordance with NFPA 286.

2.2 MANUFACTURERS

A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant,

and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

B. Resinous Flooring System: Abrasion, impact, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.
   1. **Basis-of-Design Product**: **The Sherwin-Williams Company**
      Resuflor Deco Flake BC

C.

2.3 RESINOUS FLOORING

A. System Characteristics:
   1. Color and Pattern: Eclipse
   2. Wearing Surface: Textured for slip resistance.
   3. Overall System Thickness: 20-30mils.
   4. Federal Agency Approvals: USDA approved

B. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.
   1. Sherwin-Williams HPF Resuprime 3759

C. Waterproofing Membrane: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.
   1. Sherwin-Williams HPF

D. Reinforcing Membrane: Flexible resin formulation that is recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated and that inhibits substrate cracks from reflecting through resinous flooring.
   1. Sherwin-Williams HPF: GP3556 with Scrim
   2. Applied to all construction and expansion joints

E. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

F. Body Coats
   1. Sherwin Williams Resuflor 3746
   2. Number of Coats: Two
   3. Thickness of Coats: 1/16 inch with broadcast aggregates
   4. Aggregates: Colored quartz, ceramic coated silica

G. Broadcast Deco Flake
   1. Product: Williams Decorative Flake 6750
   2. Size: 1/8”
   3. Thickness of Coats: 1/16 inch with broadcast aggregates
   4. Aggregates: Colored quartz, ceramic coated silica

H. Grout Coat
   1. Resin: Sherwin Williams Resuflor 3746
   2. Formulation Description: Polyaspartic, clear
   3. Type: 100% solids
   4. Finish: Gloss
   5. Thickness of Coat: 8 – 15 mils

I. Topcoats: Sealing or finish coats
   1. Resin: Sherwin Williams Resutile 4686
   2. Formulation Description: Polyaspartic, clear
   3. Type: 100% solids
   4. Thickness of Coat: 8 – 15 mils

J. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
   1. Bond Strength: 300 psi or substrate failure
   2. Compressive Strength: 12,000 psi
   3. Tensile Strength: 2,500 psi
   4. Flexural Modulus of Elasticity: 4,500 psi
   5. Water Absorption: Nil
   6. Shrinkage: Nil
   7. Impact Resistance: 16 ft/lbs
   8. Resistance to Elevated Temperature: Minimum 150˚F
   9. Abrasion Resistance: 90 mg loss
   10. Hardness: 70 Shore D

K. System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested according to ASTM D 1308 for 50 percent immersion in the following reagents for no fewer than seven days.
   1. Simple Green or similar cleaning degreasing detergents.
   2. SporKlenz or similar disinfection agents.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

3.2 PREPARATION

A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
   1. Roughen concrete substrates as follows:
      a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
      b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
   2. Repair damaged and deteriorated concrete according to resinous flooring

manufacturer's written instructions.

3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions. Provide moisture vapor resistant primer when test results are above minimum requirements.
   a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab area in 24 hours.
   b. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
   1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.3 APPLICATION

A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Reinforcing Membrane: Apply reinforcing membrane to substrate cracks.

D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
   1. Integral Cove Base: 4 inches high.

E. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness indicated for flooring system.
   1. Aggregates: Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.

F. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended by manufacturer.

G. Grout Coat: Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat.

H. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

3.4 FIELD QUALITY CONTROL

A. Material Sampling: Owner may, at any time and any number of times during resinous flooring application, require material samples for testing for compliance with requirements.
   1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
   2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
   3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

B. Core Sampling: At the direction of Owner and at locations designated by Owner, take one core sample per 1000 sq. ft. (92.9 sq. m) of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring. Correct deficiencies in installed flooring as indicated by testing.

3.5 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 09 67 23

SECTION 09 68 01 CARPETING WALK-OFF-MATS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Walk Off Carpet.
   2. Accessories necessary for a complete installation.

B. Related Sections;
   1. Section 03 30 00: Cast-in-Place Concrete.

1.3 SUBMITTALS

A. Product Data:
   1. Technical data including installation recommendations for each type of substrate:
      a. Carpet:
         1) For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.

B. Samples:
   1. For each products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules:
      a. Carpet: 12 inch (300 mm) square Sample from approved color and product of carpet.
      b. Exposed Edge, Transition, and Other Accessory Stripping: 12 inch (300 mm) long Samples.
      c. Mitered Carpet Border Seam: 12 inch (300 mm) square Sample. Show carpet pattern alignment.
      d. Carpet base and accessory samples.

C. Product Test Reports: For carpet and carpet cushion, for tests performed by a qualified testing agency.

D. Shop Drawings: Showing extent of product, seam direction, and location and type of carpet accessories. Submittal to indicate columns, doorways, enclosing walls or partitions, casework, and locations where cutouts are required.

E. Maintenance Data:
   1. For carpet to include in maintenance manuals. Include the following:
      a. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
      b. Precautions for cleaning materials and methods that could be detrimental to carpet and carpet cushion.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Fire Test Response Characteristics:
      a. Provide products with the critical radiant flux classification determined by testing identical products in accordance with ASTM E648:
         1) Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
   2. Accessibility Requirements:
      b. Comply with applicable requirements:
         1) Americans with Disabilities Act of 1990, as amended:
            a) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
            b) 2010 ADA regulations.
         2) 2022 California Building Code (CBC) (CCR Title 24, Part 2, as adopted and amended by DSA):
            a) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
   3. AQMD - Air Quality Management District, Local Regulations.
   4. SCAQMD – South Coast Air Quality Management District Regulations Rule 1168 Adhesive and Sealant Applications.
   5. CRI – Carpet and Rug Institute Green Label Plus.
   6. Carpet shall have level loop, textured loop, or level-cut/uncutpile texture, firm cushion, pad or backing (or no cushion or pad) and maximum pile height of 1/2 inch in accordance with CBC Section 11B-302.2. Carpet edges shall comply with CBC 11B-302.2 and carpet trim to CBC Section 11B-303.

B. Installer Qualifications: Installer having minimum 5 years documented experience as a commercial carpet installer, who is certified by the International Certified Floorcovering Installers Association at the Commercial II or higher certification level.

C. Contractor is required to achieve the specified concrete moisture content prior to installation of all flooring materials or use a flooring manufacture approved moisture barrier prior to installation of all flooring products.

D. Pre-installation Conference:
   1. Pre-Installation conference to be conducted at project site.

1.5 WARRANTY

A. Written warranty in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period:
   1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excessive surface wear, excess static discharge, and delamination.
   3. Warranty Period: 25 years from date of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

B. Store in a dry location between 65 degrees F and 90 degrees F and a relative humidity below 65%. Protect from damage and soiling. Stack carpet rolls horizontally, elevated above slab level on a flat surface, stacked no higher than two rolls.

C. Store materials in area of installation for minimum period of 48 hours prior to installation.

D. Protect carpet from damage, dirt, stains, and moisture.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers:
   1. Carpet series and patterns indicated on Finish Schedule. Subject to compliance with requirements, provide products by one of the following:
      a. Mohawk Corp. (Basis of design)
      b. Tandus-Centiva.
      c. Mannington Mills.
      d. Patcraft.
      e. Shaw Contract Group.

B. Carpet (Walk-Off):
   1. Type: Carpet Tile
   2. Yarn: Duracolor solution dyed nylon
   3. Backing: Ecoflex NXT
   4. Color(s): Obsidian / Patch Black
   5. Locations: As shown on Drawings.
   6. Product: “Step Up II” as manufactured by Mowhawk

C. Applied Soil Resistance Treatment: Standard with manufacturer.

D. Antimicrobial Treatment: Standard with manufacturer.

E. Adhesives: Water resistant, mildew resistant, nonstaining, pressure sensitive type to suit products and subfloor conditions indicated, complying with flammability requirements for installed carpet and is recommended by carpet manufacturer for releasable installation.

F. Trowelable Leveling and Patching Compounds: Latex modified, hydraulic cement based formulation provided or recommended by carpet cushion manufacturer.

G. Adhesives: Water resistant, mildew resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and carpet cushion manufacturers.

H. Extra Carpet: After completion of the carpet installation, the carpet subcontractor shall provide an additional three (3) percent of total yards installed of each carpet specified to the Owner for future carpet replacement that may be required. This extra stock is to be unused rolls, tiles, and mats and does not include scraps.

I. Transition Strip:
   1. Product: Snap-Down T 930 as manufactured by Mannington
   2. Color(s): Black
   3. Locations: As shown on Drawings.
   4. Track: Pinless metal track as manufactured by Mannington
   5. Width: 1 ½”
   6. Height: Compatible with 1/4” to 5/16” thick flooring

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet and carpet cushion until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet and carpet cushion over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.

B. Concrete Subfloors:
1. Verify that concrete slabs comply with ASTM F710 and the following:
    a. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond.
    b. Prior to delivery of flooring materials, contractor shall conduct Calcium Chloride “dome” test to verify that concrete floors are dry with maximum moisture vapor emissions of 3 lbs. per 1000 square feet. in 24 hours, and exhibit negative alkalinity, carbonation or dusting. Apply moisture test in four (4) different areas of each floor location with at least one test for each 1,000 square feet of floor area.
    c. Prior to delivery of carpeting, conduct Relative Humidity Test Method in accordance with ASTM F2170 using a Wagner Rapid RH probe to verify relative humidity and surface pH of concrete floor slabs, the method:
        1) Requires drilling holes at diameter not to exceed outside diameter of probe by more than 0.04 inch to depth equal to 40 percent of slab's thickness (elevated structural slab shall be tested at depth equal to 20 percent of slab thickness).
        2) Place probe to full depth of test hole, place cap over probe.
        3) Permit test site to acclimate, or equilibrate, for 72 hours prior to taking relative humidity readings.
        4) Remove cap and press button on the probe to obtain reading.
        5) Relative humidity readings for substrates receiving non-permeable flooring are 75% or lower.
    d. Testing shall require 3 tests in first 1,000 square feet, with one additional test per each additional 1,000 square feet of concrete slab surface.
    e. Alkalinity Testing: Concrete floors shall be tested for alkalinity prior to installation of flooring. Levels of pH shall not exceed written recommendations of flooring manufacturer or adhesive manufacturer, or both.
    f. Delivery of flooring materials and beginning of installation means acceptance of existing substrate and site conditions.
    g. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
    h. Install Vapor Emission Treatment Systems where tests reveal presence of more than acceptable moisture level in accordance with Test Method ASTM F1869 or

ASTM F2170.

C. Proceed with installation after correcting unsatisfactory conditions.

3.3 PREPARATION

A. Comply with CRI 104, Section 7.3 *Site Conditions; Floor Preparation* and with carpet manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm), unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet and cushion manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.4 INSTALLATION

A. Comply with CRI 104 and carpet and carpet cushion manufacturer written installation instructions for the following:
   1. Direct Glue Down Installation: Comply with CRI 104, Section 9 *Direct Glue Down Installation*.
   2. Stair Installation: Comply with CRI 104, Section 13 *Carpet on Stairs* for glue down installation.

B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position:
   1. Do not bridge building expansion joints with carpet.
   2. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
   3. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

C. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

D. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, *Patterned Carpet Installations* and with carpet manufacturer's written recommendations.

E. Install in accordance with CBC Section 11B-302.2

3.5 CLEANING AND PROTECTING

A. Perform cleaning operations immediately after installing carpet:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
   2. Remove yarns that protrude from carpet surface.

3. Vacuum carpet using commercial machine with face beater element.

B. Protect installed carpet to comply with CRI 104, Section 16, *Protecting Indoor Installations*.

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet cushion manufacturer.

END OF SECTION 09 68 01

SECTION 09 90 00 PAINTING AND COATING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Surface preparation and field painting of exposed items and surfaces.
   2. Field preparation and painting of factory primed metal products and fabrications.
   3. Accessories necessary for a complete installation

1.3 DEFINITIONS

A. Standard coating terms defined in ASTM D16 apply:
   1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
   2. Eggshell refers to low sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
   3. Satin refers to a slightly higher sheen than eggshell and more reflective and durable finish and is less lustrous than semi-gloss.
   4. Semigloss refers to medium sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
   5. Full gloss refers to high sheen finish with a gloss range more than 70 when measured at a 60-degree meter

1.4 SUBMITTALS

A. Product Data:
   1. Submit technical data and information for block fillers, primers, paints, and coatings, including label analysis and instructions for handling, storing, and applying each coating material proposed for use:
      a. Indicate manufacturer's instructions for special surface preparation procedures, substrate conditions requiring special attention.
      b. Material List: Provide inclusive list of required coating materials. Indicate each material and cross reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number, series, and general classification.
      c. Submit Zero VOC compliant products only.

B. Samples:
   1. Submit for each type of paint system and in each color and gloss of topcoat:
      a. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
      b. Provide list of material and application for each coat of each sample. Label each sample as to location and application.
      c. Submit samples on following substrates for review of color and texture only:
         1) Concrete: Provide two 4-inch square samples for each color and finish.
         2) Concrete Masonry: Provide two 4" x 8" samples of masonry, with mortar

joint in the center, for each finish and color.

3) Painted Wood: Provide two 12-inch square samples of each color and material on hardboard.
4) Ferrous and Nonferrous Metals: Provide two 4-inch square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.

C. Product List: Submit list of including each paint system, color, and location of application. Use same product and location designations indicated in Finish Schedule.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with Federal and local toxicity and air quality regulations and with Federal requirements on content of for heavy metals including but not limited to: lead and mercury. Do not use solvents in paint products that contribute to air pollution.
   2. Performance and Durability:
      a. ASTM D16 Standard Test Method for Load Testing Refractory Shapes at High Temperatures.
      b. ASTM D2486 Standard Test Method for Scrub Resistance of Interior Wall Paint.
      c. ASTM D2805 Standard Test Method for Hiding Power of Paints by Reflectometry.
      d. ASTM D4828 Standard Test Method for Practical Washability of Organic Coatings.

B. Applicator Qualifications: A firm or individual having minimum 5 years documented experience in applying paints and coatings similar in material, design, and extent to those indicated.

C. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

1.6 WARRANTY

A. Written warranty signed by the manufacturer and the installer in which the manufacture and installer agree to repair or replace paint and primers that fail within specified warranty period:
   1. Failures include, but are not limited to, the following:
      a. Flaking or delamination of paint with the substrate.
      b. Rust, scale, similar imperfections due to improper surface preparation.
      c. Thinning or watering of paint beyond that considered acceptable of paint manufacturer.
      d. Failure to achieve dry film thickness (DFT) recommended by manufacturer for each coat in a paint system.
      e. Deterioration or loss of color of paint beyond normal weathering.
   2. Warranty Period: One year from date of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F (7 degrees C):
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

PART 2 PRODUCTS

2.1 MATERIALS

A. Subject to compliance with requirements, provide first quality, 100% acrylic, commercial or industrial products of one of the specified manufacturers. Residential products are not permitted:
   1. Proprietary Names:
      a. Paint Schedule is based on a single manufacturer for convenience. Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that named products are required to the exclusion of comparable products of specified manufacturers. Furnish product technical data, including per cent solids by weight and volume; VOC content limits and emissions data; and certificates of performance for comparable paint products of specified manufacturer.
   2. Acceptable Paint Manufacturers:
      a. Sherwin-Williams Co.
      b. Vista Paint.
      c. Benjamin Moore & Co.
      d. Dunn Edwards.
      e. Dulux; Theater Black.

B. Material Compatibility: Provide each paint system including block fillers, primers, and finish coats, that are compatible with one another and with substrates indicated under conditions of service and application, demonstrated by manufacturer based on testing and field experience.

C. Material Quality: Provide manufacturer's best quality commercial paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint material containers not displaying manufacturer's product identification will not be acceptable. Residential quality paint products are not permitted.

D. Chemical Components of Interior Paints and Coatings:
   1. Provide products complying with limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and SCAQMD Rule1113:
      a. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
      b. Restricted Components: Paints and coatings shall not contain components restricted by the EPA and the SCAQMD.

E. Accessories: Materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

F. Patching Materials: Latex filler compatible with paint systems.

G. Fastener Head Cover Materials: Latex filler.

H. Theater Black: No Exceptions or alternates.

2.2 SOURCE QUALITY CONTROL

A. Testing of Paint Materials:
   1. Owner reserves the right to invoke to engage the services of a qualified testing agency to sample paint materials:
      a. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to site, samples may be taken at the site. Samples will be identified, sealed, and certified by testing agency.

b. Testing agency will perform tests for compliance with product requirements.
c. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Apply waterborne paints when temperatures of surfaces to be painted and surrounding air are between 50 degrees F and 90 degrees F (10 degrees and 32 degrees C).

B. Do not thin or add water to water-based paints, including water-based alkyds.

C. Weather Conditions:
1. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
2. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F (3 degrees C) above dew point; or to damp or wet surfaces.
3. Minimum Application Temperatures for Water based Paints: Between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C).

D. Apply solvent thinned paints when temperatures of surfaces to be painted and surrounding air are between 45 degrees F. and 95 degrees F (7 degrees F and 35 degrees C):
1. Minimum Application Temperature for Varnish Finishes: 65 degrees F (18 degrees C) for interior or exterior, unless required otherwise by manufacturer's instructions.
2. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

E. Provide lighting level of 80-foot candles (860lx) measured mid-height at substrate surface.

F. Labels: Do not paint over Underwriters Laboratories, Factory Mutual, other code required labels, or equipment name, identification, performance rating, or nomenclature plates.

3.2 EXTRA MATERIALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:
1. Paint: 2 percent, but not less than 1 gallon (3.8 L) of each material and color applied.

3.3 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for maximum moisture content and conditions affecting performance of the work.

B. Test substrates after repairing and cleaning substrates but prior to application of paint and coatings:
1. Maximum moisture content of substrates, when measured with an electronic moisture meter as follows:

a. Concrete: 12 percent.
b. Fiber Cement Board: 12 percent.
c. Masonry (Clay and CMUs): 12 percent.
d. Wood: 15 percent.
e. Gypsum Board: 12 percent.
f. Plaster: 12 percent.

2. Test cementitious and plaster cement/stucco for alkalinity (pH).

C. Gypsum Board Substrates: Verify taped joints are tapes and finishing compound is sanded smooth.

D. Plaster Substrates: Verify plaster has fully cured. Verify existing plaster is in good condition and can receive new paint coating.

E. Spray Textured Ceiling Substrates: Verify surfaces are dry.

F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
1. Verify previously painted surfaces can be stripped to bare substrate, repaired if necessary, and prepared to receive new paint system consisting of primer and two top coats at a minimum:
a. Where previously painted surfaces have failed to accept new paint systems. Determined cause of failure and take corrective measures to ensure each surface accepts new paint system. Failure of new paint system is not permitted.

G. Commence paint and coating application after correcting unsatisfactory conditions and surfaces are dry. Application of coating indicates applicator’s acceptance of surfaces and conditions.

3.4 PREPARATION

A. Coordination of Work:
1. Review work in which primers are provided to ensure compatibility of the total system for various substrates. Notify Architect of anticipated problems when using materials specified over substrates primed by others:
a. Preprimed Substrates: Inspect existing conditions in which primers are factory applied to ensure compatibility of the total system for each substrate. Notify Architect of anticipated problems when using the materials specified over factory primed or preprimed substrates.
b. Existing Painted Surfaces: Inspect previously painted surfaces to ensure compatibility of the existing paints with new paint system for each substrate. Notify Architect of anticipated problems.
c. Correct defects and clean surfaces affecting bond with paint system. Remove existing paints exhibiting loose surface defects showing signs of rust, scale, or delamination.
d. Seal marks which may bleed through surface finishes.

B. Surface Preparation:
1. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified. Provide barrier coats over incompatible primers or remove and reprime. If removal is impractical or impossible because of size or weight of item, provide surface applied protection before surface preparation and painting:
a. Remove hardware and hardware accessories, plates, lighting fixtures, and similar items that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface applied protection before surface

preparation and painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
b. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface applied protection if any.
c. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
d. Clean and prepare surfaces to receive paint according to manufacturer's written instructions for each substrate condition and as specified. Provide barrier coats over incompatible primers, existing paint or coating, or remove and reprime.
e. Correct defects and clean surfaces affecting bond with paint or coating system. Remove existing coatings exhibiting loose surface defects. Seal marks which may bleed through surface finishes.

C. Cleaning:
1. Before applying paint or surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning. Schedule cleaning and painting so dust and contaminants from the cleaning process will not fall on wet, newly painted surfaces:
a. Remove incompatible primers, including factory applied primers, and reprime substrate with compatible primers or apply barrier coat as necessary to produce paint systems indicated.
b. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
c. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
d. Galvanized Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
e. Aluminum Substrates: Remove surface oxidation.

D. Mildew and Mold Removal: Remove mildew and mold by high power washing (pressure range of 1500 to 4000 psi) with solution of trisodium phosphate and bleach. If substrate is too soft for high power washing, scrub substrate with solution. Rinse with clean water and allow surface to dry.

E. Protective Coverings: Provide protections for duration of the work, including covering furnishings and decorative items. Protect and mask adjacent finishes and components against damage, marking, overpainting, and injury. Clean and repair or replace damage caused by painting.

F. Renovated Surfaces:
1. Clean surface free of loose dirt and dust. Except at gypsum board surfaces, remove existing paint and coatings to bare substrate and prepare substrates to receive new paint system. Test substrate to verify it will bond with primer and receive new paint system without failure. If test fails, clean surface to base substrate and apply barrier coat. Retest to verify surface will accept new paint system:
a. Remove surface film preventing proper adhesion and bond.
b. Wash glossy paint with a solution of sal soda and rinse thoroughly.
c. Remove loose, blistered, and defective paint and varnish; smooth edges with sandpaper.
d. Clean corroded iron and steel surfaces.
e. Repair and blend into portland cement plaster.
f. Prime bare surfaces.
g. Tone varnished surfaces with stain bringing to uniform color.
h. If existing surfaces cannot be put in acceptable condition for finishing by customary

cleaning, sanding, and puttying operations, notify Owner and do not proceed until correcting unsatisfactory conditions.

G. Cementitious Substrates:
1. Prepare concrete surfaces to receive paint. Remove efflorescence, chalk, dust, dirt, grease, oils, release agents, mold, mildew, and existing paint. Roughen as necessary to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation:
   a. Use abrasive blast cleaning methods if recommended by paint manufacturer.
   b. Do not paint surfaces if moisture content or alkalinity of surfaces exceeds that permitted in manufacturer's written instructions:
      1) Determine alkalinity and moisture content of surfaces by performing appropriate pH testing. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct condition prior to application of paint.
      2) Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m).
      3) Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation after substrates have obtained percent relative humidity level recommended by paint manufacturer.
      4) Perform additional moisture tests when recommended by manufacturer. Proceed with installation when moisture content complies with that permitted in manufacturer's written instructions.
      5) Remove stains caused by weathering of corroding metals with solution of sodium metasilicate after thoroughly wetting with water. Allow to thoroughly dry.
   c. Clean concrete floors to receive paint or coating with a 5 percent solution of muriatic acid or etching cleaner. Flush floors with clean water to remove acid; neutralize with ammonia, rinse, allow to dry; vacuum before painting.

H. Ferrous Metals:
1. Clean ungalvanized ferrous metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC recommendations:
   a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC SP6/NACE No. 3.
   b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

I. Galvanized Ferrous Metal Substrates: Clean galvanized surfaces with nonpetroleum based solvents leaving surface free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

J. Shop Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC PA1 for touching up shop primed surfaces.

K. Aluminum Substrates: Clean surfaces to remove oil, grease, surface oxidation, and contaminants in accordance with SSPC SP1 Solvent Cleaning. Lightly abrade surface with a nonmetallic pad.

L. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture

content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

M. Plaster/Stucco Substrates:
1. Remove contaminants, release agents, curing compounds, efflorescence, chalk, mold, mildew, and similar deterrents. Spot patch existing plaster to eliminate blisters, buckles, excessive crazing, and to check cracking, dryouts, efflorescence, sweat outs, and similar deflects the prevent plaster from bonding with paint or coatings. Sand or texture repair or patch to match adjacent finish and to remove trowel marks and arises: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
   a. Deep Cracks: Clean out and fill deep cracks with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
   b. Do not paint surfaces if moisture content or alkalinity of surfaces exceeds that permitted in manufacturer's written instructions. Test for alkali using litmus paper.
   c. Allow patching and repair compounds to set and cure before painting.

N. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

O. Wood Substrates:
1. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
2. Sand surfaces that will be exposed to view and dust off.
3. Prime, stain, or seal wood to be painted. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
4. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
5. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

P. Pipe Covering and Insulation: Clean to remove loose, foreign, and objectionable material before applying sealing coat.

Q. Preparation of Substrates for Wallcovering:
1. Prime and seal substrate with release coat in accordance with wallcovering manufacturer's recommendations for substrate:
   a. Assure compatibility with product of wall covering manufacturer.
   b. Fill indentations in substrate and prime with opaque white primer before applying release coat.
   c. Apply release coat in accordance with manufacturer's recommendations.

R. Barrier Coat: Provide barrier coats over incompatible primers or remove and reprime. Notify Owner in writing of anticipated problems using specified finish coat material over previously coated substrates.

S. Material Preparation:
1. Mix and prepare paint materials according to manufacturer's written instructions:
   a. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
   b. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
   c. Do not use thinners for water-based paints.

d. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated:
   1. The term *exposed surfaces* includes areas visible when permanent or built in fixtures, grilles, convector covers, covers for finned tube radiation, and similar components are in place. Extend coatings in these areas to maintain system integrity and provide desired protection.
   2. Use applicators and techniques suited for paint and substrate indicated.
   3. Provide finish coats compatible with primers.
   4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   5. Paint exposed surfaces (top, bottom, sides, edges, underneath). If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces:
      a. Field painting of exposed surfaces include bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory applied final finish.
      b. Areas visible when permanent or built in fixtures, grilles, convector covers, covers for finned tube radiation, and similar components are in place.
      c. Extend coatings in areas, as required, to maintain system integrity and provide desired protection.
   6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
   7. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   8. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   9. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   10. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or surface imperfections. Cut in sharp lines and color breaks.
   11. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
   12. Provide finish coats compatible with primers used.
   13. Sand lightly between each succeeding enamel or varnish coat.

B. Items not to Receive Paint: Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

C. Applicators:
   1. Apply paints and coatings by brush, roller, spray, or applicators recommended by manufacturer:
      a. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
      b. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool recommended

by manufacturer for material and texture required.

c. Spray Equipment: Use airless spray equipment with orifice size recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness:
1. Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer:
a. Measure film thickness on magnetic surfaces by use of Elcometer thickness gauge and on nonmagnetic surfaces by pit gauge or Tooke Gauge.

E. Application:
1. Apply first coat to surfaces that have been cleaned, pretreated, or prepared for painting as soon as practicable after preparation and before subsequent surface deterioration:
a. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
b. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished after removing rust and scale and priming or touching up surface sand if acceptable to topcoat manufacturers.
c. If undercoats, stains, or conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
d. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried and cured to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

F. Mechanical and Electrical Work:
1. Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces:
a. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
b. Prime and paint uninsulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, heat exchangers, tanks, ductwork, conduit, switchgear, and paintable insulation except where items are prefinished.
c. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
d. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
e. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.
f. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
g. Concealed Members: Wherever steel and metal parts to receive paint are built into and concealed by construction, paint as specified for exposed parts so finish painting is complete before members are concealed.

G. Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Painting is limited to items exposed in equipment rooms and occupied spaces:

a. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
b. Prime and paint uninsulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, heat exchangers, tanks, ductwork, conduit, switchgear, and paintable insulation except where items are prefinished.
c. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
d. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
e. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.
f. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

H. Block Fillers: Apply block fillers to concrete masonry block at rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply prime coat, recommended by manufacturer, to material required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or defects due to insufficient sealing.

J. Finish Coats:
1. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance without bleed through:
   a. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or surface imperfections is not acceptable.
   b. Transparent (Clear) Finishes: Use multiple coats to produce glass smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

L. Touch Up:
1. Touch up marred, scraped, and blemished areas of surfaces which were factory primed or previously coated:
   a. Prepare and touch up scratches, abrasions, and blemishes and remove foreign matter before proceeding with succeeding coats.
   b. Touch up marred, scraped, and blemished areas of factory primed or previously coated surfaces.
   c. Feather touch up coating overlapping minimum 2 inches onto adjacent unblemished areas producing smooth, uniform surface.
   d. As soon after erection and installation as possible, touch up fasteners, welded surfaces and surroundings, field connections, and areas on which shop coat has

been abraded or damaged with specified primer before corrosion and other damage occurs from exposure.

3.6 FIELD QUALITY CONTROL

A. Dry Film Thickness (DFT) Testing:
   1. Tests for dry film thickness may be determined by using a Tooke Scale and microgroover, an electronic scanner, or the Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness:
      a. Contractor shall touch up and restore painted surfaces damaged by testing.
      b. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.7 CLEANING AND PROTECTION

A. It is of the upmost important to the AISD that the sites remain in a safe, clean, and well-maintained condition. At the end of each day, leave the site ready to use by staff and students. Protect staff and students and the learning environment throughout the work.

B. Cleanup: At the end of each day, remove empty cans, rags, rubbish, and discarded paint materials from site. After completion of painting work, clean glass and paint spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. Provide *Wet Paint* signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work. After related work is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

E. At completion of painting activities, touch up and restore damaged or defaced painted surfaces.

F. Waste Management: Legally dispose of unused paint and paint containers in accordance with manufacturer’s recommendations and environmental regulations.

PART 4 SCHEDULES

A. The following is a schedule of typical painted items and does not specifically include every item that is to receive paint but should establish type and quality of finish for all items normally included in a complete paint job.

B. Exterior Surfaces (Note: Exterior surfaces are divided into two (2) different categories, based upon color and level of graffiti resistance required. System 1 will be used when standard earthtone colors or neutral colors are specified, and System 2 will be used when bright colors [primary reds, yellows, and oranges] are specified and/or when a graffiti resistant coating is required):
   1. Galvanized Metal:
      a. Surface Preparation: Acid etch galvanized surfaces that have not weathered at least six (6) months prior to beginning painting operations. Krud Kutter Metal Clean

and Etch.
b. Primer: One (1) coat Ultrashield ULDM00 DTM Gray Primer.
c. Finish: Two (2) coats Ultrashield ULSH40 Low Sheen High Performance Acrylic Urethane.
d. Finish: Two (2) coats US Coatings RustGrip 2300 1-2 Mils DFT.

2. Un-galvanized Metal:
   a. Primer: One (1) coat Ultrashield ULDM00 DTM Gray Primer.
   b. Finish: Two (2) coats Ultrashield ULSH40 Low Sheen High Performance Acrylic Urethane.
3. Concrete and CMU:
   a. Primer/Finish: (2) coats Eff-Stop Premium ESPR00 Masonry Primer / (2) coats US Coatings AquaGrip 2600 3-5 Mils DFT.
4. Wood (Includes plywood siding and wooden trim):
   a. Primer: One (1) coat EZ-Prime EZPR00 Exterior Wood Primer.
   b. Finish: Two (2) coats Spartashield SSHL60 100% Acrylic Gloss.
5. Fiber-Cement Materials:
   a. Primer: One (1) coat Eff-Stop Premium ESPR00 Masonry Primer.
   b. Finish: Spartashield SSHL60 100% Acrylic Gloss.
6. Parking Line and Driveway Paint: Vin-L-Stripe VSZM10 Zone Marking Paint Yellow.
7. All piping in mechanical rooms shall be painted in their entirety, in the following colors: Aristoshield ASHL70 High-Gloss Enamel:
   a. Gas lines: Orange
   b. Domestic cold water: White
   c. Domestic hot water: Pink
   d. Heating hot water: Red
   e. Condenser water: Green
   f. Chilled water: Blue

C. Interior Surfaces:
1. Galvanized Metal:
   a. Primer: One (1) coat Ultrashield Galvanized Metal Primer ULGM00.
   b. Finish: Two (2) coats Aristoshield ASHL50 Semi-Gloss Enamel.
2. Shop-Primed Ferrous Metals (Use for metal doors and frames and miscellaneous metal items):
   a. Shop coat by others.
   b. One (1) coat over Steel: Bloc-Rust Premium BRPR00 Rust Preventative Primer; Aluminum: Ultrashield Galvanized Metal Primer ULGM00.
   c. Two (2) coats Aristoshield ASHL50 Semi-Gloss Enamel.
3. Gypsum Wallboard:
   a. Primer: One (1) coat Vinylastic Premium VNPR00 Acrylic Wall Sealer.
   b. Finish: Two (2) coats Spartawall Premium SWLL30 Acrylic Latex Eggshell.
4. Primer Concrete and CMU (Enamel):
   a. One (1) coat Smooth Blocfil Premium SBPR00 100% Acrylic Block Filler.
   b. Finish: Two (2) coats Premium SWLL50 Acrylic Latex Semi-Gloss.
5. Wood (Painted):
   a. Primer: Interkote Premium IKPR00 100% Acrylic Enamel Undercoater.
   b. Finish: Aristoshield ASHL50 Semi-Gloss Enamel.
6. Wood (Stained):
   a. Stain: Gemini Craftsman Collection Wiping Stain CCW Water-Based Series.
   b. Finish (First Coat): WB-0230 Gemini Titanium Clear Urethane Satin
   c. Finish (Second Coat): Gemini WB-0230 Gemini Titanium Clear Urethane Satin.
7. Gypsum Wallboard (Epoxy) – Kitchens, bathrooms, laboratories, etc.:
   a. Primer: One (1) coat US Coatings AquaGrip 2600 2-3 Mils DFT.
   b. Finish: Two (2) coats US Coatings AquaGrip 2600 3-5 Mils DFT per coat.
8. CMU (Epoxy) - Kitchens, bathrooms, laboratories, etc.:
   a. Primer: Two (2) coats Smooth Blocfil Premium SBPR00 100% Acrylic Block Filler.

b. Finish: Two (2) coats US Coatings AquaGrip 2600 3-5 Mils DFT.

9. Pipe and fittings, including but not limited to copper and brass, at kitchen areas (but excluding aluminum, stainless steel, nickel and chrome plated pipe and fittings):
   a. Primer: One (1) coat; US Coatings RustGrip 2300 1-2 Mils DFT.
   b. Finish: Two (2) coats bright aluminum paint, US Coatings UreGrip 3000 VOC 2-3 Mils DFT per coat.

D. Paint Types: Refer to the Finish Schedule in the Drawings.

END OF SECTION 09 90 00

SECTION 10 21 13 TOILET COMPARTMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Toilet partitions.
   2. Urinal screens.
   3. Entrance screens.
   4. Accessories necessary for a complete installation.

B. Related Sections:
   1. Section 06 10 00: Rough Carpentry.
   2. Division 09: Finishes.

1.3 SUBMITTALS

A. Product Data: Technical data for each type of product including construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings - Submit plans, elevations, sections, details, and attachments to other work:
   1. Show locations of cutouts for compartment-mounted toilet accessories.
   2. Show locations of reinforcements for compartment-mounted grab bars.
   3. Show locations of centerlines of toilet fixtures.
   4. Show ceiling grid and overhead support or bracing locations.

C. Samples: Submit for each type of unit with samples of hardware and accessories involving material and color selection.

D. Maintenance Data: Submit data to include in maintenance manuals.

1.4 PERFORMANCE REQUIREMENTS

A. Accessible Toilet Compartments:
   1. Wheelchair accessible compartment shall comply with CBC Section 11B-604.8.1.
   2. Toe clearance for at least one side partition of a wheelchair accessible compartment shall comply with CBC Section and Figure 11B-604.8.1.4. It shall be a minimum of 9 inches high above the finish floor, and a minimum of 6 inches deep beyond the compartment side face of the partition, exclusive of partition support members. It shall be a minimum of 12 inches high above the finish floor for children’s use. Partition components at toe clearances shall be smoother without shop edges or abrasive surfaces. Toe clearance at the side partition is not required in a compartment greater than 66 inches wide.
   3. Ambulatory accessible compartments shall be provided where there are six or more toilet compartments, or where the combination of urinals and water closets total six or more fixtures. Such compartments shall be provided in the same quantity as wheelchair accessible compartments per CBC Section 11B-213.3.1 and shall comply with CBC Section 11B-604.8.2.

4. Door and door hardware for accessible compartments shall be self-closing and shall comply with CBC Section 11B-404 except that if the approach is to the latch side of an ambulatory compartment door, clearance between the door side of the compartment and any obstruction shall be 44 inches minimum. See CBC Figure 11B-604.8.2.
5. A door pull complying with CBC Section 11B-404.2.7 shall be placed on both sides of the accessible compartment door near the latch.
6. Ambulatory Accessible Toilet Compartment doors shall not swing into the clear floor space or clearance required for any fixture or into the minimum required compartment area. See CBC Section 11B-604.8.2.2.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Accessibility Requirements - Comply with applicable requirements:
      a. Americans with Disabilities Act of 1990, as amended:
         1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
      b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
         1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
   2. Surface Burning Characteristics - Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency:
      a. Flame Spread Index: 25 or less.
      b. Smoke Developed Index: 450 or less.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
   1. Solid Plastic (HDPE):
      a. Scranton Products; Santana Comtec, Accutec Manufacturing. (Basis of Design)
      b. Accurate Partitions Corp.; ASI Group.
      c. Ampco Products, LLC.
      d. General Partitions Mfg. Corp.
      e. Global Partitions; ASI Group.
      f. Metpar Corp./Sanymetal

B. Aluminum Castings: ASTM B26/B26M.

C. Aluminum Extrusions: ASTM B221.

D. Stainless Steel Sheet: ASTM A666, Type 304, stretcher leveled standard of flatness.

E. Stainless Steel Castings: ASTM A743/A743M.

2.2 PARTITION COMPONENTS

A. Solid Plastic Partitions:
   1. Style:
      a. Toilet Partition: Floor anchored and overhead braced.
      b. Urinal Screen Style: Floor anchored and overhead braced.

B. Door, Panel, Screen, and Pilaster Construction - Solid, high density polyethylene (HDPE)

panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, no sightline system**,** and with homogenous color and pattern throughout thickness of material:

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat Sink Strip: Continuous, stainless steel strip fastened to exposed bottom edges of solid plastic components to hinder malicious combustion.
3. Color and Pattern: Traditional Color Collection (Paisley)
4. Pilaster Shoes and Sleeves (Caps) - Stainless steel:
   a. Pilaster shall be attached to the floor by means of an 11 gauge stainless steel footer, with provisions for leveling, attached to two (2) 3/8 inch diameter stainless steel studs set into expansion shields. The floor connections are to be covered by a four (4) inch high stainless steel shoe, #4 finish.
   b. Option Panels: 1/2 inch thick solid phenolic core with high pressure color surface on faces. Edges shall be burnished and slightly rounded.

C. Urinal Screen Post: Post design of stainless steel matching the thickness and construction of pilasters or 1-3/4 inch (44 mm) square, aluminum tube with satin finish; with shoe and sleeve (cap) matching that on the pilaster.

D. Brackets (Fittings):
1. Stirrup Type: Ear or U-brackets, stainless steel.
2. Full Height (Continuous) Type: Stainless steel.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories - Heavy duty operating hardware and accessories (Complying with CBC 11B-404):
1. Hinges: Minimum 0.062 inch (1.59 mm) thick, full door length, stainless steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through bolts.
2. Latch and Keeper: Heavy duty surface mounted cast stainless steel latch unit designed to resist damage due to slamming, with combination rubber faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through bolts.
3. Coat Hook: Heavy duty combination cast stainless steel hook and rubber tipped bumper, sized to prevent in swinging door from hitting compartment mounted accessories. Mount with through bolts.
4. Door Bumper: Heavy duty rubber tipped cast stainless steel bumper at out swinging doors and entrance screen doors. Mount with through bolts.
5. Door Pull: Heavy duty cast stainless steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through bolts.

B. Overhead Bracing: Continuous, extruded aluminum head rail with antigrip profile and in standard finish.

C. Anchorages and Fasteners: Exposed fasteners of stainless steel, finished to match the being secured, with theft resistant type heads. Provide sex type bolts for through bolt applications. For concealed anchors, use stainless steel, hot dip galvanized steel, or rust resistant, protective coated steel compatible with related materials.

2.4 FABRICATION

A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through partition toilet accessories where required for attachment of toilet accessories.

B. Overhead Braced Units: Provide corrosion resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Floor Anchored Units: Provide corrosion resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

D. Urinal Screen Posts: Provide corrosion resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.

E. Door Size and Swings: Unless otherwise indicated, provide 24 inch (610 mm) wide, in swinging doors for standard toilet compartments and 36 inch (914 mm) wide, out swinging doors with a minimum 32 inch (813 mm) wide, clear opening for compartments designated as accessible.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

3.2 EXAMINATION

A. Examine areas and conditions for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the work. Confirm location and adequacy of blocking and supports required for installation. Proceed with installation after correcting unsatisfactory conditions.

3.3 INSTALLATION

A. Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices:
   1. Maximum Clearances:
      a. Pilasters and Panels: 1/2 inch (13 mm).
      b. Panels and Walls: 1 inch (25 mm).
   2. Stirrup Brackets - Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel:
      a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
      b. Align brackets at pilasters with brackets at walls.
   3. Full Height (Continuous) Brackets - Secure panels to walls and to pilasters with full height brackets:
      a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
      b. Align brackets at pilasters with brackets at walls.

B. Overhead Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position. Attach wall brackets into solid backing/blocking and/or wall studs. No drywall anchors allowed.

C. Floor Anchored Units: Set pilasters with anchors penetrating not less than 2 inches (51 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact. Attach wall brackets into solid backing/blocking and/or wall studs. No drywall anchors allowed.

3.4 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out swinging doors to return doors to fully closed position.

3.5 MAINTENANCE MATERIAL

A. Furnish extra materials that match products installed and packaged with protective covering for storage and identified with labels describing contents and source:
   1. Door Hinges: One hinge(s) with associated fasteners.
   2. Latch and Keeper: One latch and keeper(s) with associated fasteners.
   3. Door Bumper: One bumper(s) with associated fasteners.
   4. Door Pull: One door pull(s) with associated fasteners.
   5. Fasteners: Ten fasteners of each size and type.

END OF SECTION 10 21 13

SECTION 10 28 13 TOILET ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Public use washroom accessories.
   2. Public use shower room accessories.
   3. Private use bathroom accessories.
   4. Healthcare accessories.
   5. Childcare accessories.
   6. Underlavatory guards.
   7. Custodial accessories.
   8. Accessories necessary for a complete installation.

1.3 PERFORMANCE REQUIREMENTS

A. Sanitary Facility Elements:
   1. Elements of sanitary facilities shall be mounted at locations in compliance with CBC Sections 11B-602 through 11B-612.
   2. Grab bars in toilet facilities and bathing facilities shall comply with CBC Section 11B-609.
   3. Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements and shall have rounded edges. The space around the grab bars shall be as follows:
      a. 1 ½ inches between the grab bar and the wall.
      b. 1 ½ inches minimum between the grab bar and projecting objects below and at the ends.
      c. 12 inches minimum between the grab bar and projecting objects above.
   4. Grab Bars to meet DSA IR 16-12 – Grab Bar Design and Connections: CBC.
      a. Grab Bars shall be designed to resist a single concentrated load of 250 lbs. applied in any direction at any point o the grab bar such as to produce the maximum load effect.

1.4 SUBMITTALS

A. Product Data:
   1. Technical Data including construction details, material descriptions, dimensions of individual components and profiles, and finishes:
      a. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
      b. Include electrical characteristics.

B. Samples:
   1. Full size, for each exposed product and for each finish specified:
      a. Approved full size Samples will be returned and may be used in the Work.

C. Product Schedule: Show types, quantities, sizes, and installation locations by room of each

accessory required. Identify locations using room designations indicated.

D. Maintenance Data: Submit for inclusion in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Accessibility Requirements:
   1. Comply with applicable requirements:
      a. Americans with Disabilities Act of 1990, as amended:
         1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design
      b. California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
         1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Source Limitations: Obtain products from single source from single manufacturer.

1.6 WARRANTY

A. Written warranty signed by manufacturer in which manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period:
   1. Failures include, but are not limited to, visible silver spoilage defects.
   2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers:
   1. Toilet accessories schedule is based on Bobrick Washroom Equipment. Subject to compliance with requirements, provide products by one of the following:
      a. Bobrick Washroom Equipment, Inc. Basis of Design.
      b. AJW Architectural Products.
      c. American Specialties, Inc.
      d. Bradley Corporation.
      e. Brey-Krause Manufacturing Co.
      f. GAMCO Specialty Accessories; a division of Bobrick.
      g. Tubular Specialties Manufacturing, Inc.

B. Stainless Steel: ASTM A666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

C. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

D. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

E. Galvanized Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot dip zinc coating.

F. Galvanized Steel Mounting Devices: ASTM A153/A153M, hot dip galvanized after fabrication.

G. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear glass mirrors, nominal 6.0 mm thick.

2.2 COMPONENTS

A. Underlavatory Guard:
   1. Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with piping and/or burns from piping; allow service access without removing coverings:
      a. Product: Truebro LavShield Protective Lavatory Enclosure.
      b. Material and Finish: Antimicrobial, molded plastic, white.
      c. Provide at all lavatories.

2.3 FABRICATION

A. Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 EXECUTION

3.1 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

3.2 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F446.

3.3 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items. Remove temporary labels and protective coatings. Clean and polish exposed surfaces according to manufacturer's written recommendations.

PART 4 SCHEDULE

4.1 ACCESSORY SCHEDULE

A. TA-1 - Soap Dispensers:
   1. Manufacturer: SCJohnson
   2. Mounting: Surface.
   3. Model No.: TPB1LDS
   4. Locations: Refer to drawings.

B. TA-2 - Mirrors:
   1. Mounting: Surface.
   2. Model No.: B-165.
   3. Size: 24 inches by 36 inches (600 mm by 900 mm), unless shown otherwise.
   4. Locations: Refer to drawings.

C. TA-3 - Toilet Paper Dispensers (At Typical Non-accessible Toilet Stalls):
   1. Mounting: Surface.
   2. Model No.: B-2888.
   3. Locations: Non-accessible water closets and toilet stalls.

D. TA-4 - Paper Towel Dispensers:
   1. Manufacturer: Tork
   2. Mounting: Surface
   3. Model No.: H21.
   4. Locations: Refer to drawings.

E. TA-5 - Grab Bars: Typical Accessible Toilet Stalls:
   1. Size/Finish: 42” & 36” x 1-1/2 inch diameter satin stainless steel
   2. Clearance: 1-1/2 inch between rail and wall.
   3. Model No.: B-6806.
   4. Mounting: Attach with concealed mounting kit. Mount parallel to floor.
   5. Location: Accessible water closets and toilet stalls.

F. TA-6 - Sanitary Napkin Dispensers:
   1. Mounting: Surface.
   2. Model No.: B-2706C.
   3. Capacity: 20 Napkins/ 30 Tampons.
   4. Locations: Women’s toilet room.

G. TA-7 - Sanitary Napkin Disposal:
   1. Mounting: Surface.
   2. Model No.: B-270.
   3. Capacity: 1.0 gal.
   4. Locations: Women’s toilet stalls.

H. TA-11 - Clothes Hook:
   1. Mounting: Surface.
   2. Model No.: B-6717.
   3. Locations: All shower locations.
   4. Toilet and Shower Partitions: If toilet and shower partitions are utilized, hooks are to be provided by the partition manufacturer(s) as part of their hardware package.

I. TA-13(b) – Paper Towel Dispenser:
   1. Mounting: Surface mount..
   2. Model No.: B-26212, white.
   3. Location: Refer to drawings.
   4. Dimensions: 10 ¾” W x 7 1/8” H x 4” Deep.

J. TA-14 - Trash Receptacle:
   1. Mounting: None (Floor standing)
   2. Model No.: B-2250.
   3. Locations: Refer to drawings.

K. TA-17 - Trash Receptacle:
   1. Mounting: Recessed
   2. Model No.: B3644.
   3. Locations: Refer to drawings.

L. TA-18 - Toilet Paper Dispensers:
   1. Mounting: Semi-recessed (Less than 4” projection).
   2. Model No.: B-3888.
   3. Location: Accessible water closets and toilet stalls.

M. TA-19 - Seat Cover Dispenser:
   1. Mounting: Surface.
   2. Model No.: B-221
   3. Location: All water closets and toilet stalls.

END OF SECTION 10 28 13

SECTION 10 73 13 PRE-ENGINEERED SHADE STRUCTURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Conditions of Contract, including General and Supplementary Conditions and Division 1 Administration Sections, apply to this Division.

1.2 SUMMARY

A. Structure Description:
   1. Structure(s) based on the following PC design:
      a. Gable Roof – PC# 04-122188.
      b. Frame dimensions – 25’ x 44’
      c. Eave Height – 12’

B. Design Requirements:
   1. Meet the design intent shown on the PC drawings approved for this project:
      a. Design criteria.
      b. Member sizes.
      c. Hidden bolted connections between structural members.
      d. When anchor bolts are required, columns must be anchored with (4) anchor bolts to comply with OSHA 1926.755(a)(1).
      e. No field welding permitted.
      f. No field painting permitted.
      g. Roof dimensions and slopes.
      h. Exposed steel roof fasteners (if applicable) powder coated by manufacturer.
      i. Roof deck spans from peak to eave and permits proper drainage without debris build-up.

1.3 SUBMITTALS

A. Drawings and calculations sealed by a professional engineer licensed in the appropriate state.

B. Only manufacturers that submit drawings and calculations prior to bid shall be considered.

C. Manufacturer must be able to submit appropriate laboratory tests for the following:
   1. Frame finish requirements listed in PART 2 of this specification.
   2. Certified mill certs for structural steel (describing the chemical and physical properties).
   3. Certified mill certs for structural bolts.

1.4 QUALITY ASSURANCE

A. General:
   1. Fabrication procedures shall comply with applicable codes and local regulations.
   2. Required structural tests and special inspections included on the project DSA-103 form.

B. Manufacturer qualifications:
   1. Minimum (10) years engineering and fabricating pre-engineered structures.
   2. Manufacturer owned and operated powder coat paint finish system. All AWS certified welders.

3. Full-time professional engineer on staff licensed in the appropriate state.
4. Full-time AWS certified associate welding inspector on staff.
5. Full-time quality assurance manager on staff.
6. Full-time LEED AP on staff.

C. Manufacturer certifications:
1. PCI 4000 certification through Powder Coating Institute (PCI).

D. Installer qualifications:
1. Certified installer as defined by the manufacturer.

E. Technical Support:
1. Manufacturer must have in-house engineering department and a professional engineer licensed in the appropriate state to answer technical questions.

1.5 MANUFACTURER WARRANTY

A. Structure must have (10) year limited warranty on steel frame members.

B. Structure must have (10) year limited warranty on paint system.

C. Pass through warranty of roofing manufacturer shall be provided upon request.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturers:
1. **Icon Shelter Systems Inc.**
a. 1455 Lincoln Ave., Holland, MI 49424; 616-396-0919; www.iconshelters.com.

B. Substitution Limitations:
1. The engineering for this structure is only applicable if Icon supplies the material.
2. If the contractor elects to substitute a different structure, they are responsible to obtain the necessary DSA approval with:
a. No cost to the district or architect.
b. No change to the construction schedule.
3. Substitutions must be approved a minimum of (10) days before bid.
4. All approved manufacturers shall be notified in writing before the bid date.
5. Substitute manufacturers shall not be allowed to bid without written notification.
6. Substitute manufacturers must meet “Manufacturer qualifications” listed in PART 1 of this specification.
7. Substitute manufacturers must provide proof of “Manufacturer certifications” above.
8. Substitute manufacturers must provide paint finish described in “Frame Finish” below.

2.2 FRAME

A. Materials:
1. Anchor bolts: When anchor bolts are required, see drawings for requirements. Anchor bolts not provided by manufacturer.
2. Structural steel: see drawings for requirements.
3. Structural bolts: see drawings for requirements.

B. Finish:
1. Frame finish - Powder coat. No field painting permitted:

a. Components shall be cleaned, pre-treated, and finished at a facility owned and directly supervised by the manufacturer.
b. Components shall be shot blasted to SSPC-SP10 near-white blast cleaning. SSPC-SP2 hand tool cleaning will not be an acceptable alternative.
c. Components shall be pretreated in a (3) stage iron phosphate or equal washer.
d. Components shall receive epoxy primer coat for superior corrosion protection.
e. Components shall receive top coat of Super Durable TGIC powder coat.
f. Finish shall not have any VOC emissions.
g. Manufacturer shall be able to produce documentation stating sample production components have been tested to meet the following:
    1) Salt spray resistance per ASTM B117/ ASTM D1654 to 10,000 hours with no creep from scribe line and rating of 10.
    2) Humidity resistance per ASTM D2247 to 5,000 hours with no loss of adhesion or blistering.
    3) Color/UV resistance per ASTM G154 to 2,000 hours exposure, alternate cycles with results of no chalking, 75% color retention, color variation maximum 3.0 E variation CIE formula (before and after 2,000 hours exposure).

2. Frame color: Determined by district.

C. Fabrication:
1. Fabricate components to permit bolted connections on site. No field welding permitted.
2. Label each member with unique part number to streamline erection.
3. Welding requirements: See drawings for requirements.

2.3 ROOF

A. Materials:
1. Roof material: See drawings for requirements.
2. Roof hardware: See drawings for requirements.

B. Finish:
1. Roof finish: Kynar 500 high-performance resin-based paint.
2. Roof color: determined by owner.

2.4 MISCELLANEOUS

A. Materials:
1. Concrete material: see drawings for requirements. Concrete not provided by manufacturer.

PART 3 EXECUTION

3.1 STORAGE AND HANDLING

A. Protect material after delivery from weather, sunlight, and damage.

B. Elevate material to allow circulation and reduce mold, fungi decay, and insect infestation.

C. Handle material with protective straps or padded forklift. Handling material with chain or cable will not be accepted and may void manufacturer's warranty.

D. To prevent moisture damage to any wood material (if applicable), keep wood packaged before installation and cover immediately with any secondary roof material.

3.2 ERECTION

A. Install components according to manufacturer's installation drawings and these specifications.

B. Anchor bolt and column layout is critical.

C. Comply with specific bolting installation requirements provided on drawings requiring the contractor to coordinate this phase of construction with the special bolting inspector and the inspector of record *prior to the erection of the frame.*

D. No field slotting or opening of holes will be allowed. Tolerances on steel structural members are set according to AISC construction practices, followed during fabrication, and cannot be increased.

E. After installation, restore damaged material to the original condition as supplied by the manufacturer. If the architect does not accept that, replace damaged material at no cost to the district. This includes, but is not limited to:
1. Damaged paint surfaces.
2. Deformed or bent roofing material.
3. Deformed or bent plates.

F. Coordinate as required with other disciplines (electrical, plumbing, etc.).

G. Comply with all applicable OSHA requirements.

3.3 REPAIR

A. Do not attempt any field changes to the structure without first contacting the manufacturer.

3.4 QUALITY CONTROL

A. Any special inspections required during erection needs to be specified on DSA 103 form. The project inspector, and entire construction oversight process, shall comply with DSA PR 13-01. Do not proceed until unsatisfactory conditions have been corrected.

END OF SECTION 10 73 13

SECTION 22 00 00 - GENERAL PLUMBING PROVISIONS

PART 1 GENERAL

1.1 GENERAL CONDITIONS

A. The foregoing General and Special Conditions shall form a part of this Division with the same force and effect as though repeated herein. The provisions of this Section shall apply to all the Sections of Division 22.

1.2 CODES AND REGULATIONS

A. All work and materials shall be in full accordance with current rules and regulations of applicable codes and all California Amendments. Nothing in these drawings or specifications is to be construed to permit work not conforming to these codes. Should the drawings or specifications call for material or methods of construction of a higher quality or standard than required by these codes, the specifications shall govern. Applicable codes and regulations are:

1. California Code of Regulations – CCR:
    a. Title 8, Industrial Relations.
    b. Title 24, Building Standards.
2. California Building Code – CBC.
3. California Mechanical Code – CMC.
4. California Plumbing Code – CPC.
5. California Fire Code – CFC.
6. California Green Building Code.
7. American Gas Association – AGA.
8. American National Standards Institute – ANSI.
9. American Society of Heating, Refrigerating and Air Conditioning Engineers – ASHRAE.
10. American Society of Mechanical Engineers – ASME.
11. American Society for Testing and Materials – ASTM.
12. American Water Works Association – AWWA.
13. Cast Iron Soil Pipe Institute – CISPI.
14. California Electrical Code – CEC.
15. National Electrical Manufacturers Association – NEMA.
16. National Fire Protection Association – NFPA.
17. National Sanitation Foundation – NSF.
18. Plumbing and Drainage Institute – PDI.
19. Sheet Metal and Air Conditioning Contractors National Association – SMACNA.
20. Underwriters' Laboratory – UL.
21. Occupational Safety and Health Act - OSHA.
22. California Assembly Bill 1953 (AB1953).
23. ASCE 7-16, Chapter 13.

1.3 PERMITS AND FEES

A. The Contractor shall take out all permits and arrange for all tests in connection with his work as required by local ordinances. All charges are to be included in the work. Permits for equipment connected to a particular system are to be considered as a part of the work included under each system; for example, permits for electric motor connection are part of electrical work, permits for domestic water or gas connections are part of plumbing work. All charges for service connections, meters, etc. by utility companies or districts shall be included in the work.

1.4 COORDINATION OF WORK

A. Layout of materials, equipment and systems is generally diagrammatic unless specifically dimensioned. The actual locations of all materials, piping, fixtures, equipment, supports, etc. shall be carefully planned, prior to installation of any work, to avoid all interferences with each other, or with structural, electrical or architectural elements. Verify the proper voltage and phase of all equipment with the electrical plans. All conflicts shall be called to the attention of the Engineer prior to the installation of any work or the ordering of any equipment.

1.5 GUARANTEE

A. Guarantee shall be in accordance with the General Conditions. These specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the Certificate of Guarantee shall be furnished to the Owner through the Engineer.

1.6 EXAMINATION OF SITE

A. The Contractor shall examine the site, compare it with plans and specifications, and shall have satisfied himself as to the conditions under which the work is to be performed. No allowance shall subsequently be made in his behalf for any extra expense to which he may be put due to failure or neglect on his part to make such an examination.

1.7 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Shop Drawings: Within 30 days of contract award, the Contractor shall submit six copies of shop drawings for all materials, equipment, etc. proposed for use on this project. Material and equipment shall not be ordered or installed until written review is processed by the Engineer. Any item omitted from the submittal shall be provided as specified without substitution. All shop drawings must comply with the following:
   1. Shop drawings are required for all material and equipment items and shall include manufacturer's name and catalog numbers, dimensions, capacities, performance curves, and all other characteristics and accessories as listed in the specifications or on the drawings. Descriptive literature shall be current factory brochures and submittal sheets. Capacities shall be certified by the factory.
   2. All shop drawings shall be submitted at one time in a neat and orderly fashion in a suitable binder with title sheet including Project, Engineer and Contractor; Table of Contents; and indexed tabs dividing each group of materials or item of equipment. All items shall be marked with the specification paragraph number for which they are proposed. All equipment shall also be identified by the mark number as indicated on the drawings.
   3. All capacities, characteristics, and accessories called for in the specifications or on the drawings shall be highlighted, circled, or underlined on the shop drawings. Calculations and other detailed data indicating how the item was selected shall be included for items that are not scheduled. Data must be complete enough to permit detailed comparison of every significant characteristic which is specified, scheduled, or detailed.

C. Substitutions: Manufacturers and model numbers listed in the specifications or on the drawings represent the standard of quality and the features desired. Unless otherwise noted, alternate manufacturers may be submitted for review by the Engineer. Calculations

and other detailed data indicating how the item was selected shall be included. The Contractor shall assume full responsibility that substituted items or procedures will meet the specifications and job requirements and shall be responsible for the cost of redesign and modifications to the work caused by these items.

D. Review: Submittals will be reviewed for general conformance with the design concept, but this review does not guarantee quantity shown, nor does it supersede the responsibility of the Contractor to provide all materials, equipment, and installation in accordance with the drawings and specifications. The Contractor shall agree that shop drawing submittals processed by the Engineer are not Change Orders; that the purpose of shop drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept; that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use. The Contractor shall agree that if deviations, discrepancies or conflicts between shop drawings and design drawings and specifications are discovered either prior to or after shop drawing submittals are processed by the Engineer, the design drawings and specifications shall control and shall be followed.

1.8 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Submit one electronic pdf copy for review and after approved submit three hard copies of the Operation and Maintenance Instructions and Wiring Diagrams for all equipment and parts lists for all equipment, etc. shall be submitted to the Engineer. All instructions shall be clearly identified by marking them with the same designation as the equipment item to which they apply (e.g. WH-1). All wiring diagrams shall agree with revised shop drawings and indicate the exact field installation. All instructions shall be submitted at the same time and shall be bound in a suitable binder with tabs dividing each type of equipment (e.g. Water Heaters, Pumps, Motors, etc.). Each binder shall be labeled indicating "Operating and Maintenance Instructions, Project Title, Contractor, Date" and shall have a Table of Contents listing all items included. **(These submittals shall be submitted with regular submittals at start of job so Commissioning Contractor can start on the commissioning check list for Title 24 Requirements)**

B. Verbal: The Contractor shall verbally instruct the Owner's maintenance staff in the operation and maintenance of all equipment and systems. The controls contractor shall present that portion of the instruction that applies to the control system. The Engineer's office shall be notified 96 hours prior to this meeting.

C. Acknowledgment: The Contractor shall prepare a letter indicating that all operation and maintenance instructions (printed, verbal and posted) have been given to the Owner, to the Owner's satisfaction. This letter shall be acknowledged (signed) by the Owner and submitted to the Engineer.

1.9 RECORD DRAWINGS

A. The Contractor shall maintain a set of prints for the project as a record of all construction changes made. As the Work progresses, the Contractor shall maintain a record of all deviations in the Work from that indicated on the drawings. Final location of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, i.e. buildings, curbs and walks. In addition, the water, gas, sewer, etc. within the building shall be recorded by offset distances from building walls. The original drawings will be made available to the Contractor from which he shall have a set of reproducible drawings made. The Contractor shall then transfer the changes, notations, etc. from the marked-up prints to the reproducible drawings. The record drawings (marked-up prints and reproducibles) shall be submitted to the Engineer for review (as an alternative, the marked-up prints may be photocopied full size on reproducible stock).

PART 2 PRODUCTS

2.1 PROTECTIVE COATING FOR UNDERGROUND PIPING

A. All ferrous pipe below grade (except cast iron) shall have a factory applied protective coating of extruded high density polyethylene, 35 to 70 mils total thickness, X-Tru Coat, Scotchkote. All fittings and areas of damaged coating shall be covered with two layer double wrap of 10 mil polyvinyl tape to total thickness of 40 mils. Manville Corporation. Protective coating shall be extended 6" above surrounding grade.

2.2 CONCRETE ANCHORS

A. Concrete Anchors shall comply with CBC 1901A.3. Steel stud with expansion anchor requiring a drilled hole; powder driven anchors are not acceptable. Minimum concrete embedment shall be 4-1/2 diameters. Minimum spacing shall be 10 diameters center-to-center and 5 diameters from center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80% of the test report values "with special inspection". Anchors shall be Hilti, Philips - or Approved equal.

2.3 SEISMIC RESTRAINTS

A. All plumbing systems (all equipment, piping, etc.) shall be provided with seismic restraints in accordance with all details shown on the drawings and as noted on "Piping, Ductwork, and Electrical Distribution System Bracing Note."

2.4 SYSTEM IDENTIFICATION

A. Above Grade Piping: Provide markers on piping which is either exposed or concealed in accessible spaces. For piping systems, other than drain and vent lines, indicate the fluid conveyed or its abbreviation, either by preprinted markers or stenciled marking, and include arrows to show the direction of flow. Comply with ANSI A13.1 for colors. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through floor, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portion of lines. Marking of short branches and repetitive branches for equipment connections is not required.

B. Equipment: All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. WH-1). Provide 1/2" high lettering, white on black background. Nameplates shall be permanently secured to the unit.

C. Valves: Provide valve tags on all valves of each piping system, excluding check valves, valves within equipment, faucets, stops and shut-off valves at fixtures and other repetitive terminal units. Provide brass tags or plastic laminate tags. Prepare and submit a tagged valve schedule, listing each valve by tag number, location, and piping service. Mount in glazed frame where directed.

2.5 EQUIPMENT SUPPORT FRAMES

A. Unless specifically noted otherwise, it shall be the responsibility of Plumbing Contractor to furnish and install all support frames for its equipment.

PART 3 EXECUTION

3.1 SCHEDULING OF WORK

A. All work shall be scheduled subject to the approval of the Engineer and Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site.

3.2 CONDUCT OF WORK

A. The Contractor shall have at all times, as conditions permit, a sufficient force of workmen and quantity of materials to install the work contracted for as rapidly as possible consistent with good work and shall cause no delay to other Divisions engaged upon this project or to the Owner.

B. Plumbing Contractor shall arrange for all cutting necessary for the proper installation of its work, providing all sleeves and chases necessary. Cutting shall not be done in such a manner to impair the strength of the structure. Any damage resulting from work shall be repaired by the Contractor at his expense to the satisfaction of the Engineer.

C. Progressively, daily at the completion of each day's work, and at completion of the job, the Contractor shall thoroughly clean all of his work, removing all debris, stain and marks resulting from his work.

D. IAQ Management plan will be in effect for Cal Green requirements. Adhesives and mastic must comply with low VOC requirements and documentation (MSDS, etc.) shall be provided with submittals.

3.3 EXCAVATION AND BACKFILL

A. Excavation: Trenches are to be excavated to grade and depth established by drawings. Unless otherwise noted, minimum earth cover above top of pipe shall be 24", not including base and paving in paved areas. Width of trenches at top of pipe shall be a minimum of 16" plus the outside diameter of the pipe. Provide all shoring required by site conditions. Barrel of pipe shall have uniform support on trench bottom, hand excavate additional depth at bells, hubs, and fittings. Where over-excavation occurs, provide compacted selected backfill to pipe bottom. Where ground water is encountered, remove to keep excavation dry, using well points and pumps as required.

B. Backfill:
   1. Around Pipe and to One Foot Above Pipe: Material shall be river run sand or native granular free flowing material, free of clay lumps, silt or vegetable matter and shall have 100% passing through the No. 4 sieve and a maximum of 3% passing through the No. 200 sieve. Place carefully around and on top of pipe, taking care not to disturb piping. Consolidate with vibrator.
   2. One Foot Above Pipe to Grade: Material to be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed, to proper moisture and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to approval by the Engineer.
   3. Remove all water sensitive settlement from trench backfill regardless of location and compaction requirements.

C. Compaction: Compact to a density of 95% within building and 90% outside building. Demonstrate proper compaction by testing at one-half of the trench depth. Perform three tests per 100' of trench.

3.4 OPENINGS, CUTTING AND PATCHING

A. The locations and dimensions for openings through walls, floors, ceilings, foundations,

footings, etc. required to accomplish the work under this Specification Division shall be provided under this Division. The actual openings and the required cutting and patching shall be provided. Coring through existing concrete or masonry walls, floors, ceilings, foundations, footings, etc., and saw cutting of concrete floors or asphaltic concrete required to accomplish the work under this Specification Division shall be provided under this Division. Patching of these surfaces shall also be provided. Cutting and coring shall not impair the strength of the structure. Any damage resulting from this work shall be repaired at the Contractor's expense to the satisfaction of the Engineer.

3.5 MANUFACTURER'S RECOMMENDATIONS

A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of a particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site through the construction of the project.

3.6 QUIETNESS

A. Piping and equipment shall be arranged and supported so that vibration is a minimum and is not carried to the building structure or spaces.

3.7 DAMAGES BY LEAKS

A. The Contractor shall be responsible for damages to other work caused by leaks in the temporary or permanent piping systems prior to completion of work and during the period of the guarantee, and for damages to other work caused by disconnected pipes or fittings, and the overflow of equipment prior to completion of the work.

3.8 CLEANING

A. Progressively and at completion of the job, the Contractor shall thoroughly clean all of his work, removing all debris, stain and marks resulting from his work.

END OF SECTION 22 00 00

SECTION 22 00 01 - PLUMBING

PART 1 GENERAL

1.1 GENERAL CONDITIONS

A. The foregoing Section 22 00 00, General Plumbing Provisions shall form a part of this specification.

1.2 SCOPE

A. Included: Perform all work necessary and required to complete construction as indicated. Such work includes the furnishings of all labor, materials, and services necessary for a complete, lawful, and operating plumbing system with all equipment as shown or noted on the drawings or as specified herein. The work includes, but is not necessarily limited to, the following:
1. Sanitary sewer system.
2. Domestic water system.
3. Plumbing fixtures.
4. Plumbing equipment.
5. Condensate drains.
6. Storm drain system.
7. Gas piping.

B. Work Specified Elsewhere:
1. Line voltage power wiring (60 volts or greater), motor starters in motor control centers, and disconnect switches are included in the Electrical Division, unless otherwise noted.
2. Access doors.
3. Concrete and reinforcing steel.
4. 23 00 01, Heating, Ventilating and Air Conditioning.

1.3 CODES AND STANDARDS

A. All pipe, pipe or plumbing fittings or fixture, solder, or flux shall be lead free that provides water for human consumption per California Assembly Bill 1953 (AB1953).

B. See Section 22 00 00 for additional requirements.

1.4 SUBMITTALS

A. Provide product data for all materials per Division 01.

PART 2 MATERIALS

2.1 PIPING MATERIALS

A. Sanitary Sewer:
1. Soil, Waste and Vent Piping:
a. Inside Building and Within Five Feet of Building Walls: Standard weight coated cast iron pipe and fittings. Plain end with neoprene gasket and stainless steel retaining sleeve, CISPI 301, ASTM A888 hubless cast-iron, or hub end with rubber gasket, ASTM A74, ASTM C564. Size 2” and smaller above grade may be standard weight galvanized steel, ASTM A53, with coated cast iron recessed drainage

fittings, ANSI B16.12. All cast iron pipe and couplings shall be American made and tested, no imported pipe or coupling is acceptable. Use heavy-duty (4-Band) couplings for all soil and waste piping. Use standard (2-Band) couplings for all vent piping. AB & I Foundry (Lodi USD Standard), Alternates include, Tyler Pipe, Charlotte Pipe. Couplings shall be Anaco or Husky (Lodi USD Standard). Alternates include Tyler.

2. Cleanouts: Floor cleanouts: Smith 4020 with nickel bronze top in finished areas; Smith 4220 in utility areas. Wall cleanouts: Smith 4530 with stainless steel cover and screw. Comparable models of Josam, Wade, Zurn or equal.
3. Cleanout Box: Precast reinforced concrete. Cast iron lid marked for service. Christy or equal; F22 in foot traffic area; G5 in roadways.

B. Water:
1. Hot and Cold Water, Vacuum & Air Piping:
   a. Inside Building: Type L hard temper seamless copper, ASTM B88. Wrought copper fittings ANSI B16.22. Vacuum pipe shall have long sweeping elbow fittings. 95/5 tin-silver soldered joints. Brazesafe, Silcan or equal brazing material.
   b. Outside Building Below Grade: Same as Inside Building with protective coating on ferrous pipe or Schedule 40 PVC pipe thru 2", Class 315 2" thru 4".

C. Condensate Drain Piping: Same as cold water piping.

D. Valves and Specialties:
1. Valves:
   a. General: Manufacturer's model numbers are listed to complete description. Hammond, Mueller, Nibco, Stockham, and Milwaukee, (Lodi USD Standard). All valves shall be full size of upstream piping. Ball valves shall be substituted for gate valves 2" and smaller. Butterfly valves shall be substituted for gate valves 2-1/2" and larger. C_V factors for ball valves shall not be less than equal size gate valves.
   b. Gate Valve: 2" and smaller: All bronze, rising stem, union bonnet, wedge disk, 200 psi WOG. Hammond IR-1138 or District approved equal. The material of the valve stem shall be limited to a maximum of six (6) percent zinc content. 2-1/2" and larger: Iron body, bronze mounted. Non-rising stem. Wedge disk. 200 psi WOG. Flanged or AWWA hub as applicable. Open/ closed indicator. Underground valves shall have square operating nut.
   c. Check Valve: 2" and smaller: All bronze swing check, regrinding. 200 psi WOG. Stockham B-321 (Lodi USD Standard) or approved equal. 2-1/2" and larger: Non-slam type, 125 psi iron body wafer type with renewable seats and stainless steel spring.
   d. Plug Valve: Eccentric bronze plug. Nickel chromium alloy iron body. Bronze bushings. Buna-N O-rings. UL approved for gas distribution. 175 psi WOG. DeZurick Series 400 or equal.
   e. Ball Valves: Two or three piece construction, forged bronze body, chrome plated brass ball, threaded ends, teflon seats, PTFE or reinforced teflon stem seals, lever handle. Underground valves shall have "T" handle. Provide one operating "T" extension handle for all underground valves. Nibco T and F series or District approved equal.
   f. Valve Box: Precast reinforced concrete. Cast iron lid marked for service. Christy or equal; F22 in foot traffic areas: G5 in roadways.
2. Miscellaneous Specialties:
   a. Temperature and Pressure Relief Valve: ASME rated fully automatic, reseating combination temperature and pressure relief valve sized in accordance with energy

input. Sensing element immersed within upper 6" of tank. Watts.
b. Union: 2" and Smaller: AAR malleable iron, bronze to iron ground seat. 300 psi.
c. Dielectric Coupling: Insulating coupling rated for 250 psig. EPCO or equal.
d. Shock Absorbers: Sioux Chief “Hydra-Rester”, Zurn “Shoktrol”, PPP “SC Series” or equal.

E. Miscellaneous Piping Items:
1. Pipe Support:
a. Pipe Hanger: Adjustable split ring, swivel hanger and rod. Black malleable iron. Size and maximum load per manufacturer's recommendation. Felt lined, B-Line B3690F, Unistrut or equal.
b. Construction Channel: 12 gage 1-5/8" x 1-5/8" steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Unistrut, Superstrut or equal.
2. Pipe Sleeves: 24 gage galvanized steel. Adjus-to-Crete #10 with #99 thimble for floors. #100 for walls.
3. Flashing: Vent flashing and flashing for piping through roof shall be prefabricated 24 gauge galvanized steel roof jacks with 8" square flange around pipe sealed with weatherproofing mastic.

2.2 PIPING INSULATION MATERIALS

A. General: All piping insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.

B. Pipe Insulation: Elastomeric type, ASTM C534, with a thermal conductivity of 0.27 at 75°F when measured in accordance with ASTM C177 or ASTM C518.
1. Wall thickness: 3/4 in.
2. Adhesive: Conform to Manufacturer's recommendations.

C. Pre-molded Fiberglass: Heavy density sectional pre-molded fiberglass with vapor barrier laminated all-service jacket and pressure sealing vapor barrier lap. Thermal conductivity shall not exceed 0.25 Btu-in/hr-sq. ft-degrees F, at a mean temperature of 50 degrees F. Perm rating 0.02, ASTM E96. Puncture rating 50 Beach units, ASTM D781. Provide 3" (min.) wide tape of same material as lap for butt joints. For hot water piping, thickness shall be 1" for pipe sizes less than 2", 1-1/2" thickness for pipe sizes 2" and larger. CSG Insulation Corp., Manville, Owens-Corning or equal.

D. Fiberglass Blanket: Unfaced. Thermal conductivity shall not exceed 0.25 Btu-in/hr sq. ft-degrees F, at a mean temperature of 50 degrees F. 1-1/2" thickness. Manville, Owens-Corning or equal.

E. PVC Jacket (for exposed pipes and fittings): Pre-molded polyvinyl chloride (PVC) jackets. Size to match application. Provide PVC vapor barrier, pressure-sealing tape by same manufacturer. Zeston or equal.

2.3 FIXTURES

A. General: This Division shall rough-in for and install all plumbing fixtures shown on drawings. All trim not concealed shall be brass with polished chromium plate finish unless otherwise noted. All enameled fixtures shall be acid resisting. Standard color is white unless otherwise noted.

B. Schedule: Refer to Plumbing Fixture Schedule on the drawings for list of fixtures. Manufacturer's model numbers are listed to complete description. Water consumption

quantities listed on schedule are maximum. Models of Kohler or American Standard, Zurn, Sloan, Chicago, Just, and Haws. (Lodi USD Standards). Other manufacturer products shall be reviewed by District for approval.

C. Stops and P-traps: All fixtures shall be provided with stops and p-traps as applicable.
   1. Stops: All hot and cold water supplies shall be 1/2" angle stops with IPS inlets and compression outlets, stuffing box, screwdriver lock shield, and 1/2" flexible brass tubing riser. Speedway. Wall mounted trim shall have concealed loose key wall stop. Chicago 1771 or equal.
   2. P-traps: Brass, ground joint. 17 gage. American Standard, California Tubuler or equal.
      a. Trap primers shall be provided with ball valve and cylinder key-lock access panel for all floor drains and floor sinks. PPP, Inc. or equal.

2.4 EQUIPMENT

A. General Requirements:
   1. General: These equipment specifications are to supplement the drawings. Refer to schedules on drawings for the specific equipment to be provided. Capacities shall be in accordance with the schedules shown on the drawings. Capacities are to be considered minimum.
   2. Dimensions: Equipment must conform to space requirements and limitations as indicated on the drawings and as required for operation and maintenance. Equipment will not be accepted that does not readily conform to space conditions.
   3. Ratings: Electrical equipment shall be in accordance with NEMA Standards and UL listed where applicable standards have been established.
   4. Basis of Design: Manufacturers and model numbers listed in schedules as the basis of design are intended to represent the standard of quality and the features desired.
   5. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.
   6. Electrical:
      b. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories and controls required by equipment shall be furnished. Provide terminal blocks for controls not included in equipment package. Manual and magnetic starters shall have ambient compensating running over-current protection in all ungrounded conductors. Magnetic starters shall be manual reset. Controllers and other devices shall be in NEMA 3 or 12 enclosures as applicable.
      c. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts, and other devices shall be in ungrounded conductors.
      d. Motors: Shall be rated, constructed, and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be open drip-proof, NEMA B design on pumps and fans, NEMA C on reciprocating equipment, sealed ball bearing, three-phase induction. Design shall limit starting inrush current and running current to values shown on drawings.
      e. Starters: Motor starters shall be provided for all equipment except where starter is in a motor control center as designated on the electrical drawings.
      f. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.

g. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.

B. Electric Drinking Fountain: Wall hung, Dual height with Bottle Filler. Provide steel mounting brackets. Stainless steel basin. Removable grid drain. Chrome plated brass bubbler with automatic flow regulator and self-closing valve. Nonferrous evaporator. Hermetic compressor with automatic reset overload protection. Air cooled condenser. Adjustable thermostat. UL listed. ARI certified. Haws or Elkay (Lodi USD Standards).

C. Water Heater, Instantaneous Electric: Tankless, automatic temperature control. High limit control. Provide microprocessor controls. UL listed and CEC approved. Warranty for a period of 1-year minimum. Chronomite, Eemax or Lodi USD approved equal.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

A. General:
1. Piping Layout: Piping shall be concealed in walls, above ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by Owner’s Representative. No structural member shall be cut, notched, bored, or otherwise altered unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. All piping shall be installed in a manner to ensure unrestricted flow, eliminate air pockets, prevent any unusual noise, and permit complete drainage of the system. All piping shall be installed to permit expansion and contraction without strain on piping or equipment. Expansion joints shall be installed as required. Vertical lines shall be installed to allow for building settlement without damage to piping. All exposed piping to be primed and painted, see painting section.
2. Joints:
   a. Threaded: Pipe shall be cut square and reamed to full size. Threads shall be in accordance with ANSI B2.1. Joint compound or tape suitable for conveyed fluid shall be applied to male thread only. Joints shall be made with three threads exposed.
   b. Welded or Brazed: Filler rod shall be of the same suitable alloy as pipe. Welding or brazing shall be performed in accordance with requirements of recognized published standards of practice and by licensed or otherwise certified contractors. Welder or Brazer shall be a person who specialized in welding or brazing of pipes and holds a recognized certificate of competency from a recognized testing laboratory, based on the requirements of the ASME Boiler and Pressure Vessels Code, Section 9.
   c. Other: Joints other than threaded or welded shall be installed in accordance with manufacturer's recommendations.
   d. Open Ends: Open ends of piping shall be capped during progress of work to preclude foreign matter.
   e. Electrical Equipment: Joints shall be avoided, where possible, over electrical equipment.
   f. Copper pipe 1-1/2” or less may be soldered. Above 1-1/2” and all below grade shall be brazed.
3. Fittings:
   a. Standard Fittings: All joints and changes in direction shall be made with standard fittings. Close nipples shall not be used.
   b. Reducers: Pipe size reduction shall be made with bell reducer fittings. Bushings shall not be used.
   c. Unions: A union shall be installed on the leaving side of each valve, at equipment

connections, and elsewhere as necessary for assembly or disassembly of piping.

d. Valves: All valves shall be full line size. At equipment connections, valves shall be full size of upstream piping.

4. Pipe Support:
   a. General: Hangers shall be placed to support piping without strain on joints or fittings. Maximum spacing between supports shall be as specified below. Actual spacing requirements will depend on structural system. Refer to drawings for additional requirements and attachment to structure. Vertical piping shall be supported at floor and ceiling. Support pipe within 12" of all changes in direction. Support individual pipes with pipe hanger. All pressure piping, drainage piping above grade and metallic piping of dissimilar metal from hangers shall have isolating shield, or felted hangers.
      1) Screwed Pipe:

Pipe Size Between Supports*	Max. Spacing
(in)	(ft)
½	6
¾	8
1	8
1-1/4 & larger	10

* Based on straight lengths of pipe with couplings only. Provide additional supports for equipment, valves, or other fittings.

      2) Copper Tubing: Copper tubing shall be supported at approximately six (6) foot intervals for piping one and one-half (1-1/2) inches and smaller in diameter and ten (10) foot intervals for piping two (2) inches and larger in diameter.
      3) Gravity Drainpipe: Piping shall be supported at each length of pipe or fitting, but in no case at greater spacing than indicated above for pressure pipe.
   b. Trapeze: Trapeze hangers of construction channel and pipe clamps may be used. Submit design to Engineer for approval.
5. Excavation and Backfill: Minimum cover on all piping shall be as follows unless otherwise noted:
   a. Up to 2-1/2" pipe - 24" cover.
   b. 3" and larger pipe - 30".
6. Miscellaneous:
   a. Escutcheons: Provide chromium plated escutcheons where piping penetrates walls, ceilings, or floors in finished areas.
   b. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" clearance between sleeve and pipe or pipe insulation.
   c. Dielectric Couplings: Dielectric couplings shall be installed wherever piping of dissimilar metals are joined.
   d. Shock Absorbers: Install per manufacturers recommendations.

B. Sanitary Sewer Piping:
1. General: Where inverts are not indicated, sanitary sewer piping shall be installed at 1/4" per foot pitch. Piping 4" and larger may be installed at 1/8" per foot pitch where structural or other limitations prevent installation at a greater pitch.
2. Cleanouts: Install cleanouts at ends of lines, at changes of direction greater than 45 degrees, and at not greater than 100 foot intervals. Locate interior cleanouts in accessible locations and bring flush to finished surface. Cleanouts at urinals shall be installed above urinal.
3. Vents: Vents shall terminate not less than 6" above the roof nor less than 12" from any vertical surface nor within 10 feet of any outside air intake. Install horizontal vent lines at 1/4" per foot pitch. Offset vents 2 feet minimum from gutters, parapets, ridges, and roof flashing.

4. Acid Waste & Vent: Push together joints tightly, then mark with permanent marker before fusing joints. After fusing joints with piping manufacturer's tools then cut off fusing tabs on pipe. Tailpiece and traps shall be threaded union fittings only.

C. Water Piping: Connections to branches shall be made from the top side of the main. Supply header in fixture battery shall be full size to last fixture, reducing in size only on individual connections to each fixture in battery. Provide ball valve shutoff for each building and at each connection to equipment and trap primers. Shock absorbers shall be installed in a vertical position at end of branch runs as specified in this section whether specifically shown or not on drawings. Connections to equipment shall be made with flexible connectors. Non-metallic pipe shall have 18 AWG copper tracer wire laid on top of pipe and taped in place at 15-foot spacing, terminate 4" above grade at ends of pipe runs.

3.2 PIPING INSULATION INSTALLATION

A. Domestic Tempered Water Supply:
1. General: All domestic tempered water supply piping, except for exposed connections to fixtures, shall be insulated. Do not insulate unions or valves less than 2", unless exposed to weather.
2. Install elastomeric pipe insulation by slipping over end of pipe. Where not feasible, slit insulation longitudinally, snap over piping and seal with adhesive. Insulate fittings with larger diameter sleeves or insulation, lapping pipe insulation a minimum of 2 in.
3. Butt sections of insulation tightly together and seal with adhesive to provide a continuous vapor and thermal barrier.
4. Pipe: Apply pre-molded fiberglass sections to pipe using integral pressure sealing lap adhesive in accordance with manufacturer's recommendations. Stagger longitudinal joints. Seal butt joints with factory supplied sealing tape.
5. Fittings and Valves:
   a. Wrap fitting with pre-cut fiberglass blanket to thickness matching adjoining insulation. Cover blanket with PVC jacket in accordance with manufacturer's recommendations. Seal all joints with factory supplied pressure sealing vapor barrier tape with 2" (min.) overlap on both sides of joint. Insulate valves to stem.
   b. For miscellaneous fittings for which PVC jackets are not available or where proximity of fittings precludes a neat-appearing installation, the contractor may cover the fiberglass blanket with stretchable glass fabric and at least two coats of vapor barrier coating. All exposed ends of insulation shall be adequately sealed.

B. ADA Compliant Fixtures:
1. At sinks/ lavatories which are to be ADA Compliant, the p-trap and angle stop assemblies shall be insulated with Trap Wrap Protective Kit 500R by Brocar, Truebro Handi Lav-Guard #102W or #105W or equal. Abrasion resistant exterior cover shall be smooth and have 1/8" wall minimum over cushioned foam insert. Fasteners shall remain substantially out of sight.

3.3 FIXTURE INSTALLATION

A. Fixture Height: Shall be standard height except those specified as ADA Compliant. Such fixtures shall be mounted in accordance with CBC, Section 11B, Division 6 and drawing details.

B. Wall Hung Fixtures: Shall be provided with proper backing and hanger plates secured to wall. Fixtures mounted on carriers shall bear against stop nuts, clear of wall surface. Caulk fixtures against walls with white G.E. "Sanitary SCS1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).

C. Floor Drains or Floor Sinks: Shall be placed parallel to room surfaces, set level, flush with floor, and adjusted at proper height to drain and easily accessible for inspection and cleaning. Cover openings during construction to keep all foreign matter out of drain line.

D. Other Connections: Rough-in and connection for trim or fixtures supplied by others shall be included in this specification section.

E. Floor Mounted Fixtures: Shall be provided with proper support plates. Caulk fixtures against floors with white G.E. “Sanitary SCS1700” silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).

3.4 EQUIPMENT INSTALLATION

A. General: It shall be the responsibility of the equipment installer to ensure that no work done under other specification sections shall in any way block, or otherwise hinder the equipment.

B. Connections to Equipment: Where size reductions are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

C. Diesel Fuel Tank: Install per manufacturer recommendations.

3.5 TESTS AND ADJUSTMENTS

A. General: Unless otherwise directed, tests shall be witnessed by the Owner’s Representative. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test, and repair his work, and that of other contractors, to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested. Tests may be made in sections. However, all connections between sections previously tested and new section shall be included in the new test. New sections shall be isolated from existing sections for testing purposes. There shall be no drop in pressure during test except that due to ambient temperature changes. All components of system not rated for test pressure shall be isolated from system before test is made. Test the new sections or branches of piping only.

B. Gravity System:
1. Sanitary Sewer: All ends of the new sections of sewer system shall be capped and lines filled with water to the top of the highest vent, 10 feet above grade minimum. This test shall be made before any fixtures are installed. Test shall be maintained until all joints have been inspected, but no less than 2 hours.
2. Condensate Piping: Maintain 15 psig water pressure for a duration of 4 hours.

C. Pressure Systems:
1. General: There shall be no drop in pressure during test except that due to ambient temperature changes. All components of system not rated for test pressure shall be isolated from system before test is made. Test the new sections or branches of piping only.
2. Domestic Tempered, & Cold Water Piping: Maintain 60 psig water pressure for a minimum duration of 2 hours.
3. Gas, Vacuum and Air Piping: Maintain 60 psig air pressure for a minimum duration of 2 hours.

D. Accessible Lavatories:
1. Faucet controls and operating mechanisms shall be installed and tested to comply per

CBC Section 11B-606.4.

3.6 DISINFECTION

A. Disinfect all domestic hot and cold water piping systems in accordance with California Plumbing Code Sections 609.9.1 through 609.9.4. The method to be followed shall be that prescribed by the Health Authority or, in case no method is prescribed by it, the following:
   1. The pipe system shall be flushed with clean, potable water until potable water appears at the points of outlet.
   2. The system or parts thereof shall be filled with a water-chlorine solution containing not less than 50 parts per million of chlorine, and the system or part thereof shall be valved-off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water-chlorine solution containing not less than 200 parts per million of chlorine and allowed to stand for 3 hours.
   3. Following the allowed standing time, the system shall be flushed with clean, potable water until the chlorine residual in the water coming from the system does not exceed the chlorine residual in the flushing water.
   4. The procedure shall be repeated where it is shown by bacteriological examination made by an approved agency that contamination persists in the system.

B. Disinfection process shall be performed by certified testing agency or in cooperation with health department having jurisdiction and witnessed by a representative of the Architect. During procedure, signs shall be posted at each water outlet stating, "Chlorination - Do Not Drink". After disinfection, water samples shall be collected by certified testing agency or by health department for bacteriological analysis. Certificate of Bacteriological Purity shall be obtained and delivered to the Owner through the Owner’s Representative.

END OF SECTION 22 00 01

SECTION 23 00 00 - GENERAL MECHANICAL PROVISIONS

PART 1 GENERAL

1.1 GENERAL CONDITIONS

A. The foregoing General and Special Conditions shall form a part of this Division with the same force and effect as though repeated herein. The provisions of this Section shall apply to all the Sections of Division 23.

1.2 CODES AND REGULATIONS

A. All work and materials shall be in full accordance with current rules and regulations of applicable codes and all California Amendments. Nothing in these drawings or specifications is to be construed to permit work not conforming to these codes. Should the drawings or specifications call for material or methods of construction of a higher quality or standard than required by these codes, the specifications shall govern. Applicable codes and regulations are:

1. California Code of Regulations – CCR:
    a. Title 8, Industrial Relations.
    b. Title 24, Building Standards.
2. California Building Code – CBC.
3. California Mechanical Code – CMC.
4. California Plumbing Code – CPC.
5. California Fire Code – CFC.
6. California Green Building Code.
7. Air Diffusion Council – ADC.
8. American Gas Association – AGA.
9. Air Moving and Conditioning Association – AMCA.
10. American National Standards Institute – ANSI.
11. Air Conditioning and Refrigeration Institute – ARI.
12. American Society of Heating, Refrigerating and Air Conditioning Engineers – ASHRAE.
13. American Society of Mechanical Engineers – ASME.
14. American Society for Testing and Materials – ASTM.
15. American Water Works Association – AWWA.
16. California Electrical Code – CEC.
17. National Electrical Manufacturers Association – NEMA.
18. National Fire Protection Association – NFPA.
19. Sheet Metal and Air Conditioning Contractors National Association – SMACNA.
20. Underwriters' Laboratory – UL.
21. Occupational Safety and Health Act - OSHA.
22. ASCE 7-16, Chapter 13.

1.3 PERMITS AND FEES

A. The Contractor shall take out all permits and arrange for all tests in connection with his work as required by local ordinances. All charges are to be included in the work. Permits for equipment connected to a particular system are to be considered as a part of the work included under each system; for example, permits for electric motor connection are part of electrical work, permits for domestic water or gas connections are part of plumbing work. All charges for service connections, meters, etc. by utility companies or districts shall be included in the work.

1.4 COORDINATION OF WORK

A. Layout of materials, equipment and systems is generally diagrammatic unless specifically dimensioned. The actual locations of all materials, piping, ductwork, equipment, supports, etc. shall be carefully planned, prior to installation of any work, to avoid all interferences with each other, or with structural, electrical, or architectural elements. Verify the proper voltage and phase of all equipment with the electrical plans. All conflicts shall be called to the attention of the Engineer prior to the installation of any work or the ordering of any equipment.

1.5 GUARANTEE

A. Guarantee shall be in accordance with the General Conditions. These specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the Certificate of Guarantee shall be furnished to the Owner through the Engineer.

1.6 EXAMINATION OF SITE

A. The Contractor shall examine the site, compare it with plans and specifications, and shall have satisfied himself as to the conditions under which the work is to be performed. No allowance shall subsequently be made in his behalf for any extra expense to which he may be put due to failure or neglect on his part to make such an examination.

1.7 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Shop Drawings: Within 30 days of contract award, the Contractor shall submit six copies of shop drawings for all materials, equipment, etc. proposed for use on this project. Material and equipment shall not be ordered or installed until written review is processed by the Engineer. Any item omitted from the submittal shall be provided as specified without substitution. All shop drawings must comply with the following:
   1. Shop drawings are required for all material and equipment items and shall include manufacturer's name and catalog numbers, dimensions, capacities, performance curves, and all other characteristics and accessories as listed in the specifications or on the drawings. Descriptive literature shall be current factory brochures and submittal sheets. Capacities shall be certified by the factory.
   2. All shop drawings shall be submitted at one time in a neat and orderly fashion in a suitable binder with title sheet including Project, Engineer, and Contractor; Table of Contents; and indexed tabs dividing each group of materials or item of equipment. All items shall be marked with the specification paragraph number for which they are proposed. All equipment shall also be identified by the mark number as indicated on the drawings.
   3. All capacities, characteristics, and accessories called for in the specifications or on the drawings shall be highlighted, circled, or underlined on the shop drawings. Calculations and other detailed data indicating how the item was selected shall be included for items that are not scheduled. Data must be complete enough to permit detailed comparison of every significant characteristic which is specified, scheduled, or detailed.

C. Substitutions: Manufacturers and model numbers listed in the specifications or on the drawings represent the standard of quality and the features desired. Unless otherwise noted, alternate manufacturers may be submitted for review by the Engineer. Calculations and other detailed data indicating how the item was selected shall be included. The Contractor shall assume full responsibility that substituted items or procedures will meet the specifications and job requirements and shall be responsible for the cost of redesign and

modifications to the work caused by these items.

D. Review: Submittals will be reviewed for general conformance with the design concept, but this review does not guarantee quantity shown, nor does it supersede the responsibility of the Contractor to provide all materials, equipment, and installation in accordance with the drawings and specifications. The Contractor shall agree that shop drawing submittals processed by the Engineer are not Change Orders; that the purpose of shop drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept; that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use. The Contractor shall agree that if deviations, discrepancies or conflicts between shop drawings and design drawings and specifications are discovered either prior to or after shop drawing submittals are processed by the Engineer, the design drawings and specifications shall control and shall be followed.

1.8 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Submit one electronic pdf copy for review and after approved submit three hard copies of the Operation and Maintenance Instructions and Wiring Diagrams for all equipment and parts lists for all equipment, etc. shall be submitted to the Engineer. All instructions shall be clearly identified by marking them with the same designation as the equipment item to which they apply (e.g. AC-1). All wiring diagrams shall agree with revised shop drawings and indicate the exact field installation. All instructions shall be submitted at the same time and shall be bound in a suitable binder with tabs dividing each type of equipment (e.g. Fans, Motors, etc.). Each binder shall be labeled indicating "Operating and Maintenance Instructions, Project Title, Contractor, Date" and shall have a Table of Contents listing all items included.

B. Verbal: The Contractor shall verbally instruct the Owner's maintenance staff in the operation and maintenance of all equipment and systems. The controls contractor shall present that portion of the instruction that applies to the control system. The Engineer's office shall be notified 96 hours prior to this meeting.

C. Posted: The Contractor shall prepare operation instructions for all systems which shall be typewritten, reviewed by the Engineer, and mounted under glass adjacent to the appropriate temperature control panel. These instructions shall include applicable temperature control diagrams.

D. Acknowledgment: The Contractor shall prepare a letter indicating that all operation and maintenance instructions (printed, verbal and posted) have been given to the Owner, to the Owner's satisfaction. This letter shall be acknowledged (signed) by the Owner and submitted to the Engineer.

1.9 RECORD DRAWINGS

A. The Contractor shall maintain a set of prints for the project as a record of all construction changes made. As the Work progresses, the Contractor shall maintain a record of all deviations in the Work from that indicated on the drawings. Final location of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, i.e. buildings, curbs and walks. In addition, the water, gas, under-floor ducts, etc. within the building shall be recorded by offset distances from building walls. The original drawings will be made available to the Contractor from which he shall have a set of reproducible drawings made. The Contractor shall then transfer the changes, notations, etc. from the marked-up prints to the reproducible drawings. The record drawings (marked-up prints and reproducibles) shall be submitted to the Engineer for review (as an alternative, the marked-up prints may be photocopied full size on reproducible stock).

PART 2 PRODUCTS

2.1 PROTECTIVE COATING FOR UNDERGROUND PIPING

A. All ferrous pipe below grade (except cast iron) shall have a factory applied protective coating of extruded high density polyethylene, 35 to 70 mils total thickness, X-Tru Coat, Scotchkote. All fittings and areas of damaged coating shall be covered with two layer double wrap of 10 mil polyvinyl tape to total thickness of 40 mils. Manville Corporation. Protective coating shall be extended 6" above surrounding grade.

2.2 CONCRETE ANCHORS

A. Concrete Anchors shall comply with CBC 1901A.3. Steel stud with expansion anchor requiring a drilled hole; powder driven anchors are not acceptable. Minimum concrete embedment shall be 4-1/2 diameters. Minimum spacing shall be 10 diameters center-to-center and 5 diameters from center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80% of the test report values "with special inspection". Anchors shall be Hilti, Philips - or Approved equal.

2.3 SEISMIC RESTRAINTS

A. All mechanical systems (all equipment, piping, etc.) shall be provided with seismic restraints in accordance with details on the drawings.

2.4 SYSTEM IDENTIFICATION

A. Equipment: All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-1). Provide 1/2" high lettering, white on black background. Nameplates shall be permanently secured to the unit.

B. Controls: Label all panels, thermostats and by-pass timers with plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-1). Provide 1/4" high lettering, white on black background. Nameplates shall be permanently secured to the unit.

2.5 EQUIPMENT SUPPORT FRAMES

A. Unless specifically noted otherwise, it shall be the responsibility of Mechanical Contractor to furnish and install all support frames for its equipment.

PART 3 EXECUTION

3.1 SCHEDULING OF WORK

A. All work shall be scheduled subject to the approval of the Engineer and Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site.

3.2 CONDUCT OF WORK

A. The Contractor shall have at all times, as conditions permit, a sufficient force of workmen and quantity of materials to install the work contracted for as rapidly as possible consistent with good work and shall cause no delay to other Divisions engaged upon this project or to the Owner.

B. Mechanical Contractor shall arrange for all cutting necessary for the proper installation of its work, providing all sleeves and chases necessary. Cutting shall not be done in such a manner to impair the strength of the structure. Any damage resulting from work shall be repaired by the Contractor at his expense to the satisfaction of the Engineer.

C. Progressively, daily at the completion of each day's work, and at completion of the job, the Contractor shall thoroughly clean all of his work, removing all debris, stain and marks resulting from his work.

3.3 OPENINGS, CUTTING AND PATCHING

A. The locations and dimensions for openings through walls, floors, ceilings, foundations, footings, etc. required to accomplish the work under this Specification Division shall be provided under this Division. The actual openings and the required cutting and patching shall be provided. Coring through existing concrete or masonry walls, floors, ceilings, foundations, footings, etc., and saw cutting of concrete floors or asphaltic concrete required to accomplish the work under this Specification Division shall be provided under this Division. Patching of these surfaces shall also be provided. Cutting and coring shall not impair the strength of the structure. Any damage resulting from this work shall be repaired at the Contractor's expense to the satisfaction of the Engineer.

3.4 MANUFACTURER'S RECOMMENDATIONS

A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of a particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site through the construction of the project.

3.5 QUIETNESS

A. Piping, ductwork, and equipment shall be arranged and supported so that vibration is a minimum and is not carried to the building structure or spaces.

3.6 DAMAGES BY LEAKS

A. The Contractor shall be responsible for damages to other work caused by leaks in the temporary or permanent piping systems prior to completion of work and during the period of the guarantee, and for damages to other work caused by disconnected pipes or fittings, and the overflow of equipment prior to completion of the work.

3.7 CLEANING

A. Progressively and at completion of the job, the Contractor shall thoroughly clean all of his work, removing all debris, stain and marks resulting from his work.

END OF SECTION 23 00 00

SECTION 23 00 01 - HEATING, VENTILATING AND AIR CONDITIONING

PART 1 GENERAL

1.1 GENERAL CONDITIONS

A. The foregoing Section 23 00 00, General Mechanical Provisions, shall form a part of this specification.

1.2 SCOPE

A. Included: Perform all work necessary and required to complete construction as indicated. Such work includes the furnishing of all labor, materials, and services necessary for a complete, lawful, and operating air conditioning, heating, ventilating system with all equipment as shown or noted on the drawings or as specified herein. The work includes, but is not necessarily limited to, the following:
   1. Heating, ventilating and air conditioning equipment.
   2. Air distribution system (Ductwork, Air Terminals, etc.).
   3. System insulation.

B. Work Specified Elsewhere:
   1. Line voltage power wiring (60 volts or greater), motor starters in motor control centers and disconnect switches are included in the Electrical Section.
   2. Access doors.
   3. Controls, control wiring, and conduit for control wiring.

PART 2 MATERIALS

2.1 DUCTWORK MATERIALS

A. General: All ductwork materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL-723 not exceeding a flame spread of 25 and smoke developed of 50. All ductwork shall be per Chapter 6 of the CMC.

B. Low Velocity Metal Ductwork: Metal ductwork shall be galvanized sheet steel, ASTM A653.

C. Low Velocity Flexible Ductwork: Insulated flexible ductwork. Continuous internal liner bonded to galvanized steel wire helix. One pound per cubic foot glass fiber insulation, R-8. Thermal conductivity shall not exceed 0.13 Btu./ hr. sq. ft.-degrees F at a mean temperature of 75°F. Seamless vapor barrier jacket. Each length shall have a factory installed metal sleeve at each end. Duct shall be capable of continuous operation at 1.5" of water static pressure and 4000 ft./ min. air velocity. Maximum length 5 ft., single piece at runouts to air terminals. Genflex, Lamborn or equal.

D. Spiral Duct: Ductwork shall be galvanized steel with uni-seal spiral seamlock and uni-seal fittings, ASTM A653. United McGill Corp. All exposed spiral duct shall be painted, color selected by Owner.

E. Bonding Adhesive: Durodyne WBG, Scotchgrip Adhesive 4230, United McGill Uni-Tack.

F. Duct Mastic: Minnesota Mining and Manufacturing Duct Sealer 800, Tuff-Bond No. 12, Glencoat Seal-Flex, United Duct Sealer.

G. Fiber Tape: Mineral impregnated fiber tape and plastic activator - adhesive, Hardcast, Inc.,

United McGill Uni-Cast or equal.

H. Duct Joints:
1. As an option to joints and seams designated by SMACNA or shown on Drawings, the following systems may be used:
   a. Ducts with sides 24 inches to 48 inches, transverse duct joint system by Ductmate Jr., Nexus or equal (SMACNA "E" Type connection).
   b. Ducts 48 inches and larger, Ductmate Regular, Nexus or equal (SMACNA "J" Type connection).

2.2 AIR TERMINALS AND DUCT FITTINGS

A. Grilles: (Grilles, Registers and Diffusers)
1. Information on Drawings: Refer to the Air Distribution Schedule on the drawings for the list of grilles. Manufacturer's model numbers are listed to complete the description. Equivalent models of Anemostat, J & J, Krueger, Barber-Colman, Price, Environmental Air Products, Titus or equal. Refer to the floor plans for neck size, CFM, air diffusion pattern, and fire damper, if required.
2. Performance: If, according to the certified data of the manufacturer of the proposed units, the sizes indicated on the drawings will not perform satisfactorily, the units shall be reselected by the Contractor for the proper diffusion, spread, drop, and throw.
3. Frame Accessories: All supply, return, and exhaust grilles shall be provided with cushion heads and attachments to structure, unless otherwise noted. All surface mounted grilles shall have a perimeter gasket and flanged edge. All grilles shall have frames suitable for mounting in the surfaces designated by the architectural drawing, coordinate prior to ordering.
4. Finish: All ceilings and wall grilles shall have a paintable white finish unless otherwise noted. Interior components shall be flat black.

B. Turning Vanes: Double wall, hollow metal, air-foil shape. Spacing in accordance with manufacturer's recommendations. Aero Dyne, HEP, or equal.

C. Flexible Connection: UL listed neoprene coated 30-ounce fiberglass cloth. 3" metal, 6" fabric, 3" metal. Ventglas or equal.

D. Fire/ Smoke Damper: Multi-blade construction in accordance with CBC & CMC. UL 555 and UL 555S labels. Blades shall have metal-to-metal seals and not rely on actuator torque to maintain leakage rating. Prefco, Air Balance, Ruskin, Greenheck, or equal power open/ spring close operator or equivalent.

E. Fire Damper: Dynamic rated fire dampers, U.L. 555 label. Prefco, Air Balance, Ruskin, Greenheck or equal.

F. Louvers: Refer to the Air Distribution Schedule on the drawings. Manufacturer’s model numbers are listed to complete the description. Equivalent models of Ruskin, Greenheck, Dayton or approved equal. Contractor shall fabricate and provide 16 GA. galvanized perforated panel (50% Free Area) over exterior of all louvers and have field painted to match exterior wall. Refer to the floor plans for all sizes.

2.3 DUCTWORK INSULATION MATERIALS

A. General: All ductwork insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.

B. Acoustic Lining: Glass fiber. One side coated to prevent fiber erosion up to 6000 ft./ min. Average noise reduction coefficient of 0.90. 0.13 Btu/ hr. – sq. ft. – degrees F conductivity at a mean temperature of 75 degrees F, R-8. CSG Insulation Corp., Schuller, Owens-Corning, Knauf or equal. Duct dimensions shown on drawings for lined duct are clear (net) opening inside of lining.

C. Fiber Glass Blanket: Foil faced,0.13 Btu/ hr. – sq. ft. – degrees F conductivity at a mean temperature of 75 degrees F, R-8. CSG Insulation Corp., Schuller, Owens-Corning, Knauf or equal.

D. Bonding Adhesive: Benjamin Foster 85-15 or equal.

2.4 PIPING MATERIALS

2.5 EQUIPMENT

A. General Requirements:
1. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be considered minimum.
2. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Where Architectural screening is indicated, equipment shall not extend above or beyond screening. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.
3. Ratings:
   a. Gas: Gas burning equipment shall be furnished with 100% safety gas shut-off, intermittent pilot ignition, and be CSA (US) certified, except that boilers shall be CSA (US) certified or UL listed.
   b. Electrical: Electrical equipment shall be in accordance with NEMA Standards and UL or ETL listed where applicable standards have been established.
4. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.
5. Electrical:
   a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories and controls required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Manual and magnetic starters shall have ambient compensating running overcurrent protection in all ungrounded conductors. Magnetic starters shall be manual reset, shall have H-O-A switches and auxiliary contacts. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.
   b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts, and other devices shall be in ungrounded conductors.
   c. Motors: Shall be rated, constructed, and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be open drip proof, NEMA B design on pumps and fans, NEMA C on reciprocating equipment, sealed ball bearing, three-phase induction unless otherwise noted. Design shall limit starting inrush current and running current to values shown on drawings. Motors 1 horsepower

and larger shall be the premium efficiency type, tested according to IEEE Standard 112, Method B. Motors exposed to weather shall be TEFC. Motors in a fan air stream shall be TEFC or TEAO. Vertical motors outdoors shall be ODP or TEFC and shall have rain caps.

d. Starters: Motor starters shall be furnished for all equipment except where starter is in a motor control center as designated on the electrical drawings. Deliver starter to Electrical Contractor for installation and wiring.
e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt control circuit from integral protected transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.
f. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommend external wiring.

6. Fan Selection:
   a. Fan Curves: Performance curves shall be submitted for all units of 3000 CFM or greater. Operating point for forward curved fans shall be from point of maximum efficiency towards increased CFM limited by horsepower scheduled. Operating point for backward inclined fans shall be selected near point of maximum efficiency. Curves shall plot CFM verses static pressure with constant brake horsepower, RPM, and efficiency lines.
   b. Static Pressure: Unless otherwise noted, pressure scheduled as external static pressure (ESP) includes all ductwork and accessory losses external to the unit housing. Unless otherwise noted, pressure scheduled as total static pressure includes all ductwork, filter, coil, cabinet, damper, and other accessory losses. Unless otherwise noted, pressure scheduled as duct static pressure includes all supply and return ductwork and accessory losses external to the unit housing and plenum (as applicable). The allowance for filter losses is 0.3" WC, unless otherwise noted. Submit itemized static pressure losses for all components.
7. Filters:
   a. General: Tested and rated in accordance with ASHRAE Standard 52.2 and Title 24, C.C.R. Furnish and install one complete change of all filters after air balance in completed and prior to acceptance. Provide pressure differential gage across all filter banks.
   b. Filter Media: 2" media. MERV-13. Clean filter resistance 0.25" water at 500 fpm. Throw-away frame. Class 2. Camfil Farr AP or equal.
   c. Pressure Differential Gage: Diaphragm actuated. 4" dial. Zero adjustment. Accuracy +/- 2% of full scale. Range as required. Provide static pressure sensors, tubing, and mounting brackets. Dwyer Series 2000. Mark gage to indicate filter replacement pressure, coordinate point with filter and equipment manufacturers.
8. Mixing Dampers: Opposed blade, 16-gage. Six-inch maximum blade width, 48" maximum length. Nylon or oil impregnated bronze bearings. One-half inch diameter pin shaft. 16-gage channel frame. One percent maximum leakage at 4" WC in accordance with AMCA 500 for outside air dampers. Actuating rod out of air stream. Arrow.
9. Sound Ratings: Shall be in accordance with ASHRAE 36-72. Sound ratings shall not exceed scheduled values.
10. Drives: Unless noted as direct connected, drives shall be V-belt, rated at 150% of motor horsepower. Multiple drive belts shall be matched set. Drive sheaves shall be dynamically balanced, adjustable, range +/- 10%, selected at mid-range. Adjustable relative movement shall be lockable to shaft. Belts shall be aligned within 1-1/2 degrees at all times. Open drives shall be provided with OSHA approved open mesh belt guards. Belt guards exposed to weather shall be weatherproof enclosure with louvered face for adequate ventilation. Driving motor shall be mounted on adjustable rails. T.B. Woods, Browning. Submit RPM range of driven machine with drive selection.

B. Electric Heaters: U.L. listed for zero clearance to combustibles. QMark or equivalent.
   1. Heating elements shall be 80% nickel and 20% chromium. Elements shall be 25 watts per square inch.
   2. Element terminals shall be stainless steel; insulators and bracket bushings shall be nonporous ceramic and securely positioned. Terminals shall be machine crimped to elements.
   3. Frame shall be constructed of heavy gauge galvanized steel with galvanized steel brackets, stiffening ribs and gussets spot-welded to the casing.
   4. Terminal box shall be spot welded construction with solid, hinged cover, totally enclosed, without louvers or grilles per UL Standard 1096.
   5. Recessed terminal box to be provided when coils are installed in duct with internal obstruction greater than 1".
   6. Safety devices: A disc-type automatic reset thermal cutout shall be furnished for primary over temperature protection. For secondary protection, a sufficient number of replaceable cutouts in the power lines shall de-energize elements if the primary cutout fails. All safety devices shall be serviceable through the terminal box without removing the heater from the duct.
   7. Wiring diagrams: A unique wiring diagram shall be furnished for each heater. Diagram shall include recommended supply wire gauges per CEC and fuse sizes. Typical wiring diagrams are not acceptable.
   8. Built-in components shall include safety interlocking disconnect switch, disconnecting break magnetic contactors, transformer with primary fusing per UL, pressure-type airflow with primary fusing per UL, pressure-type airflow switch set at 0.07" WC, supplementary circuit fuses per CEC, and separate load and control terminal blocks to accept conductors as shown on the electrical plan.

C. Exhaust Fans:
   1. General: All exhaust fans shall be tested and rated in accordance with AMCA Standard 210. Fans exposed to the weather shall have ventilated weatherproof housing over motor and drive assembly.
   2. Ceiling Fan: Ceiling mounted direct drive centrifugal exhaust fan with exhaust grille. Motor mounted in rubber-in-shear isolators. Motor and fan removable through grille. Acoustically lined housing. Backdraft damper. UL listed. Penn, Cook, ACME, Greenheck or equal.
   3. Roof Fan: Multivane centrifugal fan. Ball bearings. Vibration isolation mount. All aluminum curb base. Weatherproof disconnect switch. Down blast type UL listed. Cook, Greenheck, Penn, ACME or equal.
   4. In-Line Fan: Attic mounted direct drive centrifugal exhaust fan. Motor shall be open drip proof with permanently lubricated sealed bearings and built-in thermal overload protection and disconnect plug. Acoustic lined housing. Backdraft damper. Provide 24”x24” access panel with cylinder key lock when above hard ceiling. UL listed. Penn, Cook, ACME, Greenheck or equal.

D. Electric Unit Heaters:
   1. General: UL listed and labeled assembly with terminal box and cover, and built-in controls.
   2. Heating Elements: Enclosed copper tube, aluminum finned element of coiled nickel chrome resistance wire centered in tubes and embedded in refractory material.
   3. Cabinet: 16-gauge steel with easily removed insulated front panel with integral air outlet and inlet grilles.
   4. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.
   5. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard.
   6. Motor: Vertical models with grease lubricated ball bearings.
   7. Control: Separate fan speed switch and thermostat heat selector switch, factory wired,

with switches built-in behind cover. Provide thermal overload.

PART 3 EXECUTION

3.1 DUCTWORK INSTALLATION:

A. General:
1. Standards: Unless otherwise noted, all ductwork shall be constructed and installed in accordance with current SMACNA "HVAC Duct Construction Standards." Ductwork and accessories shall be installed in a manner to prevent vibration and rattling.
2. Seismic Bracing: All ducts shall be braced and supported per details on the drawings.
3. Duct Access Doors: Provide access doors as required to adjust equipment and dampers.
4. Flexible Connections: Connections of ductwork to all equipment shall be with 6" (min.) flexible connection. Install with ample slack and uniform gap after deflection of vibration isolators. There shall be no metal to metal contact across flexible connection. Protect outdoor connections with weatherproof metal shroud on top and sides, no metal-to-metal contact. Provide at all seismic joints.
5. Open ends of ductwork shall be covered during construction to keep inside clean.

B. Low Velocity-Low Pressure (up to 2000 ft./ min.; up to 2.0 in. water):
1. Sheet Metal Ductwork:
   a. Ells: Ells with less than standard radius and square ells shall be fitted with turning vanes.
   b. Tees: Tees shall be straight tap-in with extractor or 45 degree takeoff, as shown on drawings.
   c. Duct Joints: Seal duct joints airtight with fibre tape and adhesive per manufacturer's printed instructions. Ducts in weather shall be sealed air and watertight with duct mastic before closing and taping.
      1) Where Ductmate type of joints are used the manufacturer’s, designated procedure shall be followed. Ductmate joints on roof shall have continuous cleat on top duct flange to prevent water from collecting on gasket.
   d. Dampers: Install volume control damper and damper regulator in all branch ducts whether specifically shown on drawings or not.
   e. Duct dimensions shown on drawings for lined ducts are clear net openings inside of lining.
   f. Top of ducts exposed to weather shall be cross broken and sloped slightly to each side to allow rainwater to run off. Ducts that do not drain off top will be rejected and need to be replaced at contractors’ expense.
2. Flexible Glass Fiber Ductwork: Hangers shall be 2" wide metal straps spaced to prevent sagging, 3 feet spacing maximum. Insert 6" wide fiberglass pad between duct and hanging strap. All joints and fittings shall be sheet metal and shall be installed with metal bands or 3 (min.) self-tapping screws and fiber tape. Maximum length of flexible duct shall be 5 ft., single piece minimum length shall be 3 ft. Minimum turn radius shall be in accordance with SMACNA Standards (turn radius to duct centerline not less than 1.5 times the duct diameter).

3. Fiberglass Ductwork: Install per manufacturer’s instructions.

3.2 AIR TERMINALS AND DUCT FITTINGS INSTALLATION

A. General: Unless otherwise noted, all air terminals and duct fittings shall be installed in accordance with current SMACNA "HVAC Duct Construction Standards", details on drawings and manufacturer’s instructions. Terminals and fittings shall be installed in a manner to prevent vibration and rattling.

B. Fire Damper: Fire dampers shall be installed in accordance with their State Fire Marshal approval and the manufacturer's recommendations.

C. Gym: Attach safety cable to inside of duct and to grille neck with #10 sheet metal screws.

3.3 DUCTWORK INSULATION INSTALLATION

A. General: All supply and return sheet metal ductwork shall be insulated.

B. Concealed Ductwork: Wrap ductwork with fiberglass blanket lapped 2" minimum. Secure with foil tape at all joints for a complete vapor barrier.

C. Acoustic Lining: All ductwork in equipment rooms, where exposed to weather, and elsewhere as indicated on drawings, shall have acoustic lining (except downstream of final filters). Increase each sheet metal dimension to accommodate lining and maintain clear inside duct dimensions shown on drawings. Apply lining with bonding adhesive in accordance with manufacturer's recommendations and also secure with mechanical fasteners in accordance with SMACNA Standards. Seal exposed edges of lining with bonding adhesive.

3.4 TEMPERATURE CONTROL SYSTEM

A. A. Thermostat shall have the capability of terminating all heating at a temperature of no more than 70°F or terminating all cooling at a temperature of no less than 78°F, and to provide a temperature range of up to 10°F between full heating and full cooling. Thermostats shall be 7 day programmable, Carrier, Robertshaw or equal with sub-base capable of battery backup or capacitor to retain program in the event of a power outage. All control wiring, regardless of voltage, shall be installed in conduit.

3.5 TESTS AND ADJUSTMENTS

A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Architect. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test, and repair his work and that of other contractors to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested.

B. Piping Tests:
1. General: Tests may be made in sections, however, all connections between sections previously tested and new section must be included in the new test. There shall be not drop in pressure during test except that due to ambient temperature changes. All components of system not rated for test pressure shall be isolated from system before test is made.
2. Water Piping: Maintain 100 psig water pressure for a duration of 4 hours.

3.6 SYSTEM ENERGY BALANCE

A. Scope: Provide the services of a qualified independent test and balance agency certified by the Associated Air Balance Council (AABC) or The National Environmental Balancing Bureau (NEBB) to test, adjust and balance, retest, and record performance of the system to obtain design quantities as specified. Balancing contractor must also be TABB certified and have a C-20 license.

B. Qualifications: Prior to commencing work, the agency shall be approved by the Owner's Representative.

C. Instruments: All instruments shall be accurately calibrated; calibration histories shall be available for examination. Application of instrumentation shall be in accordance with AABC standards.

D. Procedure: General: Balanced quantities shall be plus 5%, minus 5% of design quantities. All name-plate data, manufacturer, model, and serial numbers shall be recorded for each item tested.

E. Extended Warranty: The test and balance agency shall include an extended warranty of 90 days after completion of test and balance work, during which time the Owner's Representative at his discretion may request a recheck or resetting of any item or items in test report. The agency shall provide technicians to assist the Owner's Representative in making any tests he may require during this period of time.

F. Air Balance Procedure:
1. Provide a sketch of the equipment showing exactly where all pressure readings were taken.
2. Adjust blower RPM to design requirements.
3. Record motor full load amperes.
4. Make pitot tube traverse of main supply and return ducts and obtain design CFM at fans.
5. Record system static pressures, inlet, and discharge.
6. Adjust system for design CFM recirculated air.
7. Adjust system for design CFM outside air.
8. Record entering air temperatures. (DB heating, DB and WB cooling.)
9. Record leaving air temperatures. (DB heating, DB and WB cooling.)
10. Adjust all main supply and return air ducts to design CFM.
11. Adjust all zones to design CFM, supply, and return.
12. Adjust all diffusers, grilles, and registers to plus 10%, minus 0% of design requirements.
13. Adjust CFM at all exhaust fans, make-up units, etc. (high and low speed, where applicable). Record applicable data from items 1 through 11 above.
14. Each grille, diffuser and register shall be identified as to location.
15. Verify proper diffusion pattern for all ceiling grilles and that all sidewall grilles are set for 5 degrees downward deflection unless otherwise noted. Make a notation of any that are not set properly.
16. Size, type and manufacturer of diffusers, grilles, registers, and all tested items shall be identified and listed. Manufacturer's ratings shall be used to make required calculations on all items.
17. Readings and tests of diffusers, grilles, and registers shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.
18. In cooperation with the control manufacturer's representative, set adjustments of automatically operated dampers to operate as specified. Testing agency shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.
19. All diffusers, grilles and registers shall be adjusted for required air patterns and to minimize drafts.
20. As a part of the work of this contract, THE AIR CONDITIONING CONTRACTOR shall make any changes in pulleys, belts, dampers, or the addition of dampers cleaning of insect screens and replacement of filters required for correct balance as recommended by air balance agency, at no additional cost to Owner.
21. Set, test, and adjust packaged heating/ cooling unit economizer operation in

cooperation with controls contractor. Record minimum and maximum outside and exhaust airflows.

G. Acoustic Performance Testing: Provide acoustic performance testing in accordance with the requirements of EQ3.0 of the "California Criteria for High Performance Schools, Best Practices Manual, 2009 Edition".

1. Maximum Background Noise Level: Unoccupied classrooms must have a maximum background noise level of no more than 45 dBA LAeq. The standard anticipates two primary noise sources, steady HVAC equipment noise and the usually unsteady exterior environmental noise. Where the measured ambient noises due to sources other than HVAC are within 5 dB of the measured overall noise (HVAC and exterior intrusive noise) a measurement of at least 1/2 hour duration shall be made in at least two classrooms in each building in the worst case (noisiest) locations on the school site during normal school days and hours.
   a. To evaluate the significance of intrusive exterior noise, a 30-minute Equivalent Sound Level (LAeq30, in general conformance with ANSI S12.60-2002, Annex E3) measurement shall be made in the classroom that is subjectively assessed to represent the worst case exposure to exterior noise, with the HVAC system not in operation. This Leq30 measurement shall be repeated with the HVAC in operation. If the second "HVAC-on" sound level is more than 5 dB greater than the initial "HVAC-off" measurement, exterior noise intrusion shall be deemed "not significant".
   b. Where intrusive exterior noise has been deemed "not significant" short-term (15 second) A-weighted sound level measurements shall be made in each classroom with the HVAC systems in operation. Where exterior intrusive noise has been deemed "significant" (per the evaluation method noted above), LAeq30 sound level measurements shall be made in each classroom with the HVAC system in operation. In either case, where classrooms are served by variable-air-volume systems, the systems shall be operated at maximum nominal flow (typically by means of varying the thermostat set point).
   c. Where exposure to exterior noise varies significantly between groups of classrooms (e.g. one side of a classroom wing adjacent to a street, the other side facing away), separate evaluations of exterior noise significance can be conducted to limit the need for LAeq30 measurements.
2. Maximum Reverberation: Classrooms less than 10,000 cubic feet must have a 0.6-second maximum (unoccupied) reverberation time and classrooms with volumes between 10,000 cubic feet and 20,000 cubic feet must have a 0.7-second maximum (unoccupied, furnished, and fitted-out) reverberation time. (ANSI Standard S12.60-2002). The reverberation times shall be measured in each classroom in three octave bands with center frequencies of 500, 1000, and 2000 Hz. The arithmetic average of the three measured values shall be compared to the standard.

END OF SECTION 23 00 01

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

CONDITIONS OF THE CONTRACT AND DIVISION 01, as applicable, apply to this Section.

PART 1 GENERAL

1.1 SUMMARY

A. Provide all work for electrical systems required in the project to be properly installed, tested, and performing their intended function.

1.2 QUALITY ASSURANCE

A. Perform all work in accordance with the latest edition of the California Electrical Code, and local codes.

B. All electrical materials and distribution, and utilization equipment shall be UL Listed.

C. All equipment and materials shall be new and unused and of United States Domestic manufacture unless approved otherwise by engineer or owner.

D. Eliminate any abnormal sources of noise that are considered by the architect not to be an inherent part of the electrical systems as designed.

1.3 COORDINATION WITH OTHER TRADES

A. Coordinate the work of this division with all other divisions to ensure that all components of the electrical system will be installed at the proper time and fit the available space.

B. Locate and size all openings in work of other trades required for the proper installation of the electrical system components.

C. Make all electrical connections to all equipment furnished by this division and any other division.

D. Make all electrical connections from all 120 volt and greater dampers and switches to associated exhaust fan(s) furnished by any other division.

1.4 DRAWINGS

A. The drawings are schematic in nature but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the building. Determine exact locations by review of equipment manufacturer's data, by job site measurements, by checking the requirements of other trades, and by reviewing all Contract Documents. The size of the electrical equipment indicated on the Drawings may be based on the dimensions of a particular manufacturer. While other listed manufacturers will be acceptable, it is the responsibility of the Contractor to determine if the equipment that Contractor proposes to furnish will fit in the space. The drawings are not intended to show exact locations of conduit and wire, or to indicate all wire terminators, connectors, conduit fittings, boxes or supports, but rather to indicate distribution, circuitry, and control.

B. The Electrical Drawings are necessarily diagrammatic in character and cannot show every connection in detail or conduit in its exact location. These details are subject to the requirements of ordinances and also structural and architectural conditions. The Contractor

shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Work shall be installed to avoid crippling of structural members. All exposed work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.

C. When the mechanical and electrical Drawings do not give exact details as to the elevation of pipe, conduit, and ducts, physically arrange the systems to fit in the space available at the elevations intended with the proper grades for the functioning of the system involved. Exposed conduit is generally intended to be installed true and square to the building construction and located as high as possible against the structure in a neat and workmanlike manner. The Drawings do not show all required offsets and their location details. Work shall be concealed in all finished areas.

1.5 SUBMITTALS

A. Specification Review:
   1. Include a paragraph-by-paragraph written specification review for each product listed requiring a submittal. Denote any proposed deviations from specifications.

1.6 EXISTING CONDITIONS

A. Do all work required to maintain electrical services to the Owner occupied portions of the building during construction.

B. No connection to existing services or utilities shall be made without Owner's knowledge and permission. All such connections shall be planned and scheduled to minimize the length of service interruption required. Request for shutdown shall be made to Owner at least two (2) weeks in advance and shall be accompanied by detailed written schedule of activities during shutdown and list of materials required for connection and renewal of service. It shall be understood that all such service interruptions shall be made at the Owner's convenience, not the Contractor's. No increase in contract amount will be allowed for reasons of premium time, inefficiency of operations or other considerations not calculated in original bid.

C. All items removed shall be stored on-site. Schedule a review of the items with the Owner. Remove from site all items the Owner does not choose to keep. Deliver Owner designated items to Owner's storage facility.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

C. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

PART 2 EXECUTION

2.1 EXISTING WORK

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

B. Provide temporary wiring and connections to maintain existing systems in service during construction.

C. When performing work on energized equipment or circuits, use personnel experienced and trained in similar operations.

D. Remove, relocate, and extend existing installations to accommodate new construction.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

2.2 OWNER INSTRUCTION

A. Provide on-site Owner training for all new equipment.

B. Use Operation and Maintenance manuals and actual equipment installed as basis for instruction.

C. At conclusion of on-site training program have Owner personnel sign written certification they have completed training and understand equipment operation. Include copy of training certificates in final Operation and Maintenance manual submission.

D. Supply record drawings to the district in PDF and the latest version of AutoCAD.

END OF SECTION 26 05 00

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section

1.2 SUMMARY

A. Section includes:
1. Wires and cables rated for 600 volts or less.
2. Connectors, splices, and terminations rated for 600 volts or less.
3. Lugs and pads rated for 600 volts or less.

B. System Description:
1. Provide wires, cables, connectors, lugs, strain reliefs, racking insulators for a complete and operational electrical system.

C. Reference Standards:
1. California Electrical Code (CEC) based on NFPA 70 (NEC). California Code of Regulations, Title 24, Part 3.
2. National Electrical Manufacturers Association (NEMA):
   a. WC 70 Power Cables Rated 2,000 V or Less for the Distribution of Electrical Energy.
3. National Electrical Testing Association (NETA):
   a. ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
4. Underwriters Laboratories, Inc. (UL):
   a. 83 UL Standard for Safety Thermoplastic-Insulated Wires and Cables.
   b. 486 Standard for Wire Connectors.
5. American Society for Testing and Materials (ASTM):
   a. B1 Standard Specification for Hard-Drawn Copper Wire.
   b. B3 Standard Specification for Soft or Annealed Copper Wire.
   c. B8 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

1.3 SUBMITTALS

A. Provide product data for the following equipment:
1. Wires.
2. Cables.
3. Connectors.
4. Lugs.
5. Splice Kits.

B. Provide the insulation cable testing report in the project closeout documentation, refer to Closeout Requirements in the General Conditions portion of this specification.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Confirm to requirements of the CEC, latest adopted version with amendments by local

Authority Having Jurisdiction (AHJ).
2. Furnish products listed by UL or other testing firm acceptable to AHJ.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wires and Cables:
1. Southwire Company
2. Encore Wire Corporation
3. Cerro Wire and Cable Co.
4. General Cable Corp.; a brand of Prysmian Group
5. Okonite Co.
6. Alan Wire
7. LS Cable and System USA
8. American Wire and Cable

B. Connectors:
1. FCI Burndy Corp.
2. Cooper Crouse Hinds.
3. O.Z./ Gedney Co.
4. Thomas & Betts Co.
5. 3-M Co.
6. Ideal Industries Co.
7. Polaris Electrical Connectors
8. ILSCO

C. Wire connectors shall be minimum 75 degree centigrade rated and properly sized for the number of conductors being connected, terminated, spliced etc. All above grade connectors shall be solderless lug or plastic wire nut type, screw on, pressure cable type (wire nut or spring nut type), 600 Volt, 105-degree C, with skirt to cover all portions of stripped wires. Connector shall be U.L. rated for number and size of conductors being joined together as a splice.

D. Splices:
1. Branch Circuit Splices: Ideal, Scotch-Lock, 3M, or approved.
2. Feeder Splices: Compression barrel splice with two layers Scotch 23 and four layers of Scotch 33+ as vapor barrier.
3. Screw Terminal Lugs.
4. Kearney Split Bolt.

2.2 WIRES AND CABLES FOR LINE VOLTAGE SYSTEM AND CONTROLS.

A. Wire and Cable Shall Be:
1. Copper, 600 volt rated throughout. Conductors 12AWG to 10AWG, solid or stranded. Conductors 8AWG and larger, stranded.
2. Phase color to be consistent at all feeder terminations; A-B-C, top to bottom, left to right, front to back. Phasing tape shall be permitted on sizes #6 and larger.

B. Each phase wire shall be uniquely color-coded as indicated below:
1. 120/ 240 Volts
Phase A – Black
Phase B – Red
Neutral – White
Ground – Green

2. 120/ 208 Volts
   Phase A – Black
   Phase B – Red
   Phase C – Blue
   Neutral – White
   Ground – Green
3. 277/ 480 Volts
   Phase A – Brown
   Phase B – Orange
   Phase C – Yellow
   Neutral – White or Natural Gray
   Ground – Green
4. Isolated Grounds: Green with Yellow Stripes

C. All conductors shall be copper unless otherwise noted. Minimum size for individual conductors shall be #12 AWG unless otherwise noted. Sizes #8 AWG and larger shall be stranded conductor. Individual conductors shall be insulated with type, XHHW, THW, THHN/ THWN 600- volt insulation unless otherwise noted. Control, signal, communication conductors shall be as dictated by the vendor of that equipment or as specified here-in. Proper insulation type shall be used for the proper environmental application (i.e., waterproof, wet location, plenum, temperature rated). If a condition exists where the application is uncertain, contact the Engineer for direction. Contractor is responsible to follow specific cabling requirements described in other sections of this specification relative to various communications and controls systems as well as the respective riser diagrams shown on plans. If a discrepancy occurs, communicate such discrepancy to the Architect and Engineer immediately for resolution.

D. Insulation types THWN, THHN or XHHW. Minimum insulation rating of 90C for branch circuits.

E. Refer to signal and communications specification sections for cable requirements.

2.3 CONNECTORS

A. Copper Pads: Drilled and tapped for multiple conductor terminals.

B. Lugs: Indent/ compression type for use with stranded branch circuit or control conductors.

C. Solid Conductor Branch Circuits: Spring connectors, wire nuts, for conductors 12 through 8AWG.

2.4 LUGS AND PADS

A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation: Conductors shall not be installed until after conduit systems are permanently in place. Use an approved non-hardening type wire pulling lubricant if lubricant is to be used. Maintain all conduits and wire pulls free from foreign material. If due to field conditions, more than a total of 300 degrees of bend are required; a pull box shall be furnished and installed for ease of installation. Said pull boxes must be sized and rated for the appropriate

application and must remain easily accessible upon completion of the project (approval of the location shall be obtained from the Architect prior to installation). Show these pullboxes on the field record drawings. Conductors installed in underground raceways on site shall be duct sealed and taped where they exit the raceway to prevent the entrance of foreign material and moisture after the conductors are installed. Proper drainage shall be provided for underground pull and splice boxes.

B. Insulation: Use proper insulation types where temperature and environment are a factor.

C. Labeling: All conductors in panels, switchboards, terminal cabinets, vaults, pull boxes, and junction boxes shall be labeled with tape number markers indicating circuit number and identifying system. All labeling shall be permanent. See Section 26 05 53: Identification of Electrical Systems.

D. All conductors, wiring, cable where installed below floor, slab or underground shall be considered wet locations, and shall be rated accordingly. Non-waterproof cabling is not allowed in any below grade or wet application.

E. Cables routed together in cable tray shall be stacked, organized and tie wrapped together in a neat and workman like manner. Random cable routing is not acceptable.

F. Cable and conductors routed through pull boxes and vaults shall be properly supported. Bend radius of cable or conductor shall not be less than six times the overall cable diameter.

G. Wires and Cables:
   1. Conductor Installation:
      a. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
      b. Install conductors with care to avoid damage to insulation.
      c. Do not apply greater tension on conductors than recommended by manufacturer during installation.
      d. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation.
   2. Conductor Size and Quantity:
      a. Install no conductors smaller than 12AWG unless otherwise shown (e.g. – Fire alarm and communications systems, as defined in their respective specifications sections and/ or drawings).
      b. Provide all required conductors for a fully operable system.
   3. Provide dedicated neutrals (one neutral conductor for each phase conductor). Exceptions may only be granted with Electrical Engineer approval.
   4. Conductors in Cabinets:
      a. Cable and train all wires in panels and cabinets for power and control neatly and uniformly. Use plastic ties in panels and cabinets.
      b. Tie and bundle feeder conductors in wireways of panelboards.
      c. Hold conductors away from sharp metal edges.

3.2 FIELD QUALITY CONTROL

A. Field inspection and test shall be performed under provisions of NETA ATS section 7.3 (2) - Low Voltage Cables, 600-Volt Maximum as follows:
   1. Visual and Mechanical Inspection:
      a. Compare cable data with drawings and specifications.
      b. Inspect exposed sections of cable for physical damage and correct connection in accordance with single-line diagram.
      c. Inspect all bolted electrical connections for high resistance using one of the following methods:

1) Use of low-resistance ohm-meter in accordance with NETA section 7.3.2.2 (Electrical Tests).
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data from NETA ATS Table 10.12.

d. Inspect compression-applied connectors for correct cable match and indentation.
e. Verify cable color coding with applicable specifications and CEC.

2. Electrical Tests
   a. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Test duration shall be one minute.
   b. Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable, in accordance with Section 7.3.2.1 (Visual and Mechanical Inspection).
   c. Perform continuity test to insure correct cable connection.
   d. Correct malfunctions and/ or deficiencies immediately as detected at no additional cost to the District, including additional verification testing.
   e. Subsequent to final wire and cable terminations, energize all circuitry and demonstrate functional adequacy in accordance with system requirements.
3. Test Values
   a. Compare bolted connection resistance to values of similar connections.
   b. Bolt-torque levels should be in accordance with NETA ATS Table 10.12 unless otherwise specified by the manufacturer.
   c. Micro-ohm or milli-volt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer’s published data. If manufacturer’s data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
   d. Minimum insulation-resistance values should not be less than 50 meg-ohms.
   e. Investigate deviations between adjacent phases.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
1. Grounding and bonding requirements of electrical installations for personnel safety and to provide a low impedance path for possible ground fault currents as described in CEC Article 250.
2. “Grounding electrode system” refers to all electrodes required by CEC, as well as including made, supplementary, lightning protection system and telecommunications system grounding electrodes.
3. The terms “connect” and “bond” are used interchangeably in this specification and have the same meaning.

B. Related Sections:
1. Section 26 05 00: Common Work Results for Electrical.
2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.

C. Reference Standards:
1. California Electrical Code (CEC) based on NFPA 70. California Code of Regulations, Title 24, Part 3.
2. Institute of Electrical and Electronics Engineers (IEEE):
   a. 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.
   b. 142 Recommended Practice for Grounding of Industrial and Commercial Power Systems.
   c. 1100 Recommended Practice for Powering and Grounding Electronic Equipment
3. National Electrical Testing Association (NETA):
   a. ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
4. Underwriters Laboratories, Inc. (UL):
   a. 83 UL Standard for Safety Thermoplastic-Insulated Wires and Cables.
   b. 467 Grounding and Bonding Equipment.
5. American Society for Testing and Materials (ASTM):
   a. B1 Standard Specification for Hard-Drawn Copper Wire.
   b. B3 Standard Specification for Soft or Annealed Copper Wire.
   c. B8 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be permitted to be identified per CEC.

B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes No. 10 AWG and smaller shall be ASTM B1 solid bare copper wire.

C. Conductor sizes shall not be less than what is shown on the drawings and not less than required by the CEC, whichever is greater.

2.2 SPLICES AND TERMINATION COMPONENTS

A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

PART 3 EXECUTION

3.1 GENERAL

A. Ground in accordance with the CEC, as shown on drawings, and as hereinafter specified.

B. System Grounding:
1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.

C. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, fire sprinklers, plumbing piping, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.

3.2 INACCESSIBLE GROUNDING CONNECTIONS

A. Make grounding connections which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

3.3 SECONDARY EQUIPMENT AND CIRCUITS

A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.

B. Metallic Piping, Building Steel, and Supplemental Electrode(s):
1. Provide a grounding electrode conductor sized per CEC between the service equipment ground bus and all metallic water and gas pipe systems, building steel, and supplemental or made electrodes. Jumper insulating joints in the metallic piping. All connections to electrodes shall be made with fittings that conform to UL 467.
2. Provide a supplemental ground electrode and bond to the grounding electrode system.

C. Service Disconnect: Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors.

D. Switchgear, Switchboards, and Motor Control Centers:
1. Connect the various feeder equipment grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
2. For service entrance equipment, connect the grounding electrode conductor to the ground bus.
3. Connect metallic conduits, which terminate without mechanical connection to the housing, by grounding bushings and grounding conductor to the equipment ground

bus.

E. Transformers:
1. Exterior: Exterior transformers supplying interior service equipment shall have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.
2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from bar at the service equipment.

F. Conduit Systems:
1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor sized per CEC.
2. Nonmetallic conduit systems shall contain an equipment grounding conductor, except that non-metallic feeder conduits which carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment need not contain an equipment grounding conductor.
3. Metal conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.

G. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, power, and lighting branch circuits.

H. Boxes, Cabinets, Enclosures, and Panelboards:
1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.

I. Motors and Starters: Provide lugs in motor terminal box and starter housing or motor control center compartment to terminate equipment grounding conductors.

J. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.

K. Ground lighting fixtures to the equipment grounding conductor of the wiring system when the green ground is provided; otherwise, ground the fixtures through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.

L. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

3.4 CONDUCTIVE PIPING

A. Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

3.5 TELECOMMUNICATIONS SYSTEM

A. Bond telecommunications system grounding equipment to the electrical grounding electrode

system. Refer to communications backbone cabling specification section.

3.6 GROUND RESISTANCE

A. Grounding system resistance to ground shall not exceed 15 ohms. Make necessary modifications or additions to the grounding electrode system for compliance without additional cost to the Owner. Final tests shall assure that this requirement is met, and test results shall be submitted to the Owner with final close out documents.

B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of- potential method as defined in IEEE Standard 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

C. Below-grade connections shall be visually inspected by the Inspector of Record (IOR) prior to backfilling. The Contractor shall notify the IOR 24 hours before the connections are ready for inspection.

D. Furnish a copy of tests to Owner at completion of project.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

CONDITIONS OF THE CONTRACT AND DIVISION 01, as applicable, apply to this Section.

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.
4. Sleeves.
5. Mechanical sleeve seals.
6. Firestopping relating to electrical work.
7. Firestopping accessories.
8. Equipment bases and supports.

1.2 REFERENCES

A. Underwriters Laboratories Inc.:
1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Firestops.
4. UL - Fire Resistance Directory.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to Building Code and UL for fire resistance ratings and surface burning characteristics.

1.5 SUBMITTALS

A. Product Data:
1. Hangers and Supports: Submit manufacturers catalog data including load capacity.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with the Building Code.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

A. Manufacturers:
1. Allied Tube & Conduit Corp.
2. Electroline Manufacturing Company.

3. O-Z Gedney Co.
4. Appleton.

B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.

F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self-locking. With Stainless tooth.

2.2 FORMED STEEL CHANNEL

A. Manufacturers:
1. Allied Tube & Conduit Corp.
2. B-Line Systems.
3. Midland Ross Corporation, Electrical Products Division.
4. Unistrut Corp.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.3 SLEEVES

A. Sleeves for raceway Through Non-fire Rated Floors: 18 gage galvanized steel.

B. Sleeves for raceway Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.

C. Sleeves for raceway Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL Listed.

D. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.4 SPRING STEEL CLIPS

A. Product Description: Mounting clamp, and screw.

2.5 MECHANICAL SLEEVE SEALS

A. Manufacturers:
1. Thunderline Link-Seal, Inc.
2. NMP Corporation.

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.6 FIRESTOPPING

A. Manufacturers:
   1. Dow Corning Corp.
   2. Fire Trak Corp.
   3. Hilti Corp.
   4. International Protective Coating Corp.
   5. 3M fire Protection Products.
   6. Specified Technology, Inc.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
   1. Silicone Firestopping Elastomeric Firestopping: Multiple component silicone elastomeric compound and compatible silicone sealant.
   2. Foam Firestopping Compounds: Multiple component foam compound.
   3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
   4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
   5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
   6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
   7. Firestop Pillows: Formed mineral fiber pillows.

2.7 FIRESTOPPING ACCESSORIES

A. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

B. General:
   1. Furnish UL Listed products.
   2. Select products with rating not less than rating of wall or floor being penetrated.

C. Non-Rated Surfaces:
   1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
   2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

B. Verify openings are ready to receive firestopping.

3.2 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:
   1. Concrete Structural Elements: Provide precast inserts, expansion anchors, powder actuated anchors or preset inserts as required.
   2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset

fasteners or welded fasteners as required.
3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors as required.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts or hollow wall fasteners as required.
5. Solid Masonry Walls: Provide expansion anchors or preset inserts as required.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Inserts:
1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over four (4) inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

C. Install conduit and raceway support and spacing in accordance with CEC.

D. Do not fasten supports to suspended ceiling support system, pipes, ducts, mechanical equipment, or conduit.

E. Install multiple conduit runs on common hangers.

F. Supports:
1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface mounted cabinets and panelboards with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards one (1) inch off wall.
4. Support vertical conduit at every floor.

3.3 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit, and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.

D. Compress fibered material to maximum 40 percent of its uncompressed size.

E. Place intumescent coating in sufficient coats to achieve rating required.

F. Remove dam material after firestopping material has cured.

G. Fire Rated Surface:
1. Seal opening at all rated floors and walls as follows:
a. Install sleeve through opening and extending beyond minimum of one (1) inch on both sides of building element.
b. Size sleeve allowing minimum of one (1) inch void between sleeve and building

element.
c. Pack void with backing material.
d. Seal ends of sleeve with UL Listed fire resistive silicone compound to meet fire rating of structure penetrated.

2. Where cable tray, bus, or conduit, penetrates fire rated surface, install firestopping product ins accordance with manufacturer's instructions.

H. Non-Rated Surfaces:
1. Seal opening through non-fire rated floors and walls as follows:
a. Install sleeve through opening and extending beyond minimum of one (1) inch on both sides of building element.
b. Size sleeve allowing minimum of one (1) inch void between sleeve and building element.
c. Install type of firestopping material recommended by manufacturer.
2. Install escutcheons where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.

3.4 INSTALLATION - SLEEVES

A. Exterior watertight entries: Provide mechanical sleeve seals.

B. Interior conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

E. Extend sleeves through floors and walls one (1) inch above finished floor level. Caulk sleeves.

END OF SECTION 26 05 29

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Conduit and fittings.
2. Outlet boxes.
3. Weatherproof outlet boxes.
4. Junction and pull boxes.
5. Floor boxes.
6. Cabinets, termination cabinets.
7. Gutters.

1.3 SUBMITTALS

A. Provide Product Data for the Following Equipment:
1. Conduit and fittings.
2. Outlet boxes.
3. Weatherproof outlet boxes.
4. Junction and pull boxes.
5. Floor boxes.
6. Cabinets, termination cabinets.
7. Gutters.
8. Putty pads.
9. Raceways

B. Submit detailed conduit routing plan, for review and approval, prior to installation as follows:
1. Exposed and/ or concealed in building walls for conduits larger than 2-inch outside diameter.
2. All underground conduits (3/4-inch and larger) in duct bank; concealed in floor slabs, equipment pads and concrete slabs.

1.4 SUBMITTALS

A. Minimum acceptable conduit sizes are summarized in the following table:

	Minimum Size
Underground, site wiring	1”
Underground • Building Wiring Aboveground • Equipment or panel feeders • Telecommunications	3/4"
Aboveground • Lighting or branch circuit wiring • Fire alarm • Security	1/2”

Other	3/4”

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Conform to requirements of the CEC, latest adopted version with amendments bylocal AHJs.
   2. Furnish products listed by UL or other independent and nationally recognized testing firm.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC and PVC-coated metallic conduit from sunlight.

C. Protection of and cleanliness of pathways and raceways must be assured during the construction process in order to eliminate the possibility of debris entering the conduit, duct, pathway resulting in decreased wire capacity and potential damage to installed conductors and cables.

PART 2 PRODUCTS

2.1 MATERIALS

A. Polyvinyl Chloride (PVC) coated galvanized rigid steel conduit and intermediate metal conduit shall be in accordance with NEMA RN 1. Coating shall be applied under controlled factory conditions. Prior to coating, conduit shall meet requirements of ANSI C80.1 and UL 6 or ANSI C80.6 and UL 1242 as appropriate. PVC coated conduits shall have ultra-violet (UV) inhibitor in the coating material.

B. Intermediate Metal Conduit (IMC). Raceway shall be hot dipped galvanized mild steel in accordance with ANSI C80.6 and UL 1242 and shall bear the UL label. Conduit shall have same characteristics of rigid steel except for thinner wall.

C. Galvanized Rigid Steel Conduit (GRSC or RGS), couplings and elbows shall be hot dip galvanized, rigid mild steel in accordance with ANSI C80.1 and UL 6. The conduit interior and exterior surfaces shall have a continuous zinc coating with a transparent overcoat of enamel, lacquer, or zinc chromate. Conduit shall be formed with continuous welded seams with a uniform wall thickness, in minimum 10-foot lengths, with threaded ends.

D. Electrical Metallic Tubing (EMT). Electrical metallic tubing, including elbows and bends, shall be zinc coated, mild steel in accordance with the requirements of ANSI C80.3 and UL 797. The interior and exterior surfaces of the tubing shall have a continuous zinc coating. Conduit shall be formed with a continuous welded seam, with a uniform wall thickness, in minimum 10-foot lengths.

E. Non-Metallic Conduit shall be as follows:
   1. Schedule 40: Conduit shall be 90 degree Celsius, polyvinyl chloride in conformance with NEMA TC-2 and UL 651 requirements.
   2. Spacers used in duct bank installations shall be high impact plastic, interlocking bases, and intermediate type spacers. Place spacers between 6 and 10 feet apart.

F. Flexible Metal Conduit shall be galvanized steel meeting the requirements of UL 1. Flexible aluminum conduit is not permitted.

G. Liquid-Tight Flexible Metal Conduit shall be plastic jacketed, galvanized steel, "Sealtite" Type EF for general service areas or Type HC for high temperature when used under raised floor or in air plenums. Conduit shall be UL listed.

H. Manufacturers:
1. Outlet Boxes: Bowers, Raco, Orbit, Steel City or equal.
2. Weatherproof Outlet Boxes: Bell, Red Dot, Carlon or equal.
3. Floor Boxes: Wiremold/ Walker, Hubbell, Steel City, or equal.
4. Junction and Pull Boxes: Circle AW, Hoffman, Wireguard or equal.
5. Box Extension Adapter: Bell, Red Dot, Carlon or equal.
6. Conduit Fittings: O-Z Gedney, Thomas & Betts, Raco, Crouse Hinds, or equal.
7. Putty pads: 3M, Hilti, or equal.
8. Heavy wall rigid non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
9. Extra heavy wall non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
10. Flexible Metal Conduit (FMC), Alflex, American Flexible Conduit or equal.
11. Liquid tight flexible metal conduit, Anacanda (type UA), Electri-flex Liquatite or equal.
12. Floor Boxes, Single Gang, Walker/ Wiremold 880 CS Series or approved equal.
13. Floor Boxes, Multiple Gang, Walker/ Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/ or water resistant device covers.
14. Masonry Boxes, outlets in concrete, Raco Series 690 or equal.

I. Listed products for termination, coupling, extending, benching supports of raceways shall be used.

2.2 OUTLET BOXES

A. NEMA 1 gutter, junction and pull boxes shall be fabricated from code gage steel finished in grey enamel with screw cover fronts and concentric knockouts in all sides.

B. NEMA 3R gutter, junction and pull boxes shall be fabricated from code gage galvanized steel with screw cover fronts and concentric knockouts in the bottom only. Any penetrations to the side, top or back shall be weatherproofed in an approved manner such as “MYERS” gasketed type hub or equal.

C. Steel outlet boxes and plaster rings shall be galvanized rigid assemblies, either one piece pressed or factory welded construction containing the size and number of knockouts required. Steel outlet boxes shall be manufactured, sized and installed in accordance with CEC Article 314. Device Outlet: Installation of one or two devices at common location, minimum 4” square, minimum 1-1/2" deep. Single or 2 gang flush device plaster ring. Raco or equal.

D. Luminaire Outlet: minimum 4” square with correct plaster ring depth, minimum 1-1/2” deep with 3/8” luminaire stud if required. Provide proper depth plaster ring on bracket outlets and on ceiling outlets.

E. Construction: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. Boxes shall be properly secured to the structure such that they are flush with the finish surface. Boxes shall be made structurally secure by means of the proper fastening devices.

F. Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, plaster rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.3 JUNCTION AND PULL BOXES

A. Construction: Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.

B. Location:
1. Install junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
2. Install junction boxes and pull boxes as required to facilitate the installation of conductors and limiting the accumulated angular sum of bends between boxes, cabinets and appliances to 300 degrees.
3. Locations: Junction boxes shall be located only where necessary and only in equipment rooms, closets, and accessible attic and underfloor spaces. A horizontal distance of 24” shall separate outlet boxes on opposite sides of occupancy separation walls, fire-rated walls or partitions.
4. Labeling: Junction box covers shall be marked with indelible ink indicated the circuit numbers passing through the box.

2.4 CONDUIT FITTINGS

A. Requirements: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and plastic conduit bushings of the type and size to suit each respective use and installation.

B. Steel boxes may allow for field knock-out modifications, but shall in all other ways conform to code requirements.

2.5 FLOOR BOXES - SINGLE GANG

A. Construction: Deep cast iron fully adjustable before and after concrete pour with all required components for complete activation. Verify required components for application of service fittings, covers, monuments, and the like, attached to floor boxes.

B. Activations:
1. Flush: Provide brass duplex or single signal cover, hinged with set screw lock. Carpet or tile finish ring.
2. Monuments: Provide stainless steel monuments with power receptacle or data grommet as noted.
3. Coordinate specific application of systems as noted on Drawings.

2.6 FLOOR BOXES - MULTIPLE GANG

A. Construction: Deep cast iron, fully adjustable before and after pour. Equal to Walker/ Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/ or water resistant device covers. Verify color. Partition for different power or signal applications. Provide required power receptacle devices and signal grommets or receptacles as noted. Flange type shall be compatible with floor covering for either carpet or vinyl as required and shall be brass type not polycarbonate.

B. Floor mounted boxes shall be water tight and cast iron when installed in grade level concrete slab floor, fully adjustable with interior and exterior leveling screws. Receptacle flange shall be brass with a duplex lift lid. Flange type shall be compatible with floor type. Before installation, coordinate exact location with Architect.

2.7 PUTTY PADS

A. Intumescent moldable firestop putty designed to protect electrical outlet boxes.

B. Provide putty pads of proper type around outlet boxes and/ or as detailed on plan to meet sound transmission restrictions and fire ratings of walls

PART 3 EXECUTION

3.1 INSTALLATION

A. Conduit systems listed below are for use in installations where they are permitted to be used by CEC and/ or other occupancy restrictions. The below installation methods do not intend to suggest that these materials be installed in conflict with any applicable code. Special attention to applications shall be made in building types such as wet location, hazardous locations, assembly occupancy and multi-story, but not limited to these. Requirements which are more restrictive than the CEC may be called for by the drawings and/ or these specifications. These requirements must be adhered to. The Electrical Contractor shall be responsible to use the proper conduit system for the application. Exposed conduit is not allowed below ceilings or above slab of floor, without prior approval from Electrical Engineer. All conduits shall be concealed except in electrical and telecommunication rooms or where shown to be surface mounted. Exposed conduit (where allowed) shall be run square and plumb with building lines in an approved manner. Support roof mount conduits, where allowed, with minimum 12” wide approved rooftop supports (B-Line Durablok or approved equal) unless otherwise detailed in roof requirements or as specified in roofing specification. Strap conduits to blocks with proper sized conduit straps. Spacing of support shall be a minimum as provided for in the CEC. All exposed conduit mounted below 8’ above finished grade shall be strapped at a minimum of 5’ spacing.

B. Non-Metallic Rigid Conduit shall be used in concrete slabs, below concrete slabs on grade, or underground outside of a building slab or foundation. Maintain minimum depth requirements and cover with appropriate fill material. Conduit shall be heavy wall Schedule 40 or 80, rigid PVC only. Rigid utility P&C duct shall not be used in any application. Properly sized grounding conductors shall be installed per CEC article 250, in all non-metallic conduit branch circuit and feeder runs. PVC conduit shall be formed or field bent only with the use of properly approved bending tools such as to not decrease the internal bore of the conduit. All conduits shall be cut square and reamed of burrs. Approved and compatible glue shall be used on all PVC fittings to attain watertight joints.

C. Galvanized Rigid Steel (GRS) conduit shall be used where exposed less than 8’–0” above finished grade to 18” below finished grade and where subject to physical damage. Conduits shall be cut square and reamed to remove burrs and sharp edges. Strap conduit below 8’ above grade at 5’ intervals. Unless otherwise noted, threadless setscrew and threadless weathertight fittings may be used in lieu of threaded fittings. All threaded ends entering a junction box of any type shall require one locknut on the inside and one on the outside of the enclosure and be provided with a plastic bushing or grounding bushing where necessary for proper grounding. Where exposed to moisture, a watertight hub or other approved method shall be required. All conduits shall be stubbed up straight and uniform into junction boxes, panels, cabinets, etc., and shall be (GRS) properly supported and strapped. All GRS conduit located below grade, shall be tape wrapped.

D. Electrical Metallic Tubing (EMT) shall be used as allowed by code and as permitted by this specification. It shall not be in contact with soil or the concrete slab on the ground floor of any structure. Connectors and couplings shall be steel insulated set screw type where installed in indoor dry locations not subject to moisture. Where the potential for moisture is present, compression type weathertight fittings are required. One hole conduit straps are permitted from 1/2" to 1” and two hole conduit straps are required for size 1-1/4” and larger. EMT shall not be allowed in areas subject to severe physical damage. Install copper ground wire sized per CEC 250-122 in all EMT conduits.

E. Flexible conduit may be used where concealed in building construction or above dropped ceilings, but shall meet the following criteria: No individual circuit path from distribution panel to last device shall exceed a cumulative length of 6’ of flexible conduit from start to end. Flexible conduit shall not exceed a total directional change of 270 bending degrees in any one run between conduit terminations. Squeeze type or Jake type steel flex fittings of a grounding type are required. Flexible conduit must be supported in accordance with CEC. Where exposed to the weather, moisture, or spray down flexible conduit shall be of the liquidtight type. Fittings shall be manufactured for use with liquidtight flexible conduit. All motor connections shall be made with liquidtight flex. Flexible conduit may not be used where exposed except for last 2’ of equipment connection and unless otherwise noted or approved. A copper ground wire sized per CEC 250-122 shall be installed in all flexible conduit runs. Flexible conduit may not be used exposed. Weatherproof liquid tight conduit shall not be used at roof level for equipment connections with lengths exceeding 24” nor shall it be used to circumvent a rigid conduit systemin a horizontal direction. Connect recessed lighting fixtures to conduit runs with a maximum of 6’ of flexible metal conduit extending from junction box to fixture.

F. Underground conduits and transition to above grade/ slab shall be as follows:
1. PVC elbows 2” and smaller are allowed, or if top of elbow is minimum 18” BFG or below top of slab, otherwise GRS elbows are required.
2. GRS risers are required from elbow below grade to equipment (device, outlet, panel, cabinet, etc.) above grade.
3. GRS elbows/risers to be PVC coated or 10 MIL tape wrapped (1/2” lapped) to 3” above finish grade or top of slab.

G. Conduit Supports: Conduit runs may be supported by one-hole and two-hole straps or supports as manufactured by Unistrut, Minerallac, Caddy or equals. Supports may be fastened by means of anchors, shields, beam clamps, toggle bolts, or other approved methods appropriate for the application and size of conduit. Pipe nailers (J-hooks) may only be used for 1” conduit and smaller and only in wood frame construction. Conduit support methods are subject to review by the engineer and authority having jurisdiction for adequacy. Installations deemed inadequate shall be corrected by the contractor at no cost to the Owner.

H. Bends and offsets shall be made with approved tools for the type of conduit being utilized. Bends shall be made without kinking or destroying the smooth bore of the conduit. Parallel conduits shall be run straight and true with bends uniform and symmetrical. Minimum radii shall be per CEC 344-24.

I. Conduit Stub-outs below grade shall be capped with plastic cap, and identified by placing a pull box marked with correctly identified utility such as “Elec”, “Tel”, etc. Dimension for exact location on field record drawings. Provide lids for proper field application (i.e. traffic, incidental, pedestrian).

J. Conduit Seals - Where below grade conduits enter structure through slab or retaining wall of building or basement, seal the inside of each conduit as follows:
1. Provide damming material around conductors 3” into conduit. Polywater or equal.

2. Fill 3” of conduit with 3M #2123 sealing compound.
3. Wrap conductors where they exit the conduit with 3M #2229 "Scotch Seal" mastic tape. Lap tape to approximate diameter of the raceway and wrap outside of conduit opening with (minimum) one turn.
4. Use conduit sealing bushings type CSB (O-Z/ Gedney) or equal.
5. Empty conduits shall be sealed with standard non-hardening duct seal compound and then capped to prevent entrance of moisture and gases and to meet fire resistance requirements.
6. Provide cable drip loop minimum 12” high.

K. Marker tape: Place marker tape at 12” below finish grade along and above buried conduits. Label tape "CAUTION: ELECTRICAL LINES BELOW" or similar wording.

L. Electrical and communications systems raceways routed underground shall not occupy the same trench as plumbing utilities such as sewer, water, storm drain, gas or other wet or dry gaseous utility system. A minimum of 12” of undisturbed earth is required. Where utilities must cross in closer proximity to each other due to physical constraints, 6” minimum crossing distances are allowed.

M. Conduits, routed below footings, slabs, grade beams, columns, and other structural elements shall be installed in strict compliance with structural details and criteria shown on structural plans. Clearances below structural elements and sleeves through structural elements must be carefully planned to avoid conflict and must be approved by the structural engineer if conflict arises.

N. All conduit or raceways passing through fire rated walls, floors, or ceilings shall be installed with a listed penetration method which protects the opening to the same rating as the assembly and is non hardening.

O. Location: Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.

P. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.

Q. Special Application: Provide weatherproof outlets for locations exposed to weather or moisture.

R. Knockout Closures: Provide knockout closures to cap unused knockout holes where blanks have been removed.

S. Mount outlet boxes, unless otherwise required by ADA, or noted on drawings, the following distances above the finished floor:
1. Receptacles, Telephone, TV & Data outlets. (measured to bottom of outlet box): +15".
2. Outlet above counter (measured to top of outlet box): +46".
3. Control (light) Switches. (measured to top of outlet box): +48".
4. Fire Alarm Manual Pull Stations, T-stats. (measured to top of outlet box): +48".
5. Fire Alarm Visuals: the lower of +80" to bottom of lens, or 6" below ceiling.
6. Other Outlets: As indicated in other sections of specifications or as detailed on drawings.

T. Coordinate all electrical device locations with the architectural floor plan and interior and exterior elevations to prevent mounting devices within elements that they may conflict such as cabinetry, mirrors, planters, etc.

U. Size outlet and junction boxes to minimum wire fill space requirements. Upsize box as

required to allow ease of wire installation and device installation.

V. Outlet and junction boxes in fire rated walls shall be gauged and spaced so as not to exceed the maximum penetration allowed by the assembly without compromising the fire rating. If a conflict arises relative to a specific condition, the contractor shall follow the requirements of the fire authority and ask for guidance from the design team. At no time should a larger box be installed prior to resolution of conflict.

END OF SECTION 26 05 33

SECTION 26 05 53 - IDENTIFICATION OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
   1. Nameplates and warning signs where specified herein and as shown on contract documents including the following:
      a. Nameplates and warning signs permanently installed on all electrical equipment and devices including, but not limited to, the following items:
         1) Enclosures for transformers, switchboards, motor control, panels, pullboxes, cabinets, motors, generators, transfer switches.
         2) Enclosures for all separately enclosed devices including, but not limited to, disconnect switches, circuit breakers, contactors, time switches, control stations and relays, fire alarm panels and lighting control panel.
         3) Wall switches not within sight of outlet controlled.
         4) Special systems such as, but not limited to, telephone, fire alarm, warning, and signal systems. Identification shall be at each equipment rack, terminal cabinet, control panel, annunciator and pullbox.
         5) Devices mounted within and part of equipment including circuit breakers, switches, control devices, control transformers, relays, indication devices and instruments.
   2. Conductor and Cable Identification.

B. Related Sections:
   1. Section 26 05 00: Common Work Results for Electrical.
   2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
   3. Section 26 24 16: Panelboards.
   4. Section 26 28 16: Enclosed Switches and Circuit Breakers.

C. Reference Standards:
   1. California Electrical Code (CEC) based on NFPA 70 (NEC). California Code of Regulations, Title 24, Part 3.
   2. National Fire Protection Agency (NFPA):
      a. 70E Standard for Electrical Safety in the Workplace.
   3. American National Standards Institute (ANSI):
      a. A13.1 Pipe Markers.
      b. Z535 Standards for Safety Signs and Labels.
   4. Underwriters Laboratories, Inc. (UL):
      a. 969 Standard for Marking and Labeling Systems.
   5. Code of Federal Regulations, Title 29, Part 1910:
      a. 144 Safety color code for marking physical hazards.
      b. 145 Specifications for accident prevention signs and tags.

PART 2 PRODUCTS

2.1 EQUIPMENT LABEL DESIGNATIONS

A. Equipment labels indicating equipment designations both emergency and normal. Designation per drawings or to be supplied with shop drawings approval.

B. Panelboard labels showing panel designation, voltage, phase, and source.

C. Distribution panels, transformers, safety switches, transfer equipment, etc. Labels shall be per ANSI Z535.4 guidelines.

2.2 MATERIALS

A. For Labels: Three layer laminated plastic or micarta with engraved white letters over black background.

B. For Emergency Equipment: Use engraved white letters over red background.

C. For Warning Signs: Minimum 18 gauge steel with red lettering on white porcelain enamel finish.

D. Arc flash labels shall be provided as required by CEC Article 70E.

E. Conductor tape number markers: TayMac MX4280 Series non-fading permanent adhesive.

PART 3 EXECUTION

3.1 MOUNTING

A. Equipment labels shall be mounted by self-tapping, threaded screws, and bolts, or by rivets. Adhesive types are not acceptable unless specifically noted in this section.

B. Conductor tape markers shall be consistently placed for ready conductor identification.

3.2 HEIGHTS ON LABELS

A. Panelboards, Switchboards and Motor Control Centers and Special Systems Enclosures: 1/4" identify equipment designation; 1/8” identify voltage rating and source.

B. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 3/16” identify circuit and load served, including location of equipment.

C. Enclosed Circuit Breakers, Enclosed Switches, and Motor Starters: 3/16” identify load served.

D. Transformers: 3/16” identify equipment designation; 1/8” identify primary and secondary voltages, primary source, and secondary load. Include location of primary source or secondary load if remote from transformer.

3.3 WARNING SIGNS

A. Warning signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.

B. Warning signs to read "DANGER - HIGH VOLTAGE", with letters 1-1/2" high, 3/16” stroke minimum.

C. Provide warning sign on all doors or immediately next to door for equipment rooms, enclosures or closets containing equipment energized above 150 volts to ground as per CEC, and/ or as directed by the Architect. For interior finish spaces and interior doors, signage shall be coordinated and approved with the Architect in advance of installation.

END OF SECTION 26 05 53

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section Includes:
   1. Enclosed contactors for lighting and general purposes. Provide complete systems using contactors, relays, photocells, time clocks, or digital time switches, where required, all properly mounted in enclosures.

1.3 SUBMITTALS:

A. Product Data: Submit dimensions, size, voltage ratings and current ratings.

B. Short circuit current rating (SCCR) of equipment.

C. U.L. Label.

D. Electrical characteristics of equipment.

E. Enclosure metal gauge and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Occupancy Sensors, Power Packs:
      a. Specifications below are based on WattStopper system of products. A different system can be substituted given equal functionality.

2.2 OCCUPANCY SENSORS:

A. Ceiling Sensors: Require power packs:
   1. W-2000- Low voltage ultrasonic ceiling mounted with 2000 square foot coverage. Typical for large restroom.
   2. DT-300- Low Voltage dual technology ceiling mounted with isolated contact. Typical for classrooms.
   3. WT-2250/ 2255- Typical corridor sensor- Low voltage ultrasonic ceiling mounted with 10’ by 90’ coverage pattern.

B. Wall Switch Sensors:
   1. PW-100 Line voltage PIR wall switch sensor for 1 circuit- Typical for small office or single person restroom.
      PW-100-24 Low Voltage PIR wall switch sensor. Requires power pack.
      PW-200- Line voltage PIR wall switch sensor for 2 circuits,

UW-100- Line Voltage ultrasonic wall switch sensor for 1 circuit.
DW-100- Line voltage dual technology wall switch sensor for 1 circuit. Typical for large office or conference room.
DW-100-24- Low voltage dual technology wall switch sensor. Requires Power Pack.
DW-200- Line voltage dual technology wall switch sensor for 2 circuits.

2. Wall switch sensors shall be capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet.
3. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180˚ coverage capability.
4. Wall switch products shall utilize Zero Crossing Circuitry which increases relay life protects from the effects of inrush current and increases sensor's longevity.
5. Wall switch sensors shall have no leakage current to load, in manual or in Auto/ Off mode for safety purposes and shall have voltage drop protection.
6. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from automatic-ON to manual-ON.
7. Where specified, vandal resistant wall switch sensors shall utilize a hard lens with a minimum 1.0mm thickness. Products utilizing a soft lens will not be considered.

C. Power and Auxiliary Packs:
1. BZ-50- Standard power pack for use with low voltage sensors. 225ma.
2. BZ-150- Power pack for use with low voltage sensors when using a manual on function. 225ma.
3. S120/ 277- Slave relay pack. For controlling more than 1 circuit from a low voltage sensor. Standard BZ-50 can also be used.

D. High Ceiling Applications:
1. HB-350B*LENS Low Voltage PIR sensor.
2. L1 Lens- 20' x 60' coverage pattern when mounted at 40'.
3. L3 Lens- 40' diameter coverage pattern when mounted at 40'.
4. L4 Lens- 60' diameter coverage pattern when mounted at 60'.

E. Passive infrared sensors:
1. Passive infrared sensors shall utilize Pulse Count Processing and Detection Signature Processing to respond only to those signals caused by human motion.
2. Passive infrared sensors shall provide high immunity to false triggering from RFI (hand-held radios) and EMI (electrical noise on the line).
3. Passive infrared sensors shall have a multiple segmented Fresnel lens, in a multiple-tier configuration, with grooves-in to eliminate dust and residue build-up.
4. Where specified, passive infrared ultrasonic and dual technology sensors shall offer daylighting footcandle adjustment control and be able to accommodate dual level lighting.

F. Dual technology sensors:
1. Dual technology sensors shall be wall mounted, corner mounted, or ceiling mounted in such a way as to minimize coverage in unwanted areas.
2. Dual technology sensors shall consist of passive infrared and ultrasonic technologies for occupancy detection. Products that react to noise or ambient sound shall not be considered.

G. Ultrasonic sensors.
1. Ultrasonic sensors shall utilize Advanced Signal Processing to adjust the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled space.
2. Ultrasonic operating frequency shall be crystal controlled at 25 kHz within ± 0.005% tolerance, 32 kHz within ± 0.002% tolerance, or 40 kHz ± 0.002% tolerance to assure reliable performance and eliminate sensor cross-talk. Sensors using multiple

frequencies are not acceptable.

H. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.

I. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.

J. When specified, sensors shall utilize SmartSet™ technology for automatically adjustable time delay and sensitivity settings.

K. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.

L. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.

M. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

N. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging, and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

O. All sensors shall have UL rated, 94V-0 plastic enclosures.

P. All occupancy sensors shall be set to maximum 30 minute time delay.

Q. Provide minimum 5% spare sensors for owner stock of each type of occupancy sensor.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Install enclosed contactors (as indicated on Drawings), in accordance with NECA "Standard of Installation."

B. Install engraved nameplates. Refer to Section 26 05 53 for requirements.

C. Install contactor and relays in Electrical/ Mechanical Rooms unless otherwise noted.

END OF SECTION 26 09 23

SECTION 26 24 13 SWITCHBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
   1. Main service switchboard.
   2. Outdoor enclosure and accessories.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.
   1. Section 03 30 00: Cast-in-place concrete. Equipment housekeeping pad.
   2. Section 09 90 00: Painting and Coatings. Touch-up of painted surfaces.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
   1. Federal Specifications (FS):
      a. FS W-C-375: Circuit Breakers, Molded Case, Branch Circuit and Service.
   2. American National Standards Institute, Inc. (ANSI):
      a. ANSI C12: Code for Electricity Metering.
      b. ANSI C37.5: Current and Potential Transformers.
      c. ANSI C39.1: Electrical Analog Indicating Instruments.
      d. ANSI C57.13: Requirements for Instrument Transformers.
   3. Underwriters Laboratories, Inc. (UL):
      a. UL 98: Dead-Front Switches.
      b. UL 486E: Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors.
      c. UL 489: Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
      d. UL 869A: Service Equipment.
      e. UL 891: Dead-Front Switchboards.
      f. UL 943: Ground-Fault Circuit Interrupters.
      g. UL 1053: Ground-Fault Sensing and Relaying Equipment.
      h. UL 1066: Low Voltage AC and DC Power Circuit Breakers Used in Enclosures.
      i. UL 1558: Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear.
   4. National Electrical Manufacturer Association (NEMA):
      a. NEMA AB1: Molded Case Circuit Breakers.
      b. NEMA PB 2: Deadfront Distribution Switchboards.
      c. NEMA PB 2.1: General Instruction for Proper Handling, Installation, Operation and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or less.
      d. NEMA PB 2.2: Application Guide Ground Fault Protective Devices for Equipment.
      e. NEMA SG 3: Low-Voltage Power Circuit Breakers.
      f. NEMA SG5: Power Switchgear Assemblies.

B. SUBMITTALS

C. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
   1. Data/catalog cuts for each product and component specified herein, listing all physical

and electrical characteristics and ratings indicating compliance with all listed standards.

2. Shop Drawings to include:
   a. Front, plan, and side view elevations with overall dimensions.
   b. Conduit entrance locations and requirements.
   c. Nameplate legends; size and number of bus bars per phase, neutral and ground.
   d. Switchboard instrument details and accessories.
   e. Electrical characteristics including voltage, frame size and trip rating and withstand ratings.
3. Outdoor weatherproof equipment enclosure and accessories.
4. Furnish critical equipment seismic certification and structural calculations for equipment anchorage as described in Section 260010: Basic Electrical Requirements.
5. Submit Manufacturer's installation instructions.
6. Complete Bill of Material listing all components.
7. Final test results.
8. Warranty.

D. Dimensions and configurations of switchboards shall conform to the space allocated on the Drawings. The Contractor shall submit a revised layout if equipment furnished varies in size from that indicated on Drawings for the Engineer's approval.

E. Service entrance switchboard utility metering sections shall be submitted to the local electrical utility company for approval prior to submission to the Engineer. A letter of acceptance from utility company shall be included in submittal package.

1.3 OPERATION AND MAINTENANCE MANUAL

A. Supply operation and maintenance manuals in accordance with the requirements of Section 260010: Basic Electrical Requirements, to include the following:
   1. A detailed explanation of the operation of the system.
   2. Instructions for routine maintenance.
   3. Pictorial parts list and part numbers.
   4. Pictorial and schematic Electrical Drawings of wiring systems, including operating and safety devices, control panels, instrumentation, and annunciators.
   5. Telephone numbers for the authorized parts and service distributors.
   6. Include all service bulletins and torque Specifications for all terminations.
   7. Final testing report.

1.4 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

C. Independent Testing Agency qualifications: Refer to Division 26: Electrical.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Switchboard components shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to Manufacturer at no cost to Owner. Components shall be properly packaged in factory-fabricated containers and mounted on shipping skids.

B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.

C. Handling: Handle in accordance with NEMA PB2.1 and Manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.6 WARRANTY

A. Units and components offered under this Section shall be covered by a 1-year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

1.7 SYSTEM START-UP

A. Upon completion of installation, a factory trained dealer service representative shall perform initial start-up of the switchboard. Sufficient time shall be allowed to properly check the system out and perform required minor adjustments before the Engineer's witnessed test shall begin.

1.8 EXTRA MATERIAL

A. Provide one spray can of matching finish paint for touching up damaged surfaces after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
1. Square D.
2. ABB/ General Electric.
3. Eaton.
4. Siemens.

B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 SWITCHBOARDS - GENERAL

A. Enclosure:
1. Each switchboard shall consist of a dead front, completely metal enclosed self-supporting structure. Construction shall consist of vertical sections of the universal frame type bolted together and braced with self-tapping bolts. Sides, top and rear shall be covered with captive-bolt fastened steel plates having formed edges all around. Front plates shall be sectionalized and removable. All plates shall be fabricated from 12-gage steel and shall have die-formed edges all around. The switchboard frame shall be suitable for use as floor sills in indoor installations. Corners shall be reinforced with rigged gussets internal and external to the structural members.
2. Switchboards shall have depth as required to house all equipment contained within it. Switchboard shall be constructed so that the back and front of all sections align. Construction of the board shall allow maintenance of incoming line terminations, device connections and all bus bolted connections.

3. All devices shall be accessible and removable from the front unless rear access is indicated on the Drawings.
4. Provide necessary hardware to permit locking every overcurrent protective device handle in the "OFF" position.
5. Provide hinged access doors to all termination, meter, and relay compartments with knurled and slotted large head captive-bolts. The design shall allow access to compartments without tools and without removing any panels.
6. Furnish cable pull sections or top cable pull boxes where indicated on the Drawings complete with cable tie down supports. Where cable pull section or pull boxes contain utility service cables, provide utility acceptable sealing means.
7. Switchboard shall be suitable for use as service entrance equipment and be labeled in accordance with UL requirements.
8. Utility metering compartment section shall be fabricated to meet all utility company requirements. Where separate vertical section is required for utility metering, match and align with switchboard enclosure.

B. Bus assembly and terminations:
1. The switchboard bussing shall be highly conductive silver-plated copper with sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements.
2. Bus arrangement shall be Phase A-B-C-N left-to-right, top-to-bottom and front-to-rear as viewed from the front. Horizontal and vertical bus ampere rating shall be uniform from end-to-end.
3. All bussing to and from an overcurrent protective device shall be rated to the frame sizing, not the trip rating.
4. Where "SPACE" is indicated in the switchboards, cross connectors and mounting hardware shall be installed to match the frame size ampere rating noted on the Electrical Drawings. All "SPACES" shall be ready for installation of overcurrent protective devices at a future time.
5. Shipping splits and provisions for future bus extension shall be provided with necessary bus splices.
6. Each switchboard shall contain a full length, bottom/front located copper ground bus that is securely connected to each vertical section. Ground bus shall be sized in accordance with UL 891, Table 25.1.
7. Termination lugs: High compression circumference crimped type rated for use with aluminum/copper conductors.
8. Switchboards shall be fully rated for a minimum of 65,000 AIC or as indicated on the Drawings.
9. Neutral bus shall be 100-percent rated unless otherwise indicated on the Drawings.
10. Main service switchboards:
    a. Removable neutral link: Provide removable bolted bus section for the purpose of disconnecting the ground circuit conductor from the premises wiring at the supply side of the service in accordance with CEC article 230-75.
    b. Main bonding jumper: Connection between the grounded circuit conductor and the equipment ground conductor at the supply side of the service. Size in accordance with CEC table 250-94 or 12-1/2% of the area of the largest phase conductor in accordance with CEC article 250-79(c).

C. Switching and overcurrent protective devices:
1. Refer to Section 262816: Overcurrent Protective Devices.
2. Main overcurrent protective devices(s) shall be fixed mounted molded case breaker with interrupting rating and frame and trip ratings as indicated on Drawings.
3. Feeder overcurrent protective device(s) shall be fixed mounted molded case breaker with frame and trip rating as indicated on Drawings.
4. Devices interrupting rating shall match that of switchboard for which the device is installed.
5. Series ratings of overcurrent protective devices is not acceptable unless specifically

noted on the Drawings.

6. Devices shall be manually operated unless shunt trip and/or electrically operated devices are indicated on Drawings.

D. Ground fault protection:
   1. General: A solid-state, zone-interlocked, ground fault protection system shall be provided integral on the main device(s) as indicated on Drawings. It shall consist of integral phase current sensors, appropriate solid-state relaying equipment to provide the desired ground fault current sensitivity and time-current response characteristics. Provide neutral ground fault current transformer for four wire systems.
   2. Device settings: Adjustable pickup current sensitivity for ground fault currents from 200 amperes to 1200 amperes shall be provided. A calibrated dial shall be provided for setting the current pickup point in the field. Time delay shall be adjustable from 0 to 60 cycles. Settings for individual relays shall be as directed by the short circuit/coordination study specified in Section 260060: Power System Study. A locking screw shall be provided to retain both adjustments at desired setting.
   3. All overcurrent devices shall be independently time coordinated irrespective of zone interlocking to allow the last downstream level of ground fault devices to be time coordinated, i.e. it shall NOT revert to the lowest time setting.

E. Instrumentation and controls:
   1. Switchboards shall have a digital meter unit (DMU) provided by the manufacturer. Control power shall be derived internally.
   2. Meter potential circuits shall be fused. Potential transformers if required for the monitoring devices shall be provided with fuses in the primary.
   3. Meter current circuits shall have shorting terminal blocks between the meter and the current transformers. Current transformers shall be ring type (one per phase) with ratio, thermal, and mechanical ratings coordinated with the application and protection.
   4. Instrument transformer accuracy per IEEE C57.13.6:
      a. Current transformers must maintain 0.15% accuracy from 5% rated current through rating factor at rated burden.
      b. Voltage transformers must maintain 0.15% accuracy from 90% to 110% of rated voltage.

F. Refer to Electrical Drawings for the following:
   1. Mounting style; voltage; terminal lug size, location, and quantity; bus ampacity; interrupting capacity of bus and overcurrent protective devices, quantity, poles, and rating of overcurrent protective devices. Note that the AIC value noted on the Drawings for distribution equipment is the minimum rating of all components; values are in RMS symmetrical amps.

G. Miscellaneous requirements:
   1. Circuit numbering: Starting at the top, odd numbered circuits in sequence down the left-hand side and even numbered circuits down the right-hand side.
   2. Nameplates: Engraved nameplates shall be provided for each device and all "SPACES" located in the switchboard. An engraved nameplate shall also be provided indicating the switchboard designation. See Section 260553: Electrical Identification for requirements.
   3. All control wires shall be labeled with wire markers and referenced to the control wiring diagrams. Provide colored wires with colored stripes to facilitate troubleshooting and locating both ends of wires. Do not use wires with all the same wire color. Use fork, crimp type terminations on all control wires.
   4. Provide a test block and plugs for voltage and current monitoring at each main switch. Provide engraved legend plates to indicate function of each test point.
   5. Vertically mounted mains shall have the operating handle in the up position when energized.

H. Weatherproof outdoor enclosure and accessories:
   1. Provide a NEMA 3R non-walk-in type weatherproof housing with hinged lockable access doors. Each section shall have a minimum of 13-inch deep vestibule. Provide a latch for each door to ensure adequate closing pressure to seal against harmful weather.
   2. Provide each section of the switchboard with the following items with power obtained from a control power transformer and circuit breaker within the switchboard.
      a. 120volt AC industrial grade LED lights inside each section vestibule.
      b. One 120volt AC GFCI type duplex outlet with weatherproof cover. Connect to 120volt AC light circuit.

I. Finish:
   1. Five step zinc phosphate pre-treatment, one coat of rust inhibiting dichromate primer and one coat of baked-on enamel finish, ANSI 61 (light gray).
   2. A seven-step spray wash electroplate primer with final baked-on enamel finish; ANSI 61 (light gray) is an acceptable finish alternative.

PART 3 EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of switchboard installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

A. Ensure all conduit stub-ups for bottom entry into switchboard are in place and located as required per Shop Drawings.

B. Whether noted on the Drawings or not, provide a 4-inch high concrete housekeeping pad beneath equipment. Coordinate actual sizes of equipment based on approved Shop Drawings and extend pad 4-inches in all directions beyond overall dimension of base. Provide reinforcing bars as required structurally within pad to ensure proper support of equipment.

3.3 INSTALLATION

A. Install switchboards in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.

B. Handling, storage, installation and energize of switchboards shall be carried out in accordance with latest edition of NEMA Publications PB 2.1.

C. Freestanding switchboards shall be accurately aligned, leveled, and bolted in place on full-length channels securely fastened to concrete floor.

D. Switchboards shall be anchored and braced to withstand seismic forces as calculated per Section 260010: Basic Electrical Requirements.

E. Provide mounting hardware brackets, bus bar drilling and filler pieces for all unused spaces.

F. "Train" interior wiring; bundle and clamp, using specified plastic wire wraps specified under Section 260519: Building Wire and Cable.

G. Replace any panel pieces, doors or trims having dents, bends, warps, or poor fit that may impede ready access, security, or integrity.

H. Conduits terminating in concentric, eccentric, or oversized knockouts at switchboards shall have ground bushings and bonding jumpers installed interconnecting all such conduits and the switchboards.

I. Check and tighten all bolts and connections with a torque wrench using Manufacturer's recommended values.

J. Visually inspect switchboards for rust and corrosion if signs of rust and corrosion are present, board shall be restored to new condition or replaced.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's field service: Contractor shall arrange and pay for the services of a factory-authorized service representative to supervise the initial start-up, testing, and adjustment of the switchboard.

B. Independent testing: Contractor shall arrange and pay for the services of an independent Testing Agency to perform all quality control electrical testing, calibration and inspection required herein. Independent Testing Agency shall meet the requirements as outlined in Section 260010: Basic Electrical Requirements. Testing Agencies objectives shall be to:
   1. Assure switchboard installation conforms to specified requirements and operates within specified tolerances.
   2. Field test and inspect to ensure operation in accordance with Manufacturer's recommendations and Specifications.
   3. Prepare final test report including results, observations, failures, adjustments, and remedies.
   4. Apply label on switchboard upon satisfactory completion of tests and results.
   5. Verify ratings and settings and make final adjustments.

C. Engineer witnessed testing: Allow a period of 4 hours per switchboard for Engineer review and final check. This review shall be done when the switchboard is de-energized, therefore plan accordingly.

D. At least three weeks prior to any testing, notify the Engineer so that arrangement can be made for witnessing test, if deemed necessary. All pretesting shall have been tested satisfactorily prior to the Engineer's witnessed test.

E. The Contractor shall supply a suitable and stable source of electrical power to each test site. The Testing Agency shall specify the specific power requirements.

F. Testing of overcurrent protective devices shall be done only after all devices are installed and prior to system being energized.

G. Prefunctional testing:
   1. Provide Testing Agency with Contract Documents and Manufacturer instructions for installation and testing.
   2. Visual and mechanical inspection:
      a. Compare nameplate information and connections to Contract Documents.
      b. Inspect for physical damage, defects alignment and fit.
      c. Verify appropriate anchorage, required clearances and correct alignment.
      d. Inspect doors, panels and sections for paint, dents, scratches, fit and missing hardware

e. Check tightness of all control and power connections.
f. Check that all covers, barriers, and doors are secure.
g. Verify correct barrier installation.
h. Verify that relays and overcurrent protective devices meet Drawing, power system study and specified requirements.
i. Perform mechanical operational tests in accordance with Manufacturer's instructions.
j. Exercise active components.
k. Inspect control power and instrument transformers.
l. Inspect insulators for evidence of physical damage or contaminated surfaces.
m. Ground-fault protection:
    1) Verify ground connection is made ahead of neutral disconnect link and on line side of any ground fault sensor.
    2) Verify neutral sensors are connected with correct polarity on both primary and secondary.
    3) Verify all phase conductors and neutral pass through sensor in same direction for zero sequence systems.
    4) Verify grounding conductors do not pass through zero sequence sensors.
    5) Verify grounded conductor is solidly grounded.
    6) Verify correct operation of self-test panel.
    7) Set pickup and time-delay settings in accordance with Specifications. Record operation and test sequences as required by code.

3. Electrical tests:
    a. Perform resistance tests through bus joints with low-resistance ohmmeter. Joints that cannot be directly measured due to permanently installed insulation wrap shall be indirectly measured from closest accessible connection.
    b. Perform insulation-resistance tests on each bus section, phase-to-phase, and phase-to-ground, at 1000volt DC for 60-seconds. Investigate resistance values less than 50-megohms.
    c. Perform over-potential test on each bus section, each phase-to-ground with phases not under test grounded, in accordance with Manufacturer’s published data. Test voltage shall be applied for 60-seconds.
    d. Perform insulation-resistance tests at 1000volt DC for 60-seconds on control wiring. Do not perform this test on wiring connected to solid-state components.
    e. Perform current injection tests on the entire current circuit in each section of switchgear.
        1) Perform current tests by primary injection, where possible, with magnitudes such that minimum of 1amp flows in secondary circuit.
        2) Where primary injection is impractical, utilize secondary injection with minimum current of 1amp.
        3) Test current at each device.
    f. Perform tests on all instrument transformers in accordance with Manufacturer’s written instructions.
    g. Determine accuracy of meters and instruments per Manufacturer’s instructions.
    h. Perform the following tests on control power transformers:
        4) Perform insulation-resistance test. Perform measurements from winding-to-winding and each winding-to-ground. Test voltages shall be determined in accordance with Manufacturer’s instructions.
        5) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to correct secondary voltage. Confirm potential at all devices.
        6) Verify correct secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.

4. Potential transformer circuits:
    a. Perform insulation-resistance tests. Perform measurements from winding-to-winding and each winding-to-ground. Test voltages shall be determined in

accordance with Manufacturer's instructions.
b. Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to correct secondary voltage.
c. Verify secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.

5. Ground resistance:
   a. Measure system neutral-to-ground insulation-resistance with neutral disconnect link temporarily removed. Replace neutral disconnect link after test.
   b. Measure insulation-resistance of control wiring at 1000volt DC for 60-seconds. Refer to Manufacturer's instruction for devices with solid-state components
6. Ground fault protection system:
   a. Perform the following pickup tests using primary injection:
      1) Verify relay does not operate at 90% of pickup setting.
      2) Verify pickup is less than 125% of setting or 1200amps, whichever is smaller.
   b. For summation type systems using phase-neutral current transformers, verify correct polarities by applying current to each phase-neutral current transformer pair. This test also applies to molded-case breakers using external neutral current transformer.
      1) Relay should operate when current direction is the same relative to polarity marks in the two current transformers.
      2) Relay should not operate when current direction is opposite relative to polarity marks in the two current transformers.
   c. Measure time delay of the relay at 150% or greater of pickup.
   d. Verify reduced control voltage tripping capacity at 55% for AC systems and 80% for DC systems.
7. Calibrate digital meters to 0.5-percent and verify meter multipliers.
8. Check phasing of alternate supply sources.
9. Verify operation of switchboard heaters.
10. Test overcurrent protection devices per Section 262816: Overcurrent Protective Devices.

H. Test values:
1. Bolt torque levels shall be in accordance with Manufacturer's requirements.
2. Compare bus connection resistances to values of similar connections.
3. Insulation-resistance values for bus, control wiring and control power transformers shall be in accordance with Manufacturer's published data. Values of insulation resistance less than Manufacturer's minimum levels should be investigated. Over-potential tests should not proceed until insulation-resistance levels are raised above minimum values.
4. Insulation shall withstand the over-potential test voltage applied.
5. Determine contact resistance in microhms. Resistance values shall not exceed high limit of normal range as indicated in Manufacturer's published data.
6. System neutral-to-ground insulation shall be a minimum of one megohm.
7. Ground fault protection systems relay timing shall be in accordance with Manufacturer's Specifications but must also be no longer than one second at 3000amps.

I. In the event that the system fails to function properly during the testing as a result of inadequate pretesting or preparation, the Contractor shall bear all costs incurred by the necessity for retesting including test equipment, transportation, subsistence and the Engineer's hourly rate.

J. Contractor shall replace at no costs to the Owner all devices which are found defective or do not operate within factory specified tolerances.

K. Contractor shall submit the Testing Agency's final report for review prior to Project closeout

and final acceptance by the Owner. Test report shall indicate test dates, devices tested, results, observation, deficiencies, and remedies. Test report shall be included in the operation and maintenance manuals.

3.5 CLEANING

A. Prior to energizing of switchboard, the Contractor shall thoroughly clean the interior of enclosure of all construction debris, scrap wire, etc. using Manufacturer's approved methods and materials.

B. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean both the interior and exterior of switchboard per Manufacturers approved methods and materials. Remove paint splatters and other spots, dirt, and debris.

C. Touch-up paint any marks, blemishes or other finish damage suffered during installation.

3.6 TRAINING

A. Factory authorized service representative shall conduct a 4-hour training seminar for Owner's Representatives upon completion and acceptance of system. Instructions shall include safe operation, maintenance, and testing of equipment with both classroom training and hands-on instruction.

B. Contractor shall schedule training with a minimum of 7-days advance notice.

END OF SECTION 26 24 13

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
   1. Panelboards.

B. Related Sections:
   1. Section 26 05 00: Common Work Results for Electrical.
   2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
   3. Section 26 05 26: Grounding and Bonding for Electrical Systems.
   4. Section 26 05 33: Raceway and Boxes for Electrical Systems.

C. Reference Standards:
   1. California Electrical Code (CEC) based on NFPA 70 (NEC). California Code of Regulations, Title 24, Part 3.
   2. California Energy Code. California Code of Regulations, Title 24, Part 6.
   3. National Electrical Manufacturers Association (NEMA):
      a. PB 1 Panelboards.
      b. PB 1.1 General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
      c. AB 3 Molded Case Circuit Breakers and their Application.
   4. National Fire Protection Agency (NFPA):
      a. 70E Standard for Electrical Safety in the Workplace.
   5. National Electrical Manufacturers Association (NECA):
      a. 407 Standard for Installing and Maintaining Panelboards.
   6. National Electrical Testing Association (NETA):
      a. ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
   7. Underwriters Laboratories, Inc. (UL):
      a. 50 Enclosures for Electrical Equipment.
      b. 67 Panelboards.
      c. 489 Molded Case Circuit Breakers and Circuit Breaker enclosures.

PART 2 PRODUCTS

2.1 PANELBOARDS

A. Approved manufacturers are:
   1. Eaton Electrical, Inc.; Cutler-Hammer Business Unit.
   2. Square D; a brand of Schneider Electric.
   3. General Electric Company; GE Consumer & Industrial – Electric Distribution.
   4. Siemens Energy & Automation, Inc.

B. Panelboards shall be standard manufactured products. All components of the panelboards shall be the product and assembly of the same manufacturer. All similar units of all

panelboards to be of the same manufacturer.

C. All panelboards shall be dead front safety type. Arrange sections for easy removal without disturbing other sections.

D. All panelboards shall be completely factory assembled with molded case circuit breakers. All factory wiring shall be checked for correct tightness and visually inspected to ensure that bussing and terminations have not become loose in transit to job site.

E. Panelboards shall have main breaker or main lugs, bus size, voltage, phase, top or bottom feed, and flush or surface mounting as scheduled on the drawings. Refer to single line diagram and panel schedules on drawings. Terminals shall be minimum 75 degree rated. Back fed main circuit breakers are not allowed.

F. Panelboards shall have the following features:
1. Nonreduced size copper bus bars, and connection straps bolted together and rigidly supported on molded insulators. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of branch circuit devices.
2. Full size neutral bar mounted on insulated supports.
3. Ground bar and isolation ground bar (where called for in panel schedule) with sufficient terminals for all grounding wires. Buses braced for the available short circuit current.
4. All breakers and phase bus connections shall be arranged so that it will be possible to substitute a 2-pole breaker for two single pole breakers, and a 3-pole breaker for three single pole breakers, when trip is 30 amps or less and frame size is 100 amperes or less, without having to drill and tap the main bus bars at bus straps. Where used for heating and air conditioning, and refrigeration equipment, use only HACR type UL listed circuit breakers.
5. Design interior so that protective devices can be replaced without removing adjacent units, main bus connectors, and without drilling or tapping.
6. Where designated on panel schedule as "space", include all necessary bussing, device support and connections. Provide blank cover for each space.
7. Series rated panelboards are not permitted.
8. Label all panels in accordance with Section 26 05 53: Identification of Electrical Systems.
9. Recessed panel space conduit: Provide (1) ¾ inch spare conduit stubbed to accessible ceiling space and/ or interstitial space below floor for every (3) spaces and spares indicated on panel schedules.

G. Panelboards serving as building mains shall be “service entrance rated” and UL Listed as “service equipment”.

2.2 CABINETS AND TRIMS

A. Cabinets:
1. Provide galvanized steel cabinets to house panelboards. Cabinets for outdoor panels shall be factory primed and suitably treated with a corrosion-resisting paint finish meeting UL standard for outdoor applications.
2. All ventilated openings in panelboards and switchboards, shall be furnished with dust filters to prevent entrance of dust and debris.
3. Cabinets for panelboards may be of one piece formed steel or of formed sheet steel with end and side panels welded, riveted, or bolted as required.
4. Provide necessary hardware for "in" and "out" adjustment of panel interior.
5. Cabinets for two section panelboards shall be arranged side by side and shall be the same height. Flush mounted cabinets should be 1-1/2" apart and coupled by conduit nipple if necessary.

6. Gutter size in panel boxes, on all sides, shall be in accordance with the CEC. Penetrations through gutter to live area of the panelboard shall incorporate approved non-metallic-grommet type of insulation to protect wire passing through.

B. Trims:
1. Fabricate trim of sheet steel consisting of frame with door attached by concealed hinges. Provide flush or surface trim as shown on the drawings.
2. Flush trims shall overlap the box by at least 3/4" all around.
3. Surface trim shall have the same width and height as the box.
4. Flush or surface trims shall not have ventilating openings.
5. Secure trims to back boxes by indicating trim clamps.
6. Provide a welded angle on rear of trim to support and align trim to cabinet.
7. Provide separate trims for each section of multiple section panelboards. Trims and doors of sections shall be of the same height.

C. Doors:
1. Provide doors with flush type latch and manufacturer's standard lock. Doors over 48 inches in height shall have a vault handle and a three-point catch, arranged to fasten door at top, bottom, and center.
2. In making switching devices accessible, doors shall not uncover any live parts.
3. Provide concealed hinges welded to the doors and trims.
4. For lighting or power contactors incorporated in panelboards, provide separate doors for the contactors.
5. Provide keyed alike system for all panelboards.
6. Provide a directory card, metal holder, and transparent cover. Permanently mount holders on inside of doors.

D. Painting:
1. Thoroughly clean and paint trims and doors at the factory with primer and manufacturer's standard finish.

2.3 MOLDED CASE CIRCUIT BREAKERS FOR PANELBOARDS

A. Breakers shall be UL listed and labeled, in accordance with the CEC, as shown on the drawings, and as specified.

B. Circuit breakers in panelboards shall be bolt on type on phase bus bar or branch circuit bar.
1. Molded case circuit breakers for lighting and appliance branch circuit panelboards shall have minimum interrupting rating as indicated.
2. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips for 100 ampere frame or less. Magnetic trip shall be adjustable from 3 times to 10 times for breakers with 600 ampere frames and higher. Factory setting shall be HI, unless otherwise noted.

C. Breaker features shall be as follows:
1. Integral housing of molded insulating material.
2. Silver alloy contacts.
3. Arc quenchers and phase barriers for each pole.
4. Quick-make, quick-break, operating mechanisms.
5. A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
6. Electrically and mechanically trip free.
7. An operating handle which indicates ON, TRIPPED, and OFF positions:
   a. Line connections shall be bolted.
   b. Interrupting rating shall not be less than the maximum short circuit current available at the line terminals as indicated on the drawings. The interrupting rating shall not

be less than the minimum identified requirement.

8. An overload on one pole of a multipole breaker shall automatically cause all the poles of the breaker to open.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with CEC, as shown on the drawings, and as specified.

B. Locate panelboards so that the present and future conduits can be conveniently connected. Coordinate the sizes and layout of cabinets within the designated spaces. All equipment must be dimensioned in order to physically fit in the spaces provided and to comply with all code required clearances.

C. Install a typewritten schedule of circuits in each panelboard. Include the room numbers (as finally described by the Owner) and items served on the cards. Obtain final room numbers from Architect prior to creating schedule.

D. Mount the panelboard so that maximum height of the top circuit breaker above finished floor shall not exceed 78 inches.

E. For panelboards located in areas accessible to the public, paint the exposed surfaces of the trims, doors, and boxes with finishes to match surrounding surfaces after the panelboards have been installed.

F. Circuit numbers shall correspond to the approved panel schedule. Provide as-built drawings showing the actual circuit numbers being used for each device on each branch circuit if changes are required.

G. Verify depth of all flush-mounted enclosures in walls to be certain wall depth will accommodate panel depth prior to installation.

H. All openings in switchgear and panelboards that are unused shall be sealed with bolts and washers. Use caulking where holes or openings cannot be sealed by way of a washer, or bolts or conduit seals.

I. Contractor shall include the services of an independent testing company to test GFI circuit breakers in distribution and main panelboards.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
   1. Wiring devices.

B. Related Sections:
   1. Section 26 05 00: Common Work Results for Electrical.
   2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
   3. Section 26 05 26: Grounding and Bonding for Electrical Systems.
   4. Section 26 05 33: Raceway and Boxes for Electrical Systems.

C. Reference Standards:
   1. California Electrical Code (CEC) based on NFPA 70 (NEC). California Code of Regulations, Title 24, Part 3.
   2. National Electrical Manufacturers Association (NEMA):
      a. WD 1 General Color Requirements for Wiring Devices.
      b. WD 6 Wiring Devices - Dimensional Specifications.
   3. National Electrical Manufacturers Association (NECA):
      a. 1 Good Workmanship in Electrical Construction.
   4. National Electrical Testing Association (NETA):
      a. ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
   5. Underwriters Laboratories, Inc. (UL):
      a. 20 Safety General-Use Snap Switches.
      b. 231 Standard for Power Outlets.
      c. 498 Attachment Plugs and Receptacles.
      d. 943 Ground-Fault Circuit-Interrupters.
      e. 1436 Standard for Outlet Circuit Testers and Similar Indicating Devices.
      f. 1472 Solid-State Dimming Controls.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Receptacles, Switches, Wall Plates:
   1. Cooper Wiring Devices; Division of Cooper Industries, Inc.
   2. Hubbell Incorporated; Wiring Device-Kellems.
   3. Leviton Mfg. Company, Inc.
   4. Pass & Seymour/ Legrand.

2.2 RECEPTACLES

A. General for all receptacles:
   1. Device shall be listed by UL

2. Mounting straps shall be plated steel, with break-off plaster ears and shall include a self- grounding feature (this feature does not substitute for a grounding conductor terminated on grounding strap of device). Terminal screws shall be brass, brass plated or a copper alloy metal.
3. Receptacles shall be of a screw terminal type, “pressure type quick wire” terminations are not allowed.

B. Duplex receptacles shall be premium specification grade single phase, 20 ampere, 120 volts, 2-pole, 3-wire, and conform to the NEMA 5-20R configuration in NEMA WD 6. The duplex type shall have bussing break-off feature for two-circuit operation. The ungrounded pole of each receptacle shall be provided with a separate terminal:
1. Wiring device color shall be standard white. Contractor to verify device color with Architect prior to procurement.
2. Ground Fault Interrupter Duplex Receptacles - Shall be an integral unit suitable for mounting in a standard outlet box:
   a. Ground fault interrupter shall be commercial grade and consist of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. It shall be rated for operation on a 60 Hz, 120 volt, 20-ampere branch circuit. Device shall meet CEC requirements. Device shall have a minimum nominal tripping time of 1/30th of a second. Devices shall meet UL 943.

C. Receptacles; 20, 30 and 50 ampere, 250 volts: Shall be complete and match with appropriate cord grip plug. Devices shall meet UL 231.

D. Weatherproof Receptacles: Shall consist of a listed weather resistant duplex receptacle, mounted in box with a gasketed, while in use weatherproof, cast metal cover plate and cap receptacle opening. The cap shall be permanently attached to the cover plate by a spring-hinged flap.

2.3 SWITCHES

A. Toggle switches shall be totally enclosed tumbler type with bodies of phenolic compound. Toggle handles color to match receptacle device color unless otherwise specified:
1. Shall be single unit toggle, butt contact, quiet AC type, heavy-duty general-purpose use with an integral self-grounding mounting strap with break-off plasters ears and be of a screw terminal type.
2. Shall be color coded for current rating, listed by UL, and meet the requirements of NEMA WD 1, Heavy-Duty and UL 20.
3. Ratings:
   a. 120 volt circuits: 20 amperes at 120-277 volts AC.
   b. 277 volt circuits: 20 amperes at 277 volts AC.
4. The switches shall be mounted on the strike plate side of doors.
5. Incorporate barriers between switches with multi-gang outlet boxes where required by the CEC.
6. All toggle switches shall be of the same manufacturer.

2.4 WALL PLATES

A. Wall plates for switches and receptacles shall be type 302 stainless steel.

B. Standard NEMA design, so that products of different manufacturers will be interchangeable. Dimensions for openings in wall plates shall be accordance with NEMA WD1.

C. For receptacles or switches ganged together, wall plates shall be a single ganged plate.

D. Wall plates for data, telephone or other communication outlets shall be as specified in the associated specification.

E. Surface mounted boxes, NEMA1, shall be industrial grade raised galvanized steel covers. In shop areas, all receptacles shall be dust proof and or waterproof where applicable.

F. Waterproof device covers shall be cast iron, 4-corner screw type, for FS and FD type mounting. Device covers shall be zinc galvanized finish. Weatherproof covers shall be lockable.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the CEC, NECA “Standard of Installation”, and as shown as on the drawings.

B. Ground terminal of each receptacle shall be bonded to the outlet box with an approved green bonding jumper, and also be connected to the green equipment grounding conductor.

C. General: Devices shall be of the type specified herein. All devices shall be installed with “pigtailed” leads from the outlet box. No device shall be used in the “feed through” application. Screw terminals shall be used to connect all devices to the circuit and shall be grounded by means of a ground wire where grounding terminals are provided in the device.

D. Installation: Devices and plates shall be installed in a “plumb” condition and must be flush with the finish surface of the wall where boxes are recessed.

E. Mounting heights: All control and convenience devices shall comply with California Code of Regulations Title 24 and ADA with respect to accessibility requirements. Mounting heights indicated on plans shall have precedence.

F. Install switches with the off position down.

G. Clean debris from outlet boxes.

H. Provide extension rings as required to bring outlet boxes flush with finished surface or casework.

I. Test each receptacle device for proper polarity.

END OF SECTION 26 27 26

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes:
   1. Disconnect and safety switches where shown on the contract drawings and specified herein.

B. Related Sections:
   1. Section 26 05 53: Identification of Electrical Systems.

C. Reference Standards:
   1. California Electrical Code (CEC) based on NFPA 70 (NEC). California Code of Regulations, Title 24, Part 3.
   2. National Electrical Manufacturers Association (NEMA):
      a. KS 1 Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).
      b. AB 3 Molded Case Circuit Breakers and their Application.
      c. FU 1 Low Cartridge Fuses.
      d. 250 Enclosures for Electrical Equipment (1000 Volts Maximum).
   3. Underwriters Laboratories, Inc. (UL):
      a. 98 Enclosed and Dead-Front Switches.
      b. 489 Molded Case Circuit Breakers and Circuit Breaker enclosures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fusible Switches, non-fusible switches, and molded case circuit breakers:
   1. Eaton Electrical, Inc.; Cutler-Hammer Business Unit.
   2. Square D; a brand of Schneider Electric
   3. General Electric Company; GE Consumer & Industrial – Electric Distribution
   4. Siemens Energy & Automation, Inc.

2.2 GENERAL

A. Disconnect Switches: Provide with devices enabling the switch to be locked in the open or closed positions.

B. Manual Motor Switches: Tumbler type rated 3HP, 240 Volts with or without overload heaters as required to protect equipment served.

C. Externally Operable Safety Switches: To have quick-make, quick-break mechanism, capable of switching 10 times switch rating, with cover interlock to prevent opening with switch in ON position and defeat mechanism for maintenance.

D. Switches: Shall be general duty (GD) for 240 volt and below and heavy duty (HD) for 277/

480 volt type unless otherwise indicated. Provide NEMA 1 enclosures for interior locations and NEMA 3R enclosures for exterior or wet locations. Provide with number of poles, ampacity, voltage, and HP rating, fusible or non-fusible as indicated. Copper blades shall be visible in off position.

E. Fusible Switches: Equip them with rejection clips for UL Class R fuses. Switches having a dual rating when used with dual element fuses shall have a rating so indicated and shall be confirmed by equipment vendor being connected.

F. 600 Amperes or Less Fuses: UL Class RKI with a minimum interrupting rating of 200,000 Amperes, Bussmann "Low-Peak Type" or equal.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. Locations: Install switches, disconnects and safety where indicated on the Contract Drawings or as required by CEC.

B. Fastenings: Securely fasten switches to structural members or Unistrut support as directed by the manufacturer.

C. Label all disconnect switches in accordance with Section 26 05 53: Identification of Electrical Systems.

D. Fuse: All fuses shall be as indicated on the plan or as required by the equipment. Verify fuse size with equipment manufacturer requirements, prior to installation. Use current limiting fuses as indicated on plan.

E. Terminals shall be minimum 75 degree rated.

END OF SECTION 26 28 16

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
   1. Interior lighting systems, including luminaires, LED's, and emergency lighting equipment.

B. Related Sections:
   1. Section 26 05 00: Common Work Results for Electrical.
   2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
   3. Section 26 05 26: Grounding and Bonding for Electrical Systems.
   4. Section 26 05 33: Raceway and Boxes for Electrical Systems.

C. Reference Standards:
   1. California Electrical Code (CEC) based on NFPA 70 (NEC). California Code of Regulations, Title 24, Part 3.
   2. California Energy Code. California Code of Regulations, Title 24, Part 6.
   3. National Electrical Manufacturers Association (NEMA).
      a. 50 Enclosures for Electrical Equipment.
      b. 67 Panelboards.
      c. 489 Molded Case Circuit Breakers and Circuit Breaker enclosures.
   4. Underwriters Laboratories, Inc. (UL).
      a. 50 Enclosures for Electrical Equipment.
      b. 67 Panelboards.
      c. 489 Molded Case Circuit Breakers and Circuit Breaker enclosures.
   5. Aluminum Association Inc. (AA).
   6. Illuminating Engineering Society of North America (IESNA or IES).

1.3 SUBMITTALS

A. Submit in accordance with Section 26 05 00: Common Work Results for Electrical.

B. Shop Drawings:
   1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
   2. Include electrical ratings, dimensions, mounting, details, materials, terminations, wiring and connection diagrams, photometric data, ballasts, luminaires, lamps, and controls.

1.4 DEFINITIONS

A. Lighting terminology used herein is defined in IES.

B. Exception: The term "driver" is used herein to cover both drivers and power supplies, where applicable.

C. Clarification: The term "LED light source(s)" is used herein per IES to cover LED

package(s), module(s), and array(s).

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be in accordance with CEC, UL, ANSI, and as shown on the drawings and specified.

2.2 LIGHTING FIXTURES (LUMINAIRES)

A. Shall be in accordance with CEC, UL 1598 and shall be as shown on drawings and as specified. All luminaires shall have been certified to the California Energy Commission by its manufacturer to comply with the efficiency standards as per California Code of Regulations Title 24, Part 6, Section 111 referencing the Appliance Efficiency Regulations in Title 20. Post certification with building permit.

B. Sheet Metal:
   1. Shall be formed to prevent warping and sagging. Housing, trim, and lens frame shall be true, straight (unless intentionally curved) and parallel to each other as designed.
   2. Wireways and fittings shall be free of burrs and sharp edges and shall accommodate internal and branch circuit wiring without damage to the wiring.
   3. When installed, any exposed fixture housing surface, trim frame, door frame and lens frame shall be free of light leaks; lens doors shall close in a light tight manner:
      a. Hinged door closure frames shall operate smoothly without binding when the fixture is in the installed position, and latches shall function easily by finger action without the use of tools.

C. Recessed fixtures shall be of the type approved for the ceiling and insulation conditions and appropriate for the installation location. Insulation must be held back from the fixture to provide manufacturers' recommended clearances for proper operation. Thermal tripping shall be the installer's responsibility to correct. Where installed in fire rated ceilings, coordinate installation of fire rated enclosures around the ceiling penetrations. Fixtures shall contain the proper through wiring capacity for that which is shown on the plans.

D. Recessed fixtures shall be provided with the appropriate trims and hardware compatible with the ceiling type shown. Plaster frames are required where plaster or gypsum board ceilings are encountered.

E. Fixtures with louvers or light transmitting panels shall have hinges, latches, and safety catches to facilitate safe, convenient cleaning and relamping.

F. Mechanical Safety: Lighting fixture closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, captive hinges, or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.

G. Metal Finishes:
   1. The manufacturer shall apply standard finish (unless otherwise specified) over a corrosion resistant primer, after cleaning to free the metal surfaces of rust, grease, dirt, and other deposits. Edges of pre-finished sheet metal exposed during forming, stamping, or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or evidence of rusting, blistering, or flaking.
   2. Interior light reflecting finishes shall be white with not less than 85 percent

reflectance's, except where otherwise specified on the drawing.
3. Exterior finishes shall be as shown on the drawings.

H. Provide all lighting fixtures with a specific means for grounding metallic wireways and housings to an equipment grounding conductor.

I. Light Transmitting Components for Fixtures:
1. Shall be 100 percent virgin acrylic plastic or water white, annealed, crystal glass.
2. Flat lens panels shall have not less than 1/8 inch of average thickness. The average thickness shall be determined by adding the maximum thickness to the minimum unpenetrated thickness and dividing the sum by 2.
3. Unless otherwise specified, lenses, diffusers and louvers shall be retained firmly in a metal frame by clips or clamping ring in such a manner as to allow expansion and contraction of the lens without distortion or cracking.

J. Recessed compact LED fixtures shall be manufactured specifically for LED lamps with drivers integral to the fixture. Assemblies designed to retrofit fixtures are prohibited except when described in this fashion.

2.3 LED LUMINAIRE REQUIREMENTS

A. General Requirements:
1. Luminaire shall have an external label per ANSI C136.15.
2. Luminaire shall have an internal label per ANSI C136.22.
3. Luminaires shall start and operate in -20°C to +40°C ambient.
4. LED light source(s) and driver(s) shall be RoHS compliant.

2.4 EMERGENCY FIXTURE POWER SUPPLY

A. Self-contained battery-operated power supply for operating specified fixture for a minimum output of 90 minutes.

B. The power supply shall be installed within the luminaire ballast compartment or wireway. Provide with test switch and charge indicator installed integral to the luminaire. The test switch and charge indictor may be installed in a remote ceiling mounted flush J-box for recessed downlights which cannot accept integral components.

C. Performance: Emergency operation lumen output for specified fixtures shall be a minimum of 600 lumens.

2.5 LED DRIVER

A. Driver:
1. Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperatures as indicated.
2. Shall accept the voltage or voltage range indicated and shall operate normally for input voltage fluctuations of plus or minus 10 percent. Consistent with NEMA SSL 1.
3. Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.

B. Electromagnetic interference:
1. Shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
2. Shall comply with FCC 47 CFR part 15 non-consumer RFI/ EMI standards.

C. The following shall be in accordance with corresponding sections of ANSI C136.37:
   1. Wiring and grounding.
   2. All internal components shall be assembled and pre-wired using modular electrical connections.
   3. Mounting provisions.
   4. Terminal blocks for incoming AC lines.
   5. Latching and hinging.
   6. Ingress protection.

2.6 LAMPS

A. Led Light Source:
   1. Minimum Color Rendering Index (CRI): 60.
   2. Correlated Color Temperature (CCT):
      a. CCT shall be as listed in Table 1 below:

Table 1. Allowable CCT

Manufacturer-Rated Nominal CCT (K)	Allowable LM-79 Chromaticity Values Measured CCT (K)
2700	2580 to 2870
3000	2870 to 3220
3500	3220 to 3710
4000	3710 to 4260
4500	4260 to 4746
5000	4745 to 5311
5700	5310 to 6020
6500	6020 to 7040

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation and furnishing of lighting fixtures shall be in accordance with the CEC, manufacturer's instructions and as shown on the drawings or specified. Fixtures damaged in transit and storage prior to completion shall be replaced at Contractor's expense.

B. Align, mount and level the lighting fixtures uniformly.

C. Avoid interference with and provide clearance for equipment. Where the indicated locations for the lighting fixtures conflict with the locations for equipment, change the locations for the lighting fixtures by the minimum distances necessary as approved by the Architect. The Architectural reflected ceiling plan will take precedence over electrical plans.

D. For suspended lighting fixtures, the mounting heights shall provide the clearances between the bottoms of the fixtures and the finished floors as shown on the drawings.

E. Lighting Fixture Supports:

1. Contractor shall provide support for all of the fixtures independent of suspended ceilings. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
2. Shall maintain the fixture positions after cleaning and re-lamping.
3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
4. Hardware for recessed fluorescent fixtures:
5. Fixtures shall be supported as detailed on drawings and as required by DSA standards.
6. Installation: Fixtures shall be securely mounted on ceilings and walls with appropriate fastening devices. "Drop-in" type T-bar fixtures shall be secured with #12 gauge safety "earthquake wires" as described by California Code of Regulations Title 24 Part 2, Chapter 47. "Tek Screws" will be required for fastening to the T-bar system in addition to safety wire. Surface mounted fluorescent fixtures shall be solidly screwed or clipped into framing above drywall with 4-#10 sheet metal screws into each fixture. Provide blocking for screw supports behind all surface mounted lighting fixtures weighing more than 15 lbs.
7. Surface mounted lighting fixtures:
   a. Fixtures shall be bolted against the ceiling independent of the outlet box at four points spaced near the corners of each unit. The bolts shall be minimum 1/4-20 bolt, secured to structural ceiling. Non-turning studs may be attached to the building structure by 12 gauge safety hangers.
8. Fixtures mounted in open construction shall be secured directly to the building structure with approved bolting and clamping devices.
9. Single or double pendent mounted lighting fixtures:
   a. Each stem shall be supported by an approved outlet box, mounted swivel joint and canopy which holds the stem captive and provides spring load (or approved equivalent) dampening of fixture oscillations. Outlet box shall be supported vertically from the building structure and be allowed to swing to a 45 degree angle.
10. Outlet boxes for support of lighting fixtures (where permitted) shall be secured directly to the building structure with approved devices or supported vertically in a hung ceiling from the building structure with a nine gauge wire hanger and be secured by an approved device to a main ceiling runner or cross runner to prevent any horizontal movement relative to the ceiling.

F. Coordinate between the electrical and ceiling trades to ascertain that approved lighting fixtures are furnished in the proper sizes and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.

G. Bond lighting fixtures and metal accessories to the grounding system as specified in Section 26 05 26: Grounding and Bonding for Electrical Systems.

H. Provide unswitched leg of interior lighting branch circuit to integral emergency battery pack light fixtures, exit signs and night lights as applicable per lighting plans.

I. Wallmount fixtures in walkway areas shall not project more than 4 inches from wall when projection occurs lower than 80 inches.

END OF SECTION 26 51 00

SECTION 26 56 00 EXTERIOR LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section specifies the furnishing, installation, and connection of exterior luminaires, controls, poles and supports.

B. Related Sections:
1. Section 26 05 00: Common Work Results for Electrical.
2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
3. Section 26 05 26: Grounding and Bonding for Electrical Systems.
4. Section 26 05 33: Raceway and Boxes for Electrical Systems.
5. Section 26 51 00: Interior Lighting.

C. Reference Standards:
1. American Society for Testing and Materials (ASTM).
2. American Concrete Institute (ACI).
3. American National Standards Institute (ANSI).
4. Aluminum Association Inc. (AA).
5. Illuminating Engineering Society of North America (IESNA).
6. National Electrical Manufacturers Association (NEMA).
7. National Fire Protection Association (NFPA).
8. Underwriters Laboratories, Inc. (UL).

1.3 SUBMITTALS

A. Submit in accordance with Section 26 05 00: Common Work Results for Electrical.

B. Shop Drawings:
1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include electrical ratings, dimensions, mounting, details, materials, required clearances, terminations, wiring and connection diagrams, photometric data, ballasts, poles, luminaires, effective projected area (EPA), lamps and controls.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be in accordance with CEC, UL, ANSI, as shown on the drawings and as specified.

2.2 LUMINAIRES

A. UL 1598 and ANSI C136.17. Luminaries shall be weatherproof, heavy duty, outdoor types designed for efficient light utilization, adequate dissipation of lamp and ballast heat and safe

cleaning and relamping.

B. Light emitting diode (LED)-based solid state lighting (SSL) products shall be factory tested in accordance to the International Engineering Society (IES) LM-79 recommendations and meet ANSI C78.377-2008 standards.

C. LED light sources shall be factory tested in accordance to IES LM-80 recommendations.

D. LED-based SSL product shall incorporate an external heat sink, integral to the luminaire.

E. IESNA HB-9 and RP-8 light distribution pattern types shall be as indicated on the drawings.

F. Lenses shall be frame-mounted heat-resistant, borosilicate glass, prismatic refractors. Attach the frame to the luminaire housing by hinges or chain.

G. Pre-wire internal components to terminal strips at the factory.

H. Bracket mounted luminaries shall have leveling provisions and clamp type adjustable slip-fitters with locking screws.

I. Materials shall be rustproof. Latches and fittings shall be non-ferrous metal.

J. LED-based SSL luminaires shall be manufactured specifically for LED lamps with drivers integral to the luminaire housing.

2.3 LED-BASED SOLID STATE DRIVERS

A. Shall be listed by either U.L. or equal listing agency and comply with IEEE C.62.41-1991, Class A operation.

B. Provide a minimum power factor of 0.9.

C. Minimum operating temperature appropriate for outdoor environments.

D. Shall operate at a frequency greater than or equal to 120Hz.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install lighting in accordance with the CEC, as shown on the drawings, and in accordance with manufacturer's recommendations.

3.2 GROUNDING

A. Ground noncurrent-carrying parts of equipment including metal poles, luminaries, mounting arms, brackets, and metallic enclosures as specified in Section 26 05 26: Grounding and Bonding for Electrical Systems. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or alloyed connectors suitable and listed for this purpose.

END OF SECTION 26 56 00

SECTION 28 31 00 FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
1. Provide a complete, fully contained fully addressable Emergency Voice/Alarm Communications System to include full automatic detection, carbon monoxide detection, notification power supplies, control modules, control relays, input modules and notification appliances (speaker strobe combinations).. The system shall be connected, tested, verified by AHJ to be acceptable and left in first class operating condition. All equipment herein specified shall be engineer-approved and California State Fire Marshal (CSFM) listed. The entire installation shall conform to the National Fire Protection Association (NFPA) Standard 72, 90A, 101 & CEC Article 760, CFC and authorities having jurisdiction as applicable. The system specified and depicted on the plan is a complete and approved system. The entire fire alarm system has been submitted and approved by the Division of the State Architect as a complete submittal. Any routing of the system wiring that is significantly different than shown on the approved drawings shall have the approval of the engineer and must be obtained prior to construction.
2. Provide all work and material as shown and / or required to provide a fully functional and adequate system as described hereon and as required by the California State Fire Marshal.
3. Supervision: The fire alarm system shall monitor the integrity of all alarm initiating and indicating appliance circuits and provide local and remote status of all connected systems. The system shall be provided with automatically charged standby batteries to maintain system operation for 24 HRS in the normal supervisory mode and 15 minutes of alarm. Batteries shall be supervised for connection to the system and low voltage threshold. The automatic battery charger shall be capable of charging fully discharged system batteries to 100% in 8 hours.
4. The system wiring and installation shall be as stated in drawings and as required by the manufacturer. All wiring shall be color coded, tagged and verified to assure that it is free from shorts and grounds and shall be rated for the appropriate environmental conditions such as well locations.
5. Testing: The completed system shall be tested in accordance with NFPA Standard 72 7.6.6 and 7.8.2.
6. All Fire Alarm wiring shown in drawings shall be installed in conduit, metal surface raceway, or open run above ceilings and supported by approved supporting methods.
7. System Operation shall include:
   a. Separate zone signaling and device status indication for all initiating devices.
   b. Audible to sound the California uniform fire alarm signal in temporal mode. Devices shall be at least 15dBA above average ambient sound level, but not less than 75dBA at 10’ or more than 120dBA.
   c. Visual devices shall not exceed 2 flashes per second and shall not be slower than 1 flash per second. Visual devices shall be synchronized when 3 or more devices are within the same field of view.
   d. Supervision of all circuits to indicate any abnormal wiring condition.
   e. N.O./N.C. integral relays for external device interface or as indicated on drawings.
   f. Central station connection capable of indicating (3) distinct separate signals as

being tamper, trouble and alarm with point reporting capabilities.

8. All work shall be completed as shown on the plans and or as specified within this specification and shall include the following (but is not limited to):
   a. Life safety fire alarm detection and signaling system.
   b. Furnishing and installation of equipment and devices.
   c. Conductors, connections and interconnections where specified and all in conduit system.
   d. Conduit, wire and connections for control of heating and ventilation motors, smoke dampers and smoke exhaust.
   e. Testing, cleaning and adjusting of completed work.
   f. Wiring diagrams, as-built drawings and three (3) sets of equipment operations and maintenance instructions for Owner.
   g. Complete maintenance for two years.
   h. Proposal for subsequent maintenance contract.
   i. All work and material for complete and operable systems as indicated or specified.
   j. Permits, inspections and fees.
   k. Identification and instruction to Owner Representative. Training shall consist of a minimum or two (2) 6-hour sessions.
9. Coordination with Section 26 05 33: Raceway and Boxes for Electrical Systems.
10. Furnishing of special back boxes where required for installation of fire alarm devices.
11. All conductors to be installed in conduit pursuant to Specification Section 26 05 33: Raceway and Boxes for Electrical Systems.
12. Qualifications: Contractor shall receive written approval and verified test results which shall be submitted to the owner for system from manufacturers recognized representative prior to completion and acceptance.
13. All initiating devices shall be separately addressed for individual identification at control panel.
14. As-Built Drawings: A complete set of reproducible “as-built” drawings showing installed wiring, color coding, wire tag notations 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 the system.
15. Maintenance Instructions: Three (3) submittals of maintenance instructions shall be provided and shall be complete, easy to read, understandable and shall provide the following information:
    a. Instructions for replacing any components of the system, including internal parts.
    b. Instructions for periodic cleaning and adjustments of equipment with a schedule of these functions.
    c. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.
    d. User operating instructions shall be prominently displayed on a separate sheet located next to the control unit in accordance with UL Standard 864. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for two years from the date of final acceptance.

B. Substitutions
   1. Substitution of system components or manufacturer will require the contractor to separately obtain approval with the CSFM at Contractor’s expense and shall meet all requirements of the system as designed and pre-approved.
   2. All proposed substitutions shall be listed with the California State Fire Marshal.

1.3 SUBMITTALS

A. Comply with applicable provisions of Section 26 05 00: Common Work Results for Electrical.

B. Product Data:
   1. A complete list of all supplied equipment including model numbers with catalog data

sheets on each component.
2. Data sheets show California State Fire Marshal Listing, U.L. listing, equipment ratings, dimensions and finishes.
3. Highlight actual devices to be used and their amp draw in stand-by and alarm modes.

C. Shop Drawings:
1. Provide schematic layout, floor plan, drawings indicating location of all components and equipment, required size and location of conduit and outlets and type and quantity of system conductors. Include voltage drop calculations and battery calculations based on actual number of devices to be installed.
2. Include riser and wiring diagrams for overall system and components including control panels, annunciators, power supplies, initiating circuits, notification appliances, control devices and FATC. Address numbers shall be noted on all devices and appliances.
3. Include physical and electrical characteristics of equipment to indicate conformance with the Specifications.
4. Describe system characteristics and function as well as device wiring diagrams.
5. Voltage loss and battery calculations for each control panel and power supply and notification appliance circuits at 24 hour stand-by and 15 mins alarm.
6. System operational matrix.
7. Reproduced copies of the bid set of drawings are not acceptable as “shop drawings”.

D. Operating and Maintenance Instruction Manual:
1. Manual shall include the following tailored to this specific project:
a. Operational description.
b. Coded cabling plan.
c. Two wire circuit diagrams.
d. Wiring destination schedule.
e. Schematic component diagrams and PC board layouts.
f. Maintenance and alignment procedures.
g. Voltage drop and battery calculations.

1.4 PERFORMANCE REQUIREMENTS

A. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style Y (Class B) Signaling Line Circuits (SLC).

B. Device Circuits (IDC) shall be wired Class B (NFPA Style Y) as part of an addressable device connected by the SLC Circuit.

C. Notification Appliance Circuits (NAC) shall be wired Class b (NFPA Style Y).

D. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

E. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

F. NAC circuits and control equipment shall be arranged such that loss of any one (1) NAC circuit will not cause the loss of any other NAC circuit in the system.

G. Two-way emergency telephone communication circuits shall be supervised for open and short circuit conditions.

1.5 QUALITY ASSURANCE

A. Loads of Equipment and Components
   a. Follow IEEE Standard where applicable.
   b. Provide fuse protection for equipment and spare fuses.
   c. Design systems for operation at 120 volts, normal or emergency power as indicated, 60 Hz nominal input.
   d. Operating voltage dissipated by resistors shall not exceed 25% of ratings.
   e. Operating voltage of capacitors shall not exceed 80% of rated voltage.
   f. Operating loads and voltages on transistors and solid-state devices shall not exceed manufacturer's recommendation for normal full load operation.
   g. Use electronic components of types and rating commonly available from stock of established commercial distribution.

B. Regulatory Requirements
   1. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.
   2. National Fire Protection Association (NFPA) – USA:
      a. NFPA 70: California Electrical Code (CEC)
      b. NFPA 72: National Fire Alarm Code
      c. NFPA 101: Life Safety Code
   3. Underwriters Laboratories Inc. (UL):
      a. UL 38: Manually Actuated Signaling Boxes
      b. UL 268: Smoke Detectors for Fire Protective Signaling Systems
      c. UL 464: Audible Signaling Appliances
      d. UL 521: Heat Detectors for Fire Protective Signaling Systems
      e. UL 864: Control Units for Fire Protective Signaling Systems
      f. UL 1480: Speakers for Fire Alarm and Signaling Systems, Including Accessories
      g. UL 1481: Power Supplies for Fire Protective Signaling Systems
      h. UL 1711: Standard for Amplifiers for Fire Protective Signaling Systems
      i. UL 1712: Tests for Ampacity of Insulated Electrical Conductors Installed in Fire Protective System
      j. UL 1971: Visual Notification Appliances
      k. UL 2572: Mass Notification Systems
   4. Local and State Building Code, including but not limited to:
      a. California Building Code
      b. California Electric Code
      c. California Fire Code
   5. All requirements of the Authority Having Jurisdiction (AHJ).

1.6 WARRANTY

A. For a period of two years from date of final acceptance, the system shall be under full guarantee for materials and labor at no cost to the Owner. The system shall be under a service contract with a technician authorized by the manufacturer. Replacement parts and labor shall be readily available during normal business hours while the service contract is in effect. A complete system inspection and test shall be performed at five months and again at eleven months after final acceptance. Tests shall include all smoke detector sensitivity settings.

B. Conform to applicable provisions of the General Requirements.

C. Service technicians and replacement components for the system shall be available locally from a service representative of the manufacturer who is able to provide evidence of technical training and authorization by the manufacturer.

D. All component failures shall be remedied to the satisfaction of the Owner.

E. A continuing service contract shall be offered at time of bid to commence at the expiration of warranty included with the system.

PART 2 PRODUCT

2.1 MANUFACTURERS

A. Main Fire Alarm Control Panel (FACP/EVAC): Gamewell (District standard)

B. Remote Power Supply (RPS): Gamewell (District standard)

C. Intelligent Loop Interface-Main Board: Gamewell (District standard)

D. Area Smoke Detectors and Heat Detectors: Gamewell (District standard)

E. CO Smoke Detector: Gamewell (District standard)

F. Addressable Manual Pull Stations: Gamewell (District standard)

G. Relay and Monitor Modules: Gamewell (District standard)

H. Strobes, Combination Speaker and Strobes, and Weatherproof Speaker: System Sensor

2.2 MATERIALS

A. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system-controlled devices.

B. System Devices and components shall be provided as specified on the fire alarm equipment legend and as shown on associated electrical drawing.

PART 3 EXECUTION

3.1 COORDINATION

A. Refer to the drawings and specifications to determine quantities and location of devices and required scope of work. Provide function described under mechanical section Sequence of Control, for fire and/or emergency conditions.

3.2 GENERAL

A. Comply with all applicable paragraphs in this section.

B. Install system(s) in accordance with manufacturer's instructions.

C. Include services of certified technicians to supervise installation, provide adjustments, provide final connections, system testing and system training to Owner Representative

3.3 INSTALLATION

A. Installation shall be in accordance with the CFC, CEC, CMC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major 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.

D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.4 GROUNDING

A. All equipment to be grounded by means of green ground wire to "U" contact of duplex receptacles and bonded to ground provided under 26 05 26: Grounding and Bonding of Electrical Systems.

B. Provide and install transient circuit protection in accordance with NFPA 72, NFPA 70, Article 760, and CFC.

3.5 INSPECTION

A. Systems to meet all the requirements of the CSFM, IOR, DSA and AHJ and shall be approved thereby before installation and prior to final acceptance.

3.6 LOCATION

A. Before installation, verify exact location of control equipment and outlets. The Owner reserves the right to relocate system components within a radius of 10' at no increase in cost before rough-in work is started for the respective component.

3.7 WIRING

A. Furnish all conduit, conductors, equipment, terminal strips, etc., and labor to install a complete and operable system. All cable conductors shall be color coded and numbered for identification at all terminals. Green shall be for grounding conductor only. Use red insulation and or red jacketing on all fire alarm cable unless otherwise approved by the Authority Having Jurisdiction.

3.8 TESTING

A. After all equipment specified herein for each system has been installed and is in operating condition, conduct performance tests to determine if the installation and components comply with these specifications. Furnish competent personnel, all test material and approved test instruments and conduct the tests under supervision of factory personnel, in the presence of the Engineer, the building and fire inspecting agencies:
   1. The contractor’s job foreman, in the presence of a representative of the manufacturer, a representative of the owner, and the fire department shall operate every installed device to verify proper operation and correct annunciation at the control panel.
   2. At least on half of all tests shall be performed on battery standby power.
   3. Where application of heat would destroy any detector, it may be manually activated.
   4. The signaling line circuits and notification appliance circuits shall be opened in at least

two (2) locations to verify the presence of supervision.

5. When the testing has been completed to the satisfaction of the contractor representative IOR, 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 authority having jurisdiction.
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 two years from the date of final acceptance by the awarding authority.
7. The local responding fire department must be notified prior to the final test in accordance with local requirements and when requested, participate in system testing and evaluation.

3.9 REPORT

A. Prepare written report of final test results, signed by witnessing parties. Submit to the Engineer in triplicate for final approval.

END OF SECTION 28 31 00

SECTION 32 13 13 CONCRETE PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Contractor shall furnish all materials for concrete in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished concrete, in accordance with the requirements of the Contract Documents.

B. Provide curb cuts meeting the accessibility requirements of the California Code of Regulations (CCR) Title 24, Part 2, 1127B.5, and ramps complying with CCR, T24, CCR, Part 2, 1003.3.4 and 11B-406.

C. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.

D. The following types of concrete shall be covered in this Section:
1. Portland cement concrete pavement, cement walks, flatwork, curbs, gutters, retaining curbs, swales, trash pick-up areas, ramps, mowing strips, fence post footings, sliding gate concrete, catch basins, pipe bedding and encasements, transition structures, flagpoles and light standard bases and footings, splash blocks, parking bumpers and equipment pads.

E. Reference Standards:
1. UU-B-790: Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant).
2. ACI 301: Specifications for Structural Concrete for Buildings.
3. ACI 318: Building Code Requirements for Reinforced Concrete.
4. ASTM C31: Practices for Making and Curing Concrete Test Specimens in the Field.
5. ASTM C33: Specification for Concrete Aggregates.
6. ASTM C39: Test Method for Compressive Strength of Cylindrical Concrete Specimens.
7. ASTM C40: Test Method for Organic Impurities in Fine Aggregates for Concrete.
8. ASTM C42: Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
9. ASTM C78: Specification for Flexural Strength.
10. ASTM C88: Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate.
11. ASTM C94: Specification for Ready-Mixed Concrete.
12. ASTM C114: Method for Chemical Analysis of Hydraulic Cement.
13. ASTM C131: Test Method for Resistance to Degradation of Small- Sized Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
14. ASTM C136: Method for Sieve Analysis of Fine and Coarse Aggregate.
15. ASTM C143: Test Method for Slump of Portland Cement Concrete.
16. ASTM C150: Specification for Portland Cement.
17. ASTM C156: Test Method for Water Retention by Concrete Curing Materials.
18. ASTM C157: Test Method for Length Change of Hardened Hydraulic Cement Mortar

and Concrete.
19. ASTM C172: Specification for Sampling Fresh Concrete.
20. ASTM C192: Method of Making and Curing Concrete Test Specimens in the Laboratory.
21. ASTM C260: Specification for Air-Entraining Admixtures for Concrete.
22. ASTM C311: Method for Sampling and Testing Fly Ash or Natural Pozzolans for Use as Mineral Admixture in Portland Cement Concrete.
23. ASTM C494: Specification for Chemical Admixtures for Concrete.
24. ASTM C618: Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement.
25. ASTM C979: Specification for Pigments for Integrally Colored Concrete.
26. ASTM C1549: Method for Determination of Solar Reflectance.
27. ASTM D1751: Specification for Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
28. ASTM E119: Method for Fire Test of Building Construction and Materials.

1.3 SUBMITTALS

A. Submittals shall be made in accordance with General Requirements.

B. The following submittals and specific information shall be provided:
1. Mix Designs - Prior to beginning the work, the Contractor shall submit to the Engineer, for review, and approval, preliminary concrete mix designs for each class and type of concrete specified herein. The mix designs shall be designed by an independent testing laboratory acceptable to the Engineer. All costs related to such mix design shall be borne by the Contractor:
   a. Each concrete mix submittal shall contain the following information:
      1) Slump on which the design is based.
      2) Total gallons of water per cubic yard.
      3) Brand, type, composition and quantity of cement.
      4) Brand type, composition and quantity of fly ash.
      5) Specific Gravity and gradation of each aggregate.
      6) Ratio of fine to total aggregate per cubic yard.
      7) Weight (surface dry) of each aggregate per cubic yard.
      8) Brand, type, and ASTM designation, active chemical ingredients and quantity of each admixture.
      9) Copy of the Building and Safety Research Report Approval for each concrete admixture.
      10) Air content.
      11) Compressive strength based on 7 day and 28 day compression tests, including standard deviation calculations, corroborative data (if applicable), and required average comprehensive strength per ACI 318, Section 5.
      12) Time of initial set.
      13) Certification stamp and signature by a Civil or Structural engineer registered in state of California.
      14) Certificate of Compliance for Cement.
      15) Test Data: ASTM C1549 Solar Reflectance. Submit test reports of proposed mix certifying solar reflectance meets project requirements.
2. Certified Delivery Tickets: Where ready-mix concrete is used, the Contractor shall provide certified weighmaster delivery tickets at the time of delivery of each load of concrete. Each certificate shall show the public weighmaster's signature, and the total quantities, by weight of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate and added at the batching plant as well as the amount of water allowed to be added at the site for the specific design mix. Each certificate shall, in addition, state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to when the batch was dispatched,

when it left the plant, when it arrived at the job, the time that unloading began, and the time that unloading was finished.

3. When a water reducing admixture is to be used, the Contractor shall furnish mix designs for concrete both with and without the admixture.
4. The Contractor shall furnish a Certificate of Compliance signed by the supplier identifying the type of fly ash and stating that the fly ash complies with ASTM C618 and these Specifications, together with all supporting test data prior to the use of the fly ash the sample represents. The supporting data shall also contain test results confirming that the fly ash in combination with the cement and water to be used meets all strength requirements and is compatible with air- entraining agents and other admixtures.
5. The Contractor shall submit to the Engineer for review the design mix for fly ash concrete together with the design mix for portland cement (non-fly ash) concrete as specified in this Section.

1.4 QUALITY ASSURANCE

A. Testing for Portland Cement Concrete shall be sampled and tested in accordance with the ASTM and California Tests listed in the Standard Specifications for Public Works Construction, Current Edition, Section 201-1.1.5.

B. Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards of concrete, or not less than once for each 2,000 square feet of surface area for slabs. Additional samples for seven-day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed.

C. The cost of all laboratory tests on cement, aggregates, and concrete, will be borne by the Contractor.

D. Concrete for testing shall be supplied by the Contractor at no cost to the Owner, and the Contractor shall provide assistance and facilities to the Inspector in obtaining samples, and disposal and cleanup of excess material.

E. Curbs and gutters shall be staked by a Land Surveyor licensed to practice in the State of California.

F. Job Mock-Up:
   1. General:
      a. Make samples on-site; revise as required; obtain Architect's approval, 10 days prior to casting finished work.
      b. Finished work to match approved samples.
      c. Approved sample may be incorporated into the work. Retain samples until completion of all concrete work.
      d. Include typical tooled joint control in sample.
   2. Color Cured Hardened Slab; Interior Slab-On-Grade: Provide sample, 20 s.f. minimum area.
   3. Broom Finished Concrete; Exterior Flatwork: Provide sample, 20 s.f. minimum area.
   4. “Sacked” Vertical Surface; Exterior Wall: Provide sample, 5 sf. minimum area.

G. Construction Tolerances: The Contractor shall set and maintain concrete forms and perform finishing operations so as to ensure that the completed work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the specified permissible variation from lines, grades, or dimensions shown.

H. Construction tolerances shall not violate dimensions, grades, slopes required by CBC for accessibility requirements. Adjust work accordingly to comply with requirements.

I. The following construction tolerances are hereby established and apply to finished walls and slab unless otherwise shown:

Item	Tolerance
Variation of the constructed linear outline from the established position in plan.	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation from the level or from the grades shown.	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation from the plumb	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation in the thickness of slabs and walls.	Minus 1/8-inch; Plus 1/4-inch
Variation in the locations and sizes of slabs inch and wall openings.	Plus or minus 1/8

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage. Only one brand of cement shall be used. Cement reclaimed from cleaning bags or leaking containers shall not be used. All cement shall be used in the sequence of receipt of shipments.

B. All materials furnished for the work shall comply with the requirements of ACI 301, as applicable.

C. Storage of materials shall conform to the requirements of Section 205 of ACI 301.

D. Form Materials - Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces:
1. Use flexible or curved forms for curves of a 100-foot or less radius.
2. Wood form material, profiled to suit conditions:
   a. Materials shall be free from defects which would impair the appearance of structural quality of the completed work
   b. Provide stakes and bracing materials as required to hold forms securely in place.

E. Reinforcing Materials:
1. Steel Reinforcing Bars: ASTM A615/A615M deformed grade 80 (80,000 psi) yield strength billet steel, unfinished, unless otherwise specified on Construction Document. Fabrication, sampling and jobsite handling shall conform to the requirements in ASTM Designation D3963, except the 2 samples shall be 30 inches long.
2. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.
3. Dowels:
   a. Dowel bars shall be plain round smooth conforming to the requirements in ASTM Designation A615/A615M, Grade 60 (60,000 psi) yield strength, except that the two

samples required in ASTM Designation D3963/D3963M shall be 18 inches long. Dowel bars shall be free from burrs or other deformations detrimental to free movement of the bars in the concrete.

b. Dowel bars shall be lubricated with a bond breaker over the entire bar. A bond breaker application of petroleum paraffin based lubricant or white- pigmented curing compound shall be used to coat the dowel bars completely prior to placement. Oil and asphalt based bond breakers shall not be used. Paraffin based lubricant shall be Dayton Superior DSC BB-Coat or Valvoline Tectyl 506 or an approved equal. Paraffin based lubricant shall be factory applied. White pigmented curing compound shall conform to the requirements of ASTM Designation C309, Type 2, Class A, and shall contain 22 percent minimum nonvolatile vehicles consisting of at least 50 percent paraffin wax. Curing compound shall be applied in 2 separate applications, the last application not more than 8 hours prior to placement of the dowel bars. Each application of curing compound shall be applied at the approximate rate of one gallon per 15 square yards.

4. Epoxy for bonding tie bars and dowel bars to portland cement concrete shall be a two-component, epoxy-resin, conforming to the requirements of ASTM Designation C881, Type V, Grade 3 (Non-Sagging), Class B or C. The class used shall be dependent on the internal temperature of the hardened concrete at the time the epoxy is to be applied. Class B shall be used when the internal temperature is from 40 °F to 60 °F. Class C shall be used when the internal temperature is above 60 °F, but not higher than recommended by the manufacturer. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 7 days prior to the start of work. Epoxy shall be applied in conformance with the manufacturer's recommendations:
   a. Simpson Strong Tie Set-XP Epoxy (or approved equal) ICC-ES ESR- 2508.

F. Concrete Materials:
1. Provide in accordance with State of CA Highways (CalTrans) standards.
2. Site concrete shall be standard brand portland cement conforming to ASTM C150, 80% Type II or Type V with 20% Class F fly ash. A water-reducing admixture conforming to section 2.01, part G.4 herein must also be used. A single brand of cement shall be used throughout the work, and prior to its use, the brand shall be acceptable to the Engineer. The cement shall be suitably protected from exposure to moisture until used. Cement that has become lumpy shall not be used. Sacked cement shall be stored in such a manner so as to permit access for inspection and sampling. Certified mill test reports for each shipment of cement to be used shall be submitted to the Inspector.
3. Concurrent with strength design criteria, concrete shall also be proportioned to provide the requisite durability to satisfy the exposure conditions imposed by either environment and/or service. Durability, in this context, refers to the ability of the concrete to resist deterioration from the environment or service in which it is placed. Concrete proportioned in accordance with ACI 318, chapter 4, Durability Requirements, will meet this criteria.
4. Combined Aggregate: 1" maximum coarse aggregate size conforming to Grading C of Standard Specifications Section 201-1.3.2(A). Aggregates shall be obtained from pits acceptable to the Inspector, shall be non-reactive, and shall conform to ASTM C33.
5. Water: Shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies.
6. **“Pea gravel” mix is not acceptable,** unless specifically approved in writing by the Civil Engineer of Record prior to construction.

G. Admixtures:
1. The Engineer may require the use of admixtures or the Contractor may propose to use

admixtures to control the set, effect water reduction, and increase workability. In either case, the addition of an admixture shall be at the Contractor's expense. The use and continued use of an admixture shall be approved by the Engineer. Admixtures specified herein, other than calcium chloride, shall conform to the requirements of ASTM C494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used. Admixtures shall contain no free chloride ions, be non-toxic after 30 days, and shall be compatible with and made by the same manufacturer as the air entraining admixture.

2. These admixtures shall not be used in greater doses than those recommended by the manufacturer or permitted by the Engineer. The permitted dosage of the admixture shall not exceed that which will result in an increase in the driving shrinkage of the concrete in excess of 20 percent when used in precast or prestressed concrete, or 10 percent when used in any other structural concrete. The strength of concrete containing the admixture in the amount of proposed shall, at the age of 48 hours and longer be not less than that of similar concrete without the admixture. The admixture shall not adversely affect the specified air content, unless permitted by the Engineer.
3. Set controlling admixture shall be either with or without water-reducing properties. Where the air temperature at the time of placement is expected to be consistently over 80 degrees F, a set retarding admixture such as [Sika Chemical Corporation's Plastiment], [Master Builder's Pozzolith 300R], or equal shall be used. Where the air temperature at the time of placement is expected to be consistently under 40 degrees F, a set accelerating admixture such as [Sika Chemical Corporation's Plastocrete 161FL], [Master Builder's Pozzolith 50C], or equal shall be used.
4. Low range water reducer shall conform to ASTM C494, Type A. It shall be either a hydroxylated carboxylic acid type or a hydroxylated polymer type. The quantity of admixture used and the method of mixing shall be in accordance with the manufacturer's instructions and recommendations.
5. High range water reducer shall be sulfonated polymer conforming to ASTM C494, Type F or G:
    a. If the high range water reducing agent is added to the concrete at the batch plant, it shall be second generation type, [Daracem 100, as manufactured by W.R. Grace & Co.]; [Pozzolith 430R, as manufactured by Masterbuilders]; or equal. High range water reducer shall be added to the concrete after all other ingredients have been mixed and initial slump has been verified.
    b. If the high range water reducer is added to the concrete at the job site, it shall be used in conjunction with a low range water reducer and shall be [Pozzolith 400N and Pozzolith MBL82, as manufactured by Masterbuilders]; [WRDA 19 and WRDA 79, as manufactured by W.R. Grace & Co.]; or equal. Concrete shall have a slump of 3-inches ± 1/2- inch prior to adding the high range water reducing admixture at the job site. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day's operation of the job site system.
6. Air-entraining agent meeting the requirements of ASTM C260, shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 4 percent; provided that, when the mean daily temperature in the vicinity of the worksite falls below 40 degrees F for more than one day, the total air content provided shall be 5 to 6 percent. The Owner reserves the right, at any time, to sample and test the air-entraining agent received on the job by the Contractor. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement.
7. Calcium Chloride: Except as otherwise provided herein, calcium chloride will not be permitted to be used in concrete.
8. Fly ash/pozzolan shall conform to ASTM C618 and the following supplementary requirements:
    a. Class F Fly Ash:

1) Loss on ignition: maximum 4 percent.
2) S03 content: maximum 3 percent.
3) Moisture content: maximum 1 percent.

b. Class F fly ash, as a percent by weight of total cementitious material, shall not exceed 15 percent.
c. When Sulfate Resistant or Special Exposure Concrete is specified, test results shall be submitted to the Engineer as specified in Section 2-5.3 of the Standard Specifications. The test result shall show that the fly ash to be used is effective in contributing to sulfate resistance in conformance with ASTM C618, Table 3 (optional physical requirements) as tested in accordance with ASTM C1012. The data submitted shall be less than 6 months old.

H. Curing Materials:
1. Concrete curing compound shall conform to the requirements of ASTM C309 Type [1 – clear or translucent without dye] [1D - clear or translucent with a fugitive dye], Class [A – no type restrictions] [B – must be a resin], except the loss of water shall not exceed 0.15 kilograms per square meter in 24 hours nor 0.45 kilograms per square meter in 72 hours when tested in accordance with ASTM C156. The Contractor shall provide, when requested by the Engineer, certified copies of vendor's test report showing compliance with ASTM C309 and these specifications. The testing and the report shall be supplied without cost to the Agency. All compounds shall be furnished by the Contractor in sealed original containers labeled in accordance with ASTM C309 and with the date of manufacture.
2. Polyethylene sheet for use as concrete curing blanket shall be white and conform to ASTM C171. The loss of moisture when determined in accordance with the requirements of ASTM C156 shall not exceed 0.055 grams per square centimeter of surface.
3. Polyethylene-coated burlap for use as concrete curing blanket shall conform to ASTM C171. The loss of moisture, when determined in accordance with the requirements of ASTM C156, shall not exceed 0.055 grams per square centimeter of surface.

I. Expansion Joint Filler Material:
1. Curb & Gutter: Nonextruding and Resilient Filler: Celotex "Flexcell", or approved equal, 1/4-inch thick material conforming to ASTM D1751.
2. Concrete Walk and Slab: Joint filler material shall be preformed expansion joint filler conforming to the requirements of ASTM D994. A Certificate of Compliance for the joint filler material shall be furnished to the Engineer. The certificate shall be accompanied with a certified test report of the results of the required tests performed on the joint filler material within the previous 12 months prior to proposed use. The certificate and accompanying test report shall be provided for each lot of joint filler material prior to use on the project.
3. Silicone Joint Sealant - Premium-grade, high-performance, moisture-cured, single-component, polyurethane-based, non-sag elastomeric sealant. Meets Federal specification TT-S-00230C. Meets ASTM C920, Type S, Class 25 or 35; Grade NS, Use T or NT, Shore A Hardness (21 day) 35-45. A Certificate of Compliance for the silicone sealant shall be furnished to the Engineer. The Certificate shall also be accompanied with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project:
   a. Sika Corporation, Sikaflex-1A.
   b. Tremco, Inc., Dymonic.
   c. Tremco, Inc., Vulkem 116.
   d. Bostik Construction Products Div., Chem-Calk 900.

J. Concrete Sealer: For natural color concrete only, HLQ-125 as manufactured by SINAK

Corp., San Diego, CA (619/231-1771), HLQ-125 as manufactured by SINAK Corp., San Diego, CA (619/231-1771), or equivalent product of another manufacturer in accordance with the "or equal" provision of the Contract Documents, penetrating sealer that interacts with mineral compounds and siliceous materials in portland cement concrete to produce more dense, non-dusting surface.

K. Related Materials:
1. Damp-proofing agent shall be an asphalt emulsion, such as [Sonneborn Hydrocide 660], [Flintkote C-13-E Foundation Coating], or equal.
2. Epoxy adhesives shall be the following products for the applications specified:
   a. For bonding freshly-mixed, plastic concrete to hardened concrete, [Sikadur Hi-Mod Epoxy Adhesive, as manufactured by Sika Chemical Corporation]; [Concresive 1001-LPL, as manufactured by Adhesive Engineering Company]; or equal.
   b. For bonding hardened concrete or masonry to steel, [Colma-Dur Gel], [Sikadur Hi-Mod Gel], or equal.

2.2 CONCRETE MIX DESIGN

A. Concrete Mix Design In Heavy Duty Areas - At a minimum, site concrete in heavy duty areas (as noted on grading plan) shall conform to the Standard Specifications for Public Works Construction, Section 201-1.1.2, mix class 650-CLE-4000P:
1. Compressive Strength: Minimum of 4,000 psi at 28 days compressive strength.
2. Slump Limit: 4 inches at point of placement.
3. Cement per cu yard (sacks): 6.9 (minimum).
4. Air Content: 4% +/- 1% percent.
5. Verifiable Solar Reflectance: 0.30 (ASTM C1549).

B. Concrete Mix Design In Light Duty Areas - At a minimum, site concrete in light duty areas (as noted on grading plan) shall conform to the Standard Specifications for Public Works Construction, Section 201-1.1.2, mix class 520-C-2500:
1. Compressive Strength: Minimum of 2,500 psi at 28 days compressive strength.
2. Slump Limit: 4 inches at point of placement.
3. Cement per cu yard (sacks): 5.5 (minimum).
4. Air Content: 4% +/- 1% percent.
5. Verifiable Solar Reflectance: 0.30 (ASTM C1549)

C. Slurry Mix Design:
1. Compressive Strength: 100 psi at min. 28 days compressive strength.
2. Slump Limit: 5 inches at point of placement.
3. Cement per cu yard (sacks): 1.0
4. Aggregate Gradation: “E” per S.S.P.W.C. table 201-1.3.2(A).
5. Air Content: 4% +/- 1% percent.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES FOR CONCRETING

A. General: Earth surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

B. Aggregate base material shall be installed in layers not exceeding 4-inches and compacted to a minimum of 95% relative density.

C. Subgrade Preparation:
   1. It is required that the native soil, and/or imported fill material, below the new aggregate base, be over excavated to the recommended minimum depth of 24 inches. Refer to section 13.2.2 of the soils report for recompaction requirements. The extent and depths of removal should be evaluated by Geotechnical representative in the field based on the materials exposed. Additional removals may be recommended if loose or soft soils are exposed during grading.
   2. Prior to placement of engineered fill, the subgrade shall be scarified to a depth of at least 8 inches, moisture conditioned and recompacted to a minimum 90% relative density.

D. The compacted surface shall be firm, hard and unyielding. The term "firm, hard and unyielding" as used in S.S.P.W.C. Section 301-1.3 shall mean that when the heaviest construction and hauling equipment used on the project drives over the subgrade, no permanent deformation shall occur either before or during pavement construction. On areas where the underlying material appears to be wet or soft, or where it deflects under wheel loads, the Contractor shall employ excavation and work techniques which do not worsen the subgrade condition.

E. The above subgrade preparation recommendations are based on the assumption that soils encountered during field exploration are representative of soils throughout the site. However, there can be unforeseen and unanticipated variations in soils between points of subsurface exploration. For this reason, the actual over-excavation depths will have to be determined on the basis of in-grading observations and testing performed by representatives of the project geotechnical consultant.

F. A California Licensed Surveyor (LS) must provide grade stakes and elevations for the Geotechnical Engineer to verify that any over-excavation depths, shown on the construction drawings for concrete pavement structural sections, have been achieved prior to re-compaction.

G. Joints in Concrete: Concrete surfaces upon or against which concrete is to be placed, where the placement of the old concrete has been stopped or interrupted so that, as determined by the Engineer, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bond. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, and foreign material. Such cleaning shall be accomplished by sandblasting followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.

H. Embedded Items: No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the Inspector at least 24 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.

I. All inserts or other embedded items shall conform to the requirements herein.

J. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms where shown or by shop drawings and shall be acceptable to the Inspector before any concrete is placed. Accuracy of placement is the responsibility of the Contractor.

K. Where concrete is to be cast against old concrete, (greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by sand-blasting,

exposing the aggregate. In concrete shear-walls, suspended slabs and roof slabs, the interface surface at construction joints shall be roughened to a full amplitude of one quarter inch. The hardened surface shall be cleaned of all latent foreign material and washed clean, prior to the application of an epoxy bonding agent.

L. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the work. No concrete shall be deposited underwater nor shall the Contractor allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the review of the Engineer.

M. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2-inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

N. Openings for pipes, inserts for pipe hangers and brackets, and the setting of anchors shall, where practicable, be provided for during the placing of concrete.

O. Anchor bolts shall be accurately set, and shall be maintained in position by templates while being embedded in concrete.

P. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.2 HANDLING, TRANSPORTING, AND PLACING

A. General: Placing of concrete shall conform to the applicable requirements of ACI 301 and the requirements of this Section.

B. The total elapsed time between the addition of water at the batch plant and the completion of the discharge of the concrete from the mixer shall not exceed 90 minutes. All concrete remaining in the mixer after said 90-minute time limit shall be rejected and removed from the project site.

C. Non-Conforming Work or Materials: Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced by and at the expense of the Contractor.

D. Whenever batch trucks or other paving equipment cause rutting of the subgrade or subbase in concrete placement areas, inspectors shall immediately stop construction. Construction shall not be allowed to resume until distorted subgrade or subbase is repaired. Contractors and inspectors should locate by proof rolling, any questionable unstable areas in advance to avoid distortion under equipment. Wet, unstable areas must be dried out or replaced before starting placement of asphalt. Locating wet or soft areas in advance can be accomplished by testing finished subgrade or subbase with a loaded truck. Construction of concrete pavement should not proceed unless testing gives a reasonable indication that distortions will not occur during construction of overlying pavement. When repair, aeration, and

recompaction are required to correct damage from Contractor's operation, all necessary repair will be done at Contractor's expense. However, if the Engineer determines that additional depth of aeration and recompaction are needed, that should be paid by change order.

E. All pull boxes, meter boxes, valve covers and manholes shall be adjusted to proposed finish grade prior to placement of the concrete.

F. Dowel Placement:
1. Dowel bars shall be centered on the joint within a tolerance of ±2 inches in the longitudinal direction directly over the contact joint or sawcut for the transverse weakened plane joints, as shown on the plans. Prior to placement of dowel bars, the Contractor shall submit to the Engineer a written procedure to identify the transverse weakened plane joint locations relative to the middle of the dowel bars and the procedure for consolidating concrete around the dowel bars.
2. Dowel bars shall be placed at longitudinal joints as shown on the plans. Dowel bars shall be placed as shown on the plans by using mechanical insertion. When dowel bars are placed by mechanical insertion, the concrete over the dowel bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been any insertion performed. When drill and bonding of dowel bars is performed at contact joints, a grout retention ring shall be used.

G. Concrete shall not be placed until the forms and reinforcement have been inspected, all preparations for the placement have been completed, and the preparations have been checked by the project inspector, all subject to the observation of the engineer or architect.

H. Casting New Concrete Against Old: An approved epoxy adhesive bonding agent shall be applied to the old surfaces according to the manufacturer's written recommendations. This provision shall not apply to joints where waterstop is installed.

I. Conveyor Belts and Chutes: All ends of chutes, hopper gates, and all other points of concrete discharge throughout the Contractor's conveying, hoisting and placing system shall be so designed and arranged that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the Inspector. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the specified consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.

J. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the pour. As the work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.

K. Temperature of Concrete: The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 40 degrees F in moderate weather, and not less than 50 degrees F in weather during which the mean daily temperature drops below 40 degrees F. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the Contractor shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The Contractor shall be entitled to no additional compensation on account of the foregoing

requirements.

L. Cold Weather Placement: Earth foundations shall be free from frost or ice when concrete is placed upon or against them. Fly ash concrete shall not be placed when the air temperature falls below 50 degrees F.

M. A transverse construction joint shall be constructed, including dowel bars, at the end of each day's work or where concrete placement is interrupted for more than 30 minutes, to coincide with the next contraction joint location. If sufficient concrete has not been mixed to form a slab to match the next contraction joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of excess concrete shall be at the Contractor's expense. Excess material shall become the property of the Contractor and shall be disposed of. A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of dowel bars.

N. Broom Finish Type:
1. Surfaces Sloped Less than 6%: Provide a medium salt (medium broom) finish by drawing a soft bristle broom across concrete surface, perpendicular to line of traffic, to provide a uniform fine line texture.
2. Surfaces Sloped greater than 6%: Provide a slip resistant (heavy broom finish) by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
3. Joints in concrete curb, gutter, and walk shall be designated as expansion joints and control joints. Joints for concrete flatwork shall be provided every eight (8) feet or less. Expansion joints for swales, curbs / curb & gutter shall be placed at no greater than 24 feet on center or as indicated on construction drawings:
   a. Expansion Joints - Provide 1/2” premolded joint filler, material meeting Section 2.01I herein. Construct expansion joints in conformance with Standard Specification Section 303-5.4.2 and the details on the construction documents:
      1) Extend expansion joint fillers full-width and depth of joint, and 1/4" below finished surface where joint filler is indicated. If no joint sealer is called for, place top of premolded joint filler flush with top of concrete or curb.
      2) Where silicone joint sealer is noted on the construction documents, the premolded joint filler strips shall be placed 1” below the surface of the concrete or curb, the full width of the expansion joint. The remainder of all joints shall be filled to within 1/4” below the surface of the concrete with the silicone joint sealant.
      3) Provide expansion joint filler strips, with elastomeric sealer, between p.c.c. walk and curb, p.c.c. walk and buildings, & p.c.c. walk and retaining walls and at locations noted on the construction documents. The depth of the filler strip shall be the depth of the p.c.c. walk plus 1 inch with the top set flush with the specified grade of the top of curb or walk.
   b. Control Joints:
      1) Control joints in site work concrete shall comply with Standard Specification Section 302-6.5.4, except that the configuration of the joint, shall be as indicated on the construction documents.
      2) Control joints in concrete curbs, sidewalks and gutters shall comply with Standard Specification Section 303-5.4.3, except that the joint configuration shall be as indicated below.
      3) Location: As shown on construction documents, but in any case not more than eight (8) feet O.C. both ways in concrete sidewalks. In swales and gutters, including gutter integral with curb, joints shall be at regular intervals not exceeding five (5) feet. Where integral curb and gutter is adjacent to concrete pavement, the joint shall be aligned with the pavement joints where practical.

O. Protection: In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control film. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

3.3 TAMPING AND VIBRATING

A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement. Vibrators shall be high speed power vibrators (8000 to 10,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required.

B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration, over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.

C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the results herein specified within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.4 CURING

A. Comply with 2022 California Building Code, Title 24, Part 2, Volume 2, Section 1905A.11:
   1. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods - Perform curing of concrete by curing as herein specified:
   1. Provide moisture-curing by the following methods:
      a. Keep concrete surface continuously wet by covering with water.
      b. Continuous water-fog spray.
      c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inch lap over adjacent absorptive covers.
   2. Provide curing and sealing compound to exposed exterior slabs, walks, and curbs, as follows:
      a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Re-coat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
      b. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid, floor hardener, waterproofing,

dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Architect.

C. Concrete slabs and paving shall be properly cured and protected against damage and defacement of nature during construction operations. If weather is hot or surface has dried out, spray surface with fine mist of water starting not later than two hours after final troweling. Surface of finish shall be kept continuously wet for at least ten days. Wetting is considered emergency work and shall be performed on weekends and holidays if necessary.

D. Concrete Sealer Application - Apply specified concrete sealer in continuous operation in accordance with manufacturer's instructions and recommendations:
   1. Prior to starting application, protect adjoining Work, including sealant bond surfaces, from spillage or blow-over of concrete sealer:
      a. Cover adjoining and nearby surfaces of aluminum and glass where there is the possibility of the concrete sealer being deposited on surfaces.
      b. Cover live plants and grass.
      c. Immediately clean concrete sealer from adjoining surfaces, complying with manufacturer's cleaning recommendations.
   2. Apply concrete sealer under temperature conditions according to manufacturer's instructions.
   3. Apply concrete sealer in light, even coats using garden sprayer, airless sprayer or paint brush.
   4. Apply concrete sealer at rate to suit porosity of portland cement concrete but not less than no more than coverage rates recommended by manufacturer for effective sealing of surface.

E. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense. Exclude traffic from concrete paving for at least 7 days after placement.

F. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

3.5 PUMPING OF CONCRETE

A. General: If the pumped concrete does not produce satisfactory end results, the Contractor shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

B. Pumping Equipment: The pumping equipment must have 2 cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the Contractor may have a standby pump on the site during pumping.

C. The minimum diameter of the hose (conduits) shall be 4-inches.

D. Pumping equipment and hoses (conduits) that are not functioning properly, shall be

replaced.

E. Aluminum conduits for conveying the concrete will not be permitted.

F. Proportioning: Minimum compressive strength, cement content, and maximum size of aggregates shall be as specified herein.

G. Gradation of coarse aggregates shall conform to ASTM C33 and shall be as close to the middle range as possible.

H. Gradation of fine aggregate shall conform to ASTM C33, with 15 to 30 percent passing the number 50 screen and 5 to 10 percent passing the number 100 screen. The fineness modulus of sand used shall not be over 3.00.

I. Water and slump requirements shall conform to the requirements of this Section.

J. Cement and admixtures shall conform to the requirements of this Section.

K. Field Control: Concrete samples for slump per ASTM C143 and test cylinders per ASTM C31 and C39.

3.6 TREATMENT OF SURFACE DEFECTS

A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the Engineer. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall have them repaired as specified herein. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced:
   1. All repairs and replacements herein specified shall be promptly executed by the Contractor at its own expense.

B. Defective surfaces to be repaired shall be cut back from trueline a minimum depth of 1/2-inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, and not less than 1/32-inch depth of the surface film from all hard portions, by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces under repair will remain moist, but not so wet as to overcome the suction upon which a good bond depends. The material used for repair purposes shall consist of a mixture of one sack of cement to 3 cubic feet of sand. For exposed walls, the cement shall contain such a proportion of Atlas white portland cement as is required to make the color of the patch match the color of the surrounding concrete.

C. Holes left by tie-rod cones shall be reamed so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with non-shrink grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their least surface dimension, shall not be reamed but shall be repaired in an approved manner with non-shrink grout.

D. All repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this Section, as applicable, using approved methods which

will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

E. Prior to filling any structure with water, all cracks that may have developed shall be repaired to the satisfaction of the Engineer. This repair method shall be done on the water bearing face of members. Prior to backfilling, faces of members in contact with fill, which are not covered with a waterproofing membrane, shall also have cracks repaired as specified herein.

F. The finished surface shall be free from humps, sags, blemishes or other irregularities.

3.7 FIELD QUALITY CONTROL

A. Correction of Mix Design for Failed Concrete Tests: If the compressive cylinder strength test for in place PCC yields test results below the specified 28-day PCC compressive strength and the Engineer determines a corrective change is necessary, the Contractor shall, at its own expense, make corrective changes in the mix proportions. The Engineer shall approve the changes in the mix proportions or PCC placement procedures, before any additional PCC is placed on the job.

B. Flood Tests: Before final acceptance, and after concrete has thoroughly cured, all concrete pavement, including swales and curb & gutter, shall be water tested to ensure proper drainage as directed by the Inspector. The Contractor shall provide water for this purpose. The flooding shall be done by water tank truck. Concrete work where water ponds and does not run off in a reasonable amount of time (1-hour), shall be removed to the nearest score or joint line and replaced to provide proper drainage. Full compensation for complying with this requirement shall be considered as included in the Contract Unit Price for cement concrete pavement.

3.8 CARE AND REPAIR OF CONCRETE

A. General: The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense.

B. The contractor shall barricade and protect placed Portland Cement Concrete from all damage, marks, mars and/or graffiti. Any Portland Cement Concrete damaged, defaced, discolored or defective shall be replaced at the contractor’s expense.

END OF SECTION 32 13 13

SECTION 32 30 01 SITE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Related Sections:
   1. Division 31: Earthwork.

B. Reference Standards:
   1. California Building Code, latest edition.
   2. ACI Standards, ACI 211.1, ACI 318, ACI 301, ACI 305R, ACI 306R.
   3. ASTM – American Society for Testing and Materials:
      a. ASTM C94, Specification for Ready-Mixed Concrete.
   4. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice (latest edition).

1.3 SUBMITTALS

A. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

B. Materials list: Submit to the Architect a complete list of all materials proposed to be used in this portion of the work. Submitted items should include but are not limited to sand, gravel, admixtures, surface treatments, coloring agents, sealers, fibers, cast-in-place accessories, forming and curing products and concrete mix designs.

C. With concrete submittal, provide documented history of mix design performance.

1.4 QUALITY ASSURANCE

A. Use only new materials and products.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Sieve analysis from testing laboratories identifying rock/sand percentages within the concrete mix; or class 2 aggregate base shall have the current project name and project location identified on the report. Outdated analytical reports greater than 90 days old will not be accepted

E. Testing:
   1. Cement and Reinforcing shall be tested in accordance with CBC Section 1910A. Testing of reinforcing may be waived in accordance with Section 1910A.2 when approved by the Structural Engineer and DSA.

F. Adequacy And Inspection:
1. Design, erect, support, brace and maintain formwork and shoring to safely support all vertical and lateral loads that might be applied until such loads can be carried by concrete.
2. Notify Inspector, Architect and DSA at least 48 hours prior to placing of concrete.

G. Protection:
1. Finish surfaces shall be protected at all times from concrete pour. Inspect forming against such work and establish tight leak-proof seal before concrete is poured. Finish work damaged, defaced or vandalized during the course of construction shall be replaced by contractor at contractor expense.

H. Field Measurements:
1. Make and be responsible for all field dimensions necessary for proper fitting, slopes and completion of work. Report discrepancies to Architect before proceeding.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

E. Store cement in weather tight building, permitting easy inspection and identification. Protect from dampness. Lumpy or stale cement will be rejected.

F. Aggregates: Prevent excessive segregation, or contamination with other materials or other sizes of aggregate. Use only one supply source for each aggregate stock pile.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cement: Portland cement, ASTM C150, Type II, per ACI 318 Section 26.4.

B. Concrete Aggregates: Normal weight aggregates shall conform to ASTM C33, except as modified by this section. Combined grading shall meet limits of ASTM C33. Lightweight aggregate shall conform to ASTM C330, suitably processed, washed and screened, and shall consist of durable particles without adherent coatings.

C. Water: Clean and free from deleterious amounts of acids, alkalis, scale, or organic materials and per ACI 318 Section 26.4.1.3.1.

D. Fly Ash: Western Fly Ash, conforming to ASTM C618 for Class N or Class F materials (Class C is not permitted). Not more than 15% (by mass) may be substituted for portland cement.

E. Water Reducing Admixture: Admixture to improve placing, reduce water cement ratio, and ultimate shrinkage may be used. Provide WRDA 64 by Grace Construction Products or approved equal. Admixture shall conform to ASTM C494 and ACI 318 Section 26.4.1.4.19(a). Such admixture must receive prior approval by the Architect, Structural Engineer, and the Testing Lab, and shall be included in original design mix.

F. Air-entraining Admixture: Daravair 1000 by Grace Construction Products or approved equal. Admixture must conform to ASTM C260 and ACI 318, section 26.4.1.4.

G. Exterior Flatwork Expansion Joint Sealant: 1-part polyurethane sealant, Sikaflex -1c SL or approved equal.

H. Surface Retarder (for exposed aggregate finishes): Rugasol-S by Sika Corporation or approved equal.

I. Form Coating: Material which will leave no residue on concrete surface that will interfere with surface coating, as approved by the Architect.

J. Expansion Joint Material: Preformed 3/8" fiber material, full depth of concrete section, with bituminous binder manufactured for use as concrete expansion joint material, as accepted by the Architect.

K. Reinforcement Bars: New billet steel deformed bars conforming to requirements of ASTM A615 or ASTM A706; Grade 60. Dowels for installation through expansion joints or construction joints to existing sidewalks or concrete features shall be smooth or shall be sleeved on one end for slippage.

L. Reinforcing supports: Galvanized metal chairs or spacers or metal hangers, accurately placed 3’-0” O.C.E.W. Staggered and each support securely fastened to steel reinforcement in place. Bottom bars in footings may be supported with 3” concrete blocks with embedded wire ties. Concrete supports without wire ties will not be allowed.

M. Truncated Domes:
   1. Vitrified Polymer Composite (VPC), Cast-In-Place Detectable/Tactile Warning Surface Tiles; “Armor-Tile”, “Access Tile Tactile Systems”, or approved equal. Tiles shall comply with Americans with Disabilities Act and the California Code of Regulations (CCR) Title 24, Part 2, Chapter 11B. Install tiles as recommended by manufacturer:
      a. Color: As selected by the Architect.

N. Curing Compound (for exterior slabs only): Burke Aqua Resin Cure by Burke by Edoco, 1100 Clear by W.R. Meadows or accepted equal. Water based membrane-forming concrete curing compound meeting ASTM C309 and C1315.

O. Concrete Bonding Agent: Weld-Crete by Larson Products Corp., Daraweld C by Grace Construction Products or accepted equal.

P. Patching Mortar: Meadow-Crete GPS, one-component, trowel applied, polymer enhanced, shrinkage-compensated, fiber reinforced, cementitious repair mortar for horizontal, vertical and overhead applications as manufactured by W.R. Meadows or accepted equal.

Q. Non-shrink Grout: Masterflow 713 Plus by Master Builders or approved equal. Premixed,non-metallic, no chlorides, non-staining and non-shrinking per CRD-C621, Corps of Engineers Specification and ASTM C1107, Grades B and C.

R. Aggregate Base: Class 2 AB per Caltrans specification section 26-1.02A.

S. Joint sealant for expansion joints: Single component silicone sealant, Type S, ASTM D5893

T. Pre- Formed plastic Expansion Joint; W.R. Meadows 3/8" "Snap Cap", Tex-Trude expansion joint cap, or an approved equal.

U. Adhesive Anchoring (Epoxy): Hilty HIT-HY 200 Safe Set, or approved equal.

2.2 CONCRETE DESIGN AND CLASS

A. Class "B": Concrete shall have 1" max. size aggregate, shall have 3000 psi min. at 28-day strength with a maximum water to cementitious ratio no greater than 0.50. Use for exterior slabs, including walks, vehicular paved surfaces, manhole bases, poured-in-place drop inlets, curbs, valley gutters, curb & gutter and other concrete of like nature.

B. Slump Limits: Provide concrete, at point of final discharge, of proper consistency determined by Test Method ASTM C143 with a slumps of 4" plus or minus 1".

C. Mix Design: All concrete used in this work will be designed for strength in accordance with provisions of ACI 318 Section 26.4. Should the Contractor desire to pump concrete, a modified mix design will need to be submitted for review. Fly ash may be used in concrete to improve workability in amounts up to 15% of the total cementitious weight.

D. Air Entrainment; Per the Local Jurisdiction minimum requirements, or 3% minimum.

2.3 MIXING OF CONCRETE

A. Conform to requirements of CBC, Chapter 19A.

B. All concrete shall be mixed until there is uniform distribution of material and mass is uniform and homogenous; mixer must be discharged completely before the mixer is recharged.

C. Concrete shall be Ready-mixed Concrete:
   1. Mix and deliver in accordance with the requirements set forth in ASTM C94 and ACI 301. Batch Plant inspection may be waived in accordance with CBC Section 1705A.3.3.1, when approved by Structural Engineer and DSA:
      a. Approved Testing Laboratory shall check the first batching at the start of the work and furnish mix proportions to the Licensed Weighmaster.
      b. Licensed Weighmaster to positively identify materials as to quantity and to certify to each load by ticket.
      c. Ticket shall be transmitted to Project Inspector by truck driver with load identified thereon. Project Inspector will not accept load without load ticket identifying mix and will keep daily record of pours, identifying each truck, its load and time of receipt and will transmit two copies of record to DSA.
      d. At end of project, Weighmaster shall furnish affidavit to DSA on form satisfactory to DSA, certifying that all concrete furnished conforms in every particular and to proportions established by mix designs.
      e. Placement of concrete shall occur as rapidly as possible after batching and in a manner which will assure that the required quality of the concrete is maintained. In no case may concrete be placed more than 90 minutes from batch time.
      f. Water may be added to the mix only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. In no case shall more than 10 gallons of water shall be added to a full 9 yard load, or 1 gal. per yard on remaining concrete within the drum providing load tag indicates at time of mixing at plant will allow for additional water.

2.4 MATERIALS TESTING

A. Materials testing of concrete and continuous batch plant inspection may be waived in accordance CBC Sections 1704A.4.4 when approved by Structural Engineer and DSA.

B. Testing of concrete shall be performed per article 3.12 of this specification.

2.5 EQUIPMENT

A. Handling and mixing of concrete: Project Inspector may order removal of any equipment which in his opinion is insufficient or in any way unsuitable.

PART 3 EXECUTION

3.1 APPROVAL OF FORMS AND REINFORCEMENTS

A. Forms and reinforcements are subject to approval by the Project Inspector, and notice of readiness to place first pour shall be given to DSA, Architect and Structural Engineer 48 hours prior to placement of concrete. Before placing concrete, clean tools, equipment and remove all debris from areas to receive concrete. Clean all reinforcing and other embedded items off all coatings oil, and mud that may impair bond with concrete.

B. All reinforcing steel and or W.W.F. shall be adequately supported by approved devices on centers close enough to prevent any sagging.

C. All reinforcing bar lap splices shall be staggered a minimum of 5 ft.

D. Additional reinforcing steel shall be placed around all utility boxes, valve boxes, manhole frames and covers that are located within the concrete placements.
   1. The bars shall be placed so that there will be a minimum of 1 ½” clearance and a maximum of 3” clearance. The reinforcing steel shall be placed mid-depth of concrete slab.

E. At all right angles or intersections of concrete walks, additional 2’x2’ #5, 90 degree bars shall be added at all inside corners for additional crack control. The bars shall be placed 2” from concrete forms and supports at mid-depth of slab.

3.2 PROTECTION

A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Sub-Grade in vehicular concrete paved areas: Subgrade shall be clean, shaped and compact to hard surface free from elevations or depressions exceeding 0.05’ in 10' from true plan. Compact per Division 31: Earthwork. Compaction and moisture content shall be verified immediately prior to placement of concrete. Proof roll subbase in presence of geotechnical engineer prior to placement of aggregate base.

3.3 CLEANING

A. Reinforcement and all other embedded items at time of placing concrete to be free of rust, dirt oil or any other coatings that would impair bond to concrete.

B. Remove all wood chips, sawdust, dirt, loose concrete and other debris just before concrete is to be poured. Use compressed air for inaccessible areas. Remove all standing water from excavations.

3.4 FORMING

A. Form material shall be straight, true, sound and able to withstand deformation due to loading and effects of moist curing. Materials which have warped or delaminated, or require more than minor patching of contact surfaces, shall not be reused.

B. Build forms to shapes, lines, grades and dimensions indicated. Construct form work to maintain tolerances required by ACI 301. Forms shall be substantial, tight to prevent leakage of concrete, and properly braced and tied together to maintain position and shape. Butt joints tightly and locate on solid backing. Chamfer corners where indicated. Form bevels, grooves and recesses to neat, straight lines. Construct forms for easy removal without hammering, wedging or prying against concrete.

C. Space clamps, ties, hangers and other form accessories so that working capacities are not exceeded by loads imposed from concrete or concreting operations.

D. Build openings into vertical forms at regular intervals if necessary to facilitate concrete placement, and at bottoms of forms to permit cleaning and inspection.

E. Build in securely braced temporary bulkheads, keyed as required, at planned locations of construction joints.

F. Slope tie-wires downward to outside of wall.

G. Brace, anchor and support all cast-in items to prevent displacement or distortion.

H. During and immediately after concrete placing, tighten forms, posts and shores. Readjust to maintain grades, levels and camber.

I. Concrete paving, Curbs, Curb and Gutters, Ramps:
   1. Expansion Joints: Install at locations indicated, and so that maximum distance between joints is 20’ for exterior concrete unless otherwise shown. Expansion joint material shall be full depth of concrete section. Recess for backer rod and sealant where required. Expansion joints shall not exceed ¼ inch depth measured from finish surface to top of felt or sealant, and ½ inch width.
   2. Curbs, Valley Gutter, and Curb & Gutter: Install expansion joints at 60’ on center, except when placing adjacent to concrete walks, the expansion joints shall align with the expansion joints shown for the concrete walks. Expansion joint material shall be full depth of concrete section. Recess for backer rod and sealant will be required.
   3. Isolation Joints: 3/8” felt between walls and exterior slabs or walks so that paved areas are isolated from all vertical features, unless specifically noted otherwise on plans.
   4. Exterior Concrete Paving: Install expansion joints at 20’ on center maximum, both directions, unless shown otherwise on plans.
   5. Ramps, whether shown or not all ramps shall have control joints and expansion joints:
      a. Control joints on ramps shall be aligned and be placed in between with the vertical posts for the handrails. The curbs, if required shall have control joints that align with the handrail posts.
      b. Expansion joints shall be placed at the upper, intermediate, and bottom landings.

3.5 FORM COATING

A. Before placement of reinforcing steel, coat faces of all forms to prevent absorption of moisture from concrete and to facilitate removal of forms. Apply specified material in conformance with manufacturer's written directions.

B. Before re-using form material, inspect, clean thoroughly and recoat.

C. Seal all cut edges.

3.6 INSTALLATION

A. General: Reinforcement shall be accurately placed at locations indicated on the drawings within required tolerances and providing required clearances. Reinforcement shall be secured prior to placement of concrete such that tolerances and clearances are maintained. Coverage shall be in accordance with Section 1907A.7 of the CBC. Keep a person on the job to maintain position of reinforcing as concrete is placed. Reinforcement must be in place before concreting is begun. Install dowels as shown on drawings. Give notice whenever pipes, conduits, sleeves, and other construction interferes with placement; obtain method of procedure to resolve interferences. All expansion and construction joints in concrete shall have dowels of size and spacing as shown, or as approved by Architect.

B. Placing Tolerances:
1. Per ACI 301 or CRSI/WCRSI Recommended Practice for Placing Reinforcing Bars, unless otherwise shown.
2. Clear distance between parallel bars in a layer shall be no less than 1”, the maximum bar diameter not 1 ½ times the maximum size of coarse aggregate.

C. Splices:
1. General:
   a. Unless otherwise shown on drawings, splice top reinforcing at midspan between supports, splice bottom reinforcing at supports and stagger splices at adjacent splices 5 foot minimum. Bar laps shall be wired together. Reinforcing steel laps shall be as follows:
      1) Lap splices in concrete: Lap splice lengths shall not be less than 62 bar diameter for No. 5 bar, 56” minimum for No. 6 bars. No. 4 bar shall have a minimum of 24” splice. 93 bar diameters for No. 7 bars and larger.
      2) All splices shall be staggered at 5 feet minimum.

3.7 INSPECTION

A. Approval of reinforcing steel, after installation, must be received from Inspector. Architect, Structural Engineer and DSA must be notified 48 hrs. in advance of beginning of concrete placement operations.

B. Slope of concrete forms and finish condition shall be checked with a two foot (2’) digital level.

3.8 PLACING OF CONCRETE

A. Adjacent finish surfaces shall be protected at all times during the concrete pour and finishing. Verify that all formwork is tight and leak-proof before concrete is poured. Finish work defaced during the concrete pour and finishing shall be replaced at no extra cost to the owner.

B. Transport concrete from mixer to place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients. Deposit as close as practicable in final

position to avoid re-handling or flowing. Partially hardened concrete must not be deposited in work. Concrete shall not be wheeled directly on top of reinforcing steel.

C. Placing: Once started, continue concrete pour continuously until section is complete between predetermined construction joints. Prevent splashing of concrete onto adjacent forms or reinforcement and remove such accumulation of hardened or partially hardened concrete from forms or reinforcement before work proceeds in that area. Free fall of concrete shall not to exceed 4'-0" in height. If necessary, provide lower openings in forms to inject concrete and to reduce fall height.

D. Remove form spreaders as placing of concrete progresses.

E. Place footings as monolithic and in one continuous pour.

F. Keep excavations free of standing water, but moisture condition sub-grade before concrete placement.

G. Compacting: All concrete shall be compacted by mechanical vibrators. Concrete shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms. Vibrating shall not be applied to concrete which has already begun to initially set nor shall it be continued so long as to cause segregation of materials.

H. Grout under column bearing plates: Dry pack with specified Non-shrink Grout, as recommended by manufacturer. Use as little water as practicable. Ram grout solid into place.

I. Concrete Flatwork:
   1. All flatwork shall be formed and finished to required line and grades. Flatwork shall be true and flat with a maximum tolerance of 1/8" in 10’ for flatness. Flatwork which is not flat and are outside of the maximum specified tolerances shall be made level by the Contractor at no additional expense to the Owner.
   2. Thoroughly water and soak the flatwork subgrade as required to achieve required moisture content prior to the concrete pour. Provide damming as required to keep water within the formed area and to allow for proper saturation of the subgrade.
   3. Concrete vibrator shall be used to assist concrete placement. Contractor shall have spare concrete vibrator on site during concrete placement.
   4. Thoroughly water and soak the exterior slabs, curbs, curb and gutters, footing subgrades with multiple daily waterings for at least three (3) days or as required to achieve required moisture content prior to the concrete pour in order to place the subgrade soils in full expansion. Provide damming as required to keep standing water within the formed area and to allow for proper saturation and full expansion of the subgrade soils. Remove any standing water before concrete placement.

J. Placing in hot weather: Comply with ACI 305R. Concrete shall not exceed 85 degrees F at time of placement. Concrete shall be delivered, placed and finished in a sufficiently short period of time to avoid surface dry checking. Concrete shall be kept wet continuously after tempering until implementation of curing compound procedure in accordance with this specification.

K. Placing in cold weather: Comply with ACI 306R. Protect from frost or freezing. No antifreeze admixtures are permitted. When deposited concrete during freezing or near-freezing weather, mix shall have temperature of at least 50 degrees F but not more than 90 degrees F. Concrete shall be maintained at temperature of at least 50 degrees F for not less than 72 hours after placing or until it has thoroughly hardened. Provide necessary thermal coverings for any flat work exposed to freezing temperatures.

L. Horizontal construction joint: Keep exposed concrete face of construction joints continuously moist from time of initial set until placing of concrete; thoroughly clean contact surface by chipping entire surface not earlier than 5 days after initial pour to expose clean hard aggregate solidly embedded, or by approved method that will assure equal bond, such as green cutting. If contact surface becomes contaminated with soil, sawdust or other foreign matter, clean entire surface and re-chip entire surface to assure proper adhesion.

3.9 CONCRETE FINISHES

A. Concrete Slab Finishing:
   1. Finish slab as required by ACI 302.1R. Use manual screeds, vibrating screeds to place concrete level and smooth. Use “jitterbugs” or other special tools designed for the purpose of forcing the course aggregate below the surface leaving a thick layer of mortar 1 inch in thickness. Surface shall be free from trowel marks, depressions, ridges or other blemishes. Tolerance for flatness shall be 1/8" in 10'. Provide final finish as follows:
      a. Flatwork, medium broom finish: Typical finish to be used at all exterior walks and stairs.
      b. Ramps, heavy broom finish: Concrete surfaces with slope greater than 5% including all ramps. Brooming direction shall run perpendicular to slope to form non-slip surface
      c. Under no circumstances can water be added to the top surface of freshly placed concrete.

B. Curb Finishing: Steel trowel.

C. Joints and Edges:
   1. Mark-off exposed joints, where indicated, with ¼” radius x 1” deep jointer or edging tool. Joints to be clean, cut straight, parallel or square with respect to concrete walk edge. Tool all edges of exposed expansion and contraction joints, walk edges, and wherever concrete walk adjoins other material or vertical surfaces:
      a. The expansion joints shall be full depth as shown in the plan details. Failure to do so will result in non-compliance and shall be immediately machine cut by the contractor at his expense.

D. Exposed Concrete Surface Finishing (not including top surface of flatwork): Remove fins and rough spots immediately following removal of forms from concrete which is to be left exposed. Damaged and irregular surfaces and holes left by form clamps and sleeves shall be patched with grout. Tie wires are to be removed to below exposed surface and holes pointed up with neat cement paste similar to procedure noted under "Patching" below. Removal of tie wires shall extend to distance of 2" below established grade lines. Ends of tie wires shall be cut off flush at all other, unexposed locations. Care shall be taken to match adjacent finishes of exposed concrete surface. After patching, all concrete that is to remain exposed, shall be sacked with a grout mixture of 1-part cement, 1 1/2- parts fine sand and sufficient water to produce a consistency of thick paint. After first wetting the concrete surface, apply mixture with a brush and immediately float entire surface vigorously using a wood float. Keep damp during periods of hot weather. When set, excess grout shall be scraped from wall with edge of steel trowel, allowed to set for a time, then wiped or rubbed with dry burlap. Entire finishing operation of any area shall be completed on the same day. This treatment shall be carried to 4" below grade, and all patching and sacking shall be done immediately upon removal of the forms.

E. Stair Treads and Risers: Tool exterior stair tread nosing per ADA requirements and as detailed. Paint or stain tooled area at every stair tread nosing or as detailed. Stair tread nosing shall contain no pockets, voids or spalls. Patching is not allowed. Damaged nosing shall be replaced.

3.10 CURING

A. Cured Concrete in Forms: Keep forms and top on concrete between forms continuously wet until removal of forms, 7 days minimum. Maintain exposed concrete in a continuous wet condition for 14 days following removal of forms.

B. Flatwork/Variable Height Curbs, Curb and gutter, Valley Gutter:
   1. Cure utilizing Curing Compound. If applicable, the Contractor shall verify that the approved Curing Compound is compatible with the approved colorant system. Upon completion of job, wash clean per manufacturer's recommendations:
      a. Curing compound shall be applied in a wet puddling application. Spotty applications shall be reason for rejection and possibly concrete removal and replacement at the contractor's expense with no compensation from the owner.

C. No Curing Compound shall be applied to areas scheduled to receive resilient track surface including, curbs, ramps, run ways, etc.

3.11 DEFECTIVE CONCRETE

A. Determination of defective concrete shall be made by the Architect or Engineer. His opinion shall be final in identifying areas to be replaced, repaired or patched.

B. The Owner reserves the right to survey the flatwork, if it is determined to be outside of the maximum tolerance for flatness. If the flatwork is found to be out of tolerance, then the Contractor will be required to replace concrete. The Contractor will be responsible for reimbursing the Owner for any surveying costs incurred. Determination of flatwork flatness, surveying and any remedial work must be completed far enough in advance so that the project schedule is maintained, delays are avoided and the new flatwork or flatwork repairs are properly cured.

C. As directed by Architect, cut out and replace defective concrete. All defective concrete shall be removed from the site. No patching is to be done until surfaces have been examined by Architect and permission to begin patching has been provided.

D. Permission to patch any area shall not be considered waiver of right, by the Owner, to require removal of defective work, if patching does not, in opinion of Architect, satisfactorily restore quality and appearance of surface.

E. Defective concrete is:
   1. Concrete that does not match the approved mix design for the given installation type.
   2. Concrete not meeting specified 28-day strength.
   3. Concrete which contains rock pockets, voids, spalls, transverse cracks, exposed reinforcing, or other such defects which adversely affect strength, durability or appearance.
   4. Concrete which is incorrectly formed, out of alignment or not plumb or level.
   5. Concrete containing embedded wood or debris.
   6. Concrete having large or excessive patched voids which were not completed under Architect's direction.
   7. Concrete not containing required embedded items.
   8. Excessive Shrinkage, Traverse cracking, Crazing, Curling; or Defective Finish. Remove and replace if repair to an acceptable condition is not feasible.
   9. Concrete that is unsuitable for placement or has set in truck drum for longer than 90 minutes from the time it was batched.
   10. Expansion joint felt that is not isolating the full depth of the concrete section, and recessed as required for backer rod and sealant where required.

11. Concrete that is excessively wet or excessively dry and will not meet the minimum or maximum slump required per mix design.
12. Finished concrete with oil stains from equipment use, and or rust spots that cannot be removed.
13. Control joints (weakened planed joints) that do not meet the required minimum depth shown on the drawings.

F. Patching: Install specified Patching Mortar per manufacturer's recommendations. **Repairs to defective concrete which affect the strength of any structural concrete member or component are subject to approval by the architect and dsa.**

3.12 CONCRETE TESTING

A. Comply with CBC Section 1903A, 1905A.1.16, 1910A and 1705A.3 and as specified in B. below. Costs of tests will be borne by the Owner.

B. Four identical cylinder samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards of concrete, or not less than once for each 2,000 square feet of surface area for slabs or walls. In addition, samples for strength tests for each class of concrete shall be taken for seven-day tests at the beginning of the concrete work or whenever the mix or aggregate is changed.

C. Strength tests will be conducted by the Testing Lab on one cylinder at seven (7) days and two cylinders at twenty-eight (28) days. The fourth remaining cylinder will be available for testing at fifty-six (56) days if the 28-day cylinder test results do not meet the required design strength.

D. On a given project, if the total volume of concrete is such that the frequency of testing required by paragraph B. above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

E. Cost of retests and coring due to low strength or defective concrete will be paid by Owner and back-charged to the Contractor.

F. Each truck shall be tested for slump before concrete is placed.

3.13 REMOVAL OF FORMS

A. Remove without damage to concrete surfaces.

B. Sequence and timing of form removal shall insure complete safety of concrete structure.

C. Forms shall remain in place for not less than the following periods of time. These periods represent cumulative number of days during which temperature of air in contact with concrete is 60 degrees F and above:
1. Vertical forms of foundations, walls and all other forms not covered below: 5 days.
2. Slab edge screeds or forms: 7 days.
3. Concrete columns and beam soffits: 28 days.

D. Concrete shall not be subjected to superimposed loads (structure or construction equipment) until it has attained its full design strength and not for a period of at least 21 days after placing. Concrete systems shall not be subjected to construction loads in excess of design loads.

3.14 CLEANING

A. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

B. Clean excess material from surface of all concrete walks and utility structures.

C. Power wash all concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

END OF SECTION 32 30 01

SECTION 32 31 13 CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. All Chain link fences, new or modernized shall comply with all local codes and zoning, where located on property and in route of travel all hardware to meet specified requirements listed here-in. Refer to Drawings and Details.

B. Related Section:
   1. Section 03 30 00: Cast-In-Place Concrete.

C. Reference Standards:
   1. ASTM International (ASTM):
      a. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
      b. F567, Standard Practice for Installation of Chain Link Fence.
      c. F626, Standard Specification for Fence Fittings.
      d. F900, Standard Specification for Industrial and Commercial Swing Gates.
      e. F1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded for Fence Structures.
      f. F2611, Standard Guide for Design and Construction of Chain Link Security Fencing.

D. Accessibility Requirements - Comply with applicable requirements:
   1. Americans with Disability Act of 1990, as amended.
   2. 2022 California Building Code (CBC):
      a. CBC Chapter 11B - California Building Code - Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing; 2022.
      b. Door and Gate closures shall comply with 11B-404.2.8.1.
      c. Door and Gate opening force shall comply with 11B-404.2.9.
      d. Door and Gate operation shall comply with 11B-309.4.
   3. California Referenced Standards Code:
      a. CCR Title 24, Part 2, as adopted and amended by DSA.
      b. Title 24, Part 12, Section 12-10-202, Item (F).

1.4 SUBMITTALS

A. Product Data:
   1. Manufacturer’s schedules, charts, literature, and illustrations indicating the performance, fabrication procedures, product variations and accessories indicating material compliance and specified options.
   2. Manufacturer’s installation instructions.

B. Shop Drawings: Indicate materials, dimensions, details, and finish, show locations and installation procedures. Include details of fence and gate joints, attachments, accessories, footings, and clearances.

1.3 QUALITY ASSURANCE

A. Accessibility Requirements for Fences, Gates, and Hardware:
   1. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with CNC Section 11B-404.
   2. The levers of lever actuated latches or locks for accessible gates shall be curved with a return to within ½ inch of the gate surfaces to prevent catching on the clothing or persons. See California Referenced Standards Code T-24, Part 12, Section 12-10-202, Item (F).
   3. Swing doors and gate surfaces within 10 inches of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16 inch of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. See CBC Section 11B-404.2.10.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Specifications are based on products of Anchor Fence by Master Halco Inc., Baltimore, MD, Phone (800) 229-5615.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing chain link fencing and gates meeting or exceeding the following specifications for design, size, gauge, finish of metal parts and fabrication and comply with Division 01 requirements for substitutions in order to be considered:
   1. Golden State Fence, Co Inc, Rancho Cordova, CA (916) 468-0975
   2. S & S Fence Co, Sacramento, CA (916) 682-1100

2.2 CHAIN LINK FENCE MATERIALS

A. General:
   1. Selvage: Knuckled finish top and bottom.
   2. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to 16 feet high. Wire sizes includes zinc coating.
   3. Galvanized Wire: Zinc coated wire-ASTM A392, Class 1, with not less than 1.2 oz. zinc. per sq. ft.

B. Fence Fabrics:
   1. Type B - Non-Slatted Fabric: Standard Industrial grade, 1" mesh, 9 gauge zinc coated steel wire, top selvage twisted tight, bottom selvage knuckled end closed.

C. Fence Framing:
   1. Strength requirements for posts and rails shall conform to ASTM F1043.
   2. Pipe shall be straight, true to section, material, and sizes specified, and shall conform to the following weights per foot:

NPS in inches	Outside Diameter (OD) in inches	Type 1 Steel	Type II Steel
1	1.315	1.68	1.35
1.25	1.660 (1-5/8")	2.27	1.84
1.5	1.900 (2")	2.72	2.28
2	2.375 (2-1/2")	3.65	3.12
2.5	2.875 (3")	5.79	4.64
3	3.500	7.58	5.71
3.5	4.000	9.11	6.56

4	4.500	10.79	---
6	6.625	18.97	---

3. Posts, Rails, Braces, and Gate Frames - Steel pipe - Type I - ASTM F1083, standard weight Schedule 40; minimum yield strength of 25,000 psi; sizes as indicated below. Hot-dipped galvanized with minimum average 1.8 oz/ft² of coated surface area:
   a. Line posts: 2-3/8 inch o.d, weighing 2.72 lb/ft.
   b. Terminal, End, Corner, and Pull Posts: 2-7/8 inch o.d., weighing 3.65 lb/ft.
   c. Rails and Braces: 1-5/8 inch o.d., weighing 2.27 lb/ft.
4. End, corner, and pull posts for following fabric heights:
   a. 6 feet to 10 feet: 2.875" OD (3" OD) (with privacy slats provide 3.5" OD)
5. Line or intermediate posts for following fabric heights:
   a. 6 feet to 8 feet: 2.375" OD (2-1/2" OD) (with privacy slats provide 3" OD)
6. Top, Bottom and Horizontal Intermediate Rails:
   a. Top, bottom and horizontal intermediate rails (as applicable) shall be 1.66" OD (1-5/8"OD)
7. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
   a. 6 feet to 10 feet: 3.5" OD
   b. Under 6 feet: 2-7/8" OD
8. Gate Frames: Furnish frames (single or double gate), for nominal gate widths as follows:
   a. 6 feet to 10 feet: 1.90" OD (2" OD)
   b. Under 6 feet:1.66" OD (1-5/8"OD)
9. All gates with panic hardware, the frame and adjacent posts are to be fabricated with steel tubing. Refer to Section 32 31 19: Decorative Metal Fences and Gates.

D. Concrete: ASTM C94/C94M-19a; Portland Cement, 3,00 p.s.i. strength at 28 days, 3 inch slump; one inch maximum sized coarse aggregate.

E. Fence Accessories:
1. Chain Link Fence Accessories: Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.
2. Post Caps: Formed steel, cast malleable iron, or aluminum alloy weathertight closure cap for tubular posts. Provide one (1) cap for each post (where top rail is used, provide tops to permit passage of top rail).
3. Top Rail and Brace Rail Ends: Formed steel, malleable or cast iron, for connection of rail and brace to terminal posts.
4. Top Rail Sleeves: 6 inch sleeve allowing for expansion and contraction of top rail.
5. Wire Ties: 9 gauge galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge for rails and braces. Hog ring ties of 12-1/2 gauge for attachment of fabric to tension wire.
6. Brace and Tension (Stretcher Bar) Bands: Pressed steel.
7. Tension (Stretcher) Bars: One piece lengths equal to 2 inches less than full height of fabric with a minimum cross-section of 3/16 inch x 3/4 inch or equivalent fiber glass rod. Provide tension (stretcher) bars where chain link fabric meets terminal posts.
8. Tension Wire: 7 gauge, diameter core wire with tensile strength of 75,000 psi.
9. Truss Rods: Steel rods with minimum diameter of 5/16 inch.
10. Fasteners: Galvanized nuts and bolts.

2.3 CHAIN LINK SWING GATES

A. Gate Frames: Fabricate chain link swing gates in accordance with ASTM F900 using galvanized steel tubular members, 2 inches square, weighing 2.60 lb/ft. Fusion or stainless steel welded connections forming rigid one-piece unit.

B. Chain Link Fence Fabric: Same as specified above for fence. Install fabric with hook bolts and tension bars at all four (4) sides. Attach to gate frame at not more than 15 inches on center.

C. Hardware Materials - Hot dipped galvanized steel or malleable iron shapes to suit gate size.
   1. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180 degrees inward.
   2. Latch: Non-accessible; Forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
   3. Gate Hardware: Shall conform to 1.2.D this section and as listed in part 4 below.
   4. Keeper: Provide keeper for each gate leaf over five (5) feet wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
   5. Drop Rod: Provide at double gates to hold inactive leaf. Provide gate stop pipe to engage center drop rod. Provide locking device and padlock eyes as an integral part of latch, requiring one (1) padlock for locking both gate leaves.

D. Gate Posts - Steel pipe, ASTM F1083, standard weight Schedule 40; minimum yield strength of 25,000 psi. Hot-dipped galvanized with minimum 1.8 oz/ft² of zinc. Sizes as follows:
   1. Width for single gate or one gate leaf of double gates:
      a. 6 feet or less: 2.875 inches in diameter, weighing 5.79 lb/ft.
      a. Over 6 feet to 12 feet: 4.00 inches in diameter, weighing 9.11 lb/ft.
      b. Over 12 feet to 19 feet: 6.625 inches in diameter, weighing 18.97 lb/ft.

2.4 SETTING MATERIALS

A. Concrete: Minimum 28 day compressive strength of 3,000 psi.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify areas to receive fencing are completed to final grades and elevations.

B. Ensure property lines and legal boundaries of work are clearly established.

3.2 CHAIN LINK FENCE FRAMING INSTALLATION

A. Install chain link fence in accordance with ASTM F567 and manufacturer’s instructions.

B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30 degrees or more.

C. Space line posts uniformly at 10 feet on center.

D. Concrete fence post footings:
   1. Drill holes in firm, undisturbed or compacted soil. Excavate deeper than specified below as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.
   2. Line posts shall be set in 9 inch minimum diameter concrete piers, with a minimum of 36 inches of post embedment in concrete with an additional 3 inch concrete cover at bottom.
   3. All end, corner, and pull posts shall be set in minimum 12 inch minimum diameter concrete piers, with a minimum of 36 inches of post embedment in concrete with an additional 3 inch concrete cover at bottom.

4. Place concrete around posts in a continuous pour.
5. Trowel finish around post. Slope to direct water away from posts.

E. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

F. Bracing: Install horizontal pipe brace at mid-height for fences six (6) and over, on each side of terminal posts. Firmly attach with fittings. Install diagonal truss rods at these points. Adjust truss rod, ensuring posts remain plumb.

G. Tension Wire: Provide tension wire at bottom of fabric. Install tension wire before stretching fabric and attach to each post with ties. Secure tension wire to fabric with 12-1/2 gauge hog rings 24 inches on center.

H. Top Rail: Install lengths, 21 feet. Connect joints with sleeves for rigid connections for expansion/contraction.

I. Bottom Rails: Install bottom rails between posts with fittings and accessories.

3.3 CHAIN LINK FABRIC INSTALLATION

A. Fabric: Install fabric on security side and attach so that fabric remains in tension after pulling force is released. Leave approximately 2 inches between finish grade and bottom selvage. Attach fabric with wire ties to line posts at 15 inches on center and to rails, braces, and tension wire at 24 inches on center.

B. Tension (stretcher) bars: Pull fabric taut; thread tension bar through fabric and attach to terminal posts with bands or clips spaced maximum of 15 inches on center.
1. Install to the guideline of ASTM F2611.

3.4 ACCESSORIES

A. Tie Wires: Bend ends of wire to minimize hazard to persons and clothing.

B. Fasteners: Install nuts on side of fence opposite fabric side for added security.

3.5 CHAIN LINK SWING GATE POST INSTALLATION

A. Install gate posts in accordance with manufacturer’s instructions.

B. Concrete gate post footings:
1. Drill holes in firm, undisturbed or compacted soil. Excavate deeper than specified below as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.
2. All gate posts shall be set in minimum 12 inch diameter concrete piers, with a minimum of 36 inches of post embedment in concrete with an additional 3 inch concrete cover at bottom.
3. Place concrete around posts in a continuous pour.
4. Trowel finish around post. Slope to direct water away from posts.

C. Gate posts and hardware: Set keeper, stops, sleeves into concrete. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

3.6 GATE INSTALLATION

A. Install gates plumb, level, and secure for full opening without interference.

B. Attach hardware by means which will prevent unauthorized removal.

C. Adjust hardware for smooth operation.

3.7 CLEANING

A. Clean up debris and unused material, and remove from the site.

PART 4 HARDWARE

4.1 HARDWARE LISTING

A. Group 1 - Man Gate Hardware:
   1. Exit Hardware: Von Duprin 98/99 Series Rim Device.
   2. 996L Breakaway Lever w/IC Large Format Core.
   3. Format IC Core (Keyed per District Requirement).
   4. Closure: LCN 4040xl Series Closer.
      a. Alt.: Locinox Inc. Gate closure hinge, Tiger.
      b. Alt.: Locinox Inc. Gate closure, Verticlose.
   5. Kick Plate: 10 GA. Galv.
   6. Hardware Backing-Plate: 24” tall X width of gate 16 GA Galv.
   7. Closure Backing Plate: Sized fit item c. Closure.
   8. Flat mounted Gorilla weld on hinges. (See 4.a. Tiger hinge)

B. Knox Boxes:
   1. Knox Rapid Entry System, 3200 Series, Knox Company, 1601 W. Deer Valley Road, Phoenix, AZ 85027 800-552-5669.
      a. Location as noted on Drawings.
      b. Local Fire Dept. Approval may be required.

END OF SECTION 32 31 13

APPENDIX A

Limited 3-year AHERA Reinspection

George Washington Elementary School
831 West Lockeford Street
Lodi, CA

August 24, 2023 | Report Number: Report No. NA237021

Prepared for:

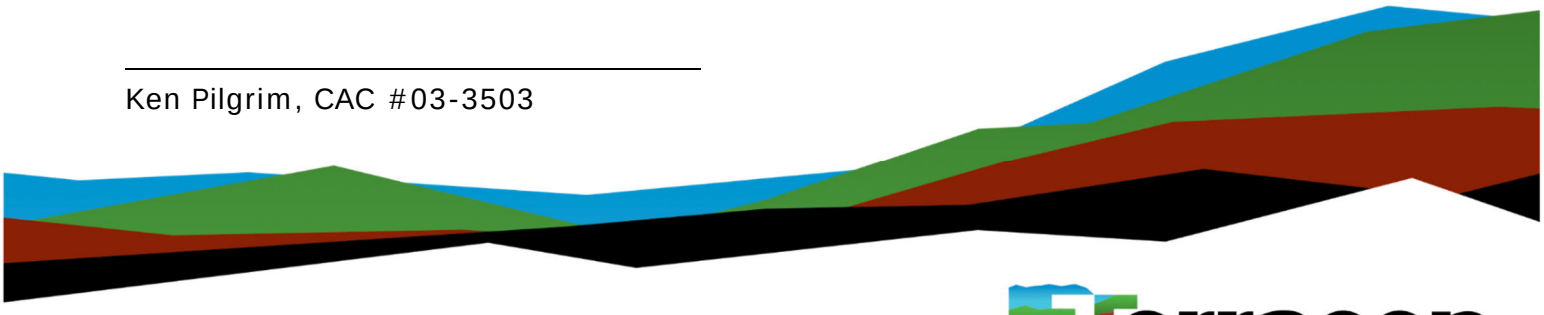
Lodi Unified School District
1305 East Vine Street
Lodi, CA

Prepared by:

Terracon Consultants, Inc.
1220 Concord Avenue, Suite 450
Concord, CA 94520

for: _____
Wyatt Renner, CSST #15-5504

_____
Ken Pilgrim, CAC #03-3503



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APPENDIX B AHERA School Reinspection Suggested Forms

I. EXECUTIVE SUMMARY

Terracon was asked to conduct an Asbestos Hazard Emergency Response Act (AHERA) three-year inspection of the Lodi Unified School District buildings. Wyatt Renner, Certified Site Surveillance Technician, conducted the re-inspection work under the guidance of Terracon's Environmental Department Manager, Kenneth Pilgrim, Cal/OSHA Certified Asbestos Consultant (CAC). Site inspection activities were performed in accordance with the requirements outlined in the Asbestos Hazard Emergency Response Act (AHERA) 40 CFR Part 763, Subpart E. Terracon used the previously conducted inspection report carried out by ADR Environmental Group, Inc. (ADR) in 2014 as provided by the District to locate and assess the asbestos containing materials.

II. ASBESTOS OVERVIEW

Asbestos is a naturally occurring threadlike mineral fiber. Generally, "asbestos" is a generic name applied to a basic group of six fibrous silicate minerals found in certain types of rock formations. Manufacturers and builders have utilized asbestos fibers in approximately 3,000 building materials due to the numerous attributes of its mineral composition, which include: durability, insulating properties, fire resistance, chemical resistance, tensile strength, sound absorption, plentiful supply, and relative cost effectiveness.

III. REGULATORY OVERVIEW

Under the Asbestos Hazard Emergency Response Act of 1986, EPA published the Asbestos Containing Materials in Schools rule, (commonly referred to as AHERA), 40 CFR 763, Subpart E which became effective in December of 1987. One aspect of the rule requires local educational agencies (K-12, public and private) to inspect all of their school buildings for asbestos containing building materials (ACBMs) and prepare a management plan with policies and procedures for managing the ACBMs to prevent or reduce asbestos hazards.

AHERA also requires that at least once every three years, an accredited inspector visually re-inspect and re-assess the condition of known or assumed friable ACBMs and visually inspect and assess previously identified non-friable ACBMs to determine if they have since become friable. A biannual inspection is also required to monitor any changes to the conditions of the ACBMs previously identified.

Once the re-inspection has been completed, an accredited management planner will review the building inspection reports and conduct a hazard assessment. The assessment takes into consideration the location, amount, and condition of each material, as well as its accessibility and potential for disturbance. This hazard assessment combines the AHERA categories of condition and potential for disturbance.

A. AHERA Categories of Condition

AHERA recognizes three (3) categories for the condition of ACBM based on a visual inspection: significantly damaged, damaged, and good.

1. Significantly damaged is a material with one or more of the following characteristics:

   a) At least 10% of the surface is crumbling or blistered if the damage is evenly distributed or 25% if the damage is localized or

   b) 10% (25% if localized) of the material is hanging from the surface, deteriorated, or showing signs of adhesive failure or

   c) 10% (25% if localized) of the surface has water stains, gouges, or marks

2. Damaged is a material with the following characteristics:

   a) Less than 10% (25% if localized) of the surface is crumbling, blistered, water stained, gouged, marred, or otherwise abraded

3. Good is a material with no visible damage or deterioration or showing very limited damage or deterioration.

B. Potential for Disturbance

It is important to evaluate the likelihood that the suspect material could be disturbed in the future. This relates to the frequency of contact with the material, its location with respect to sources of vibration and air erosion. The following table identifies the criteria for each ranking.

Potential for Disturbance	Frequency of Potential Contact	Influence of Vibration	Potential for Air Erosion
High	Maintenance workers in the vicinity at least 1x per week or the ACBM is in public area accessible to building occupants	Loud motors or engines present or intrusive noises or easily sensed vibrations, i.e., airports and major highways	Presence of high velocity air
Moderate	Maintenance workers in the vicinity at least 1x per month or the ACBM is in a room accessible to building occupants	Loud motors or engines present but not obtrusive or occasional loud noises	Noticeable air movement
Low Potential	Maintenance workers in the vicinity less than 1x per month or the ACBM is visible but not accessible to building occupants	None of the above	None of the above

If any of the three factors is determined to be high, then the level for potential for disturbance is defined by AHERA as “potential for significant damage. Any moderate value is defined as “potential for damage” and all low values are “low potential”.

	Frequency of Potential Contact	Influence of Vibration	Potential for Air Erosion
Potential for Significant Damage	Any HIGH value		
Potential for Damage	Any MODERATE value		
Low Potential	All LOW values		

Once each material has been correctly assessed and categorized, it is then placed into one of seven categories identified by the EPA. The categories are outlined below:

1. Damaged or significantly damaged thermal system insulation ACM.
2. Damaged friable surfacing ACM.
3. Significantly damaged friable miscellaneous ACM.
4. Damaged or significantly damaged friable miscellaneous ACM.
5. ACBM with potential for damage.
6. ACBM with potential for significant damage.
7. Any remaining friable ACBM or friable suspected ACBM.

IV. KEY REGULATORY TERMS

A. Assumed ACM – a suspect ACM that has not been sampled and analyzed for asbestos content.

B. Friable materials – asbestos containing materials that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

C. Functional Space a room, group of rooms, or homogeneous area (including crawl spaces or the space between a dropped ceiling and the floor or roof deck above), such as classroom(s), a cafeteria, gymnasium, hallway(s), designated by a person accredited to prepare management plans, design abatement projects, or conduct response actions.

D. Categories of ACBMs:

1. Surfacing: Material that is sprayed, troweled-on, or otherwise applied to surfaces such as acoustical plaster on ceiling and fireproofing materials on structural members, or to the materials on surfaces for acoustical, fireproofing, and other purposes. Additional types of known surfacing materials to contain asbestos are stucco, brown coats, skim coats, wall texturing, and scratch coats.

2. Thermal System Insulation (TSI): TSI is defined as "ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain". Typically, this category of material is found on heating, ventilation, and air conditioning (HVAC) systems and plumbing systems.

3. Miscellaneous Material: This category includes any ACM not considered surfacing or thermal system insulation. Some of the most prevalent types of miscellaneous ACM are flooring materials, flooring mastics, Transite, taping mud, gaskets, and roofing products.

V. LODI UNIFIED SCHOOL DISTRICT BUILDING SUMMARY

This re-inspection included George Washington Elementary School. Each building on the campus was inspected independently per AHERA requirements. The table below summarizes the sites targeted during the AHERA reinspection process. Refer to Appendix A for further details regarding the ACBMs identified and previously removed materials. Appendix B contains recommended forms to be utilized during reinspection activities performed by district staff.

VI. ADDITIONAL REGULATORY REQUIREMENTS

Asbestos-containing materials in concentrations greater than one tenth of one percent (0.1%) are present in the building. Impacting materials containing greater than 0.1% asbestos either through repair, maintenance, or demolition activities triggers numerous regulations enforced by such agencies as OSHA (worker protection) and EPA (environmental exposure, transportation, and disposal).

Listed below are the regulations that apply to the asbestos containing materials:

- Any individual who contracts to provide health and safety services relating to ACMs must be certified by Cal-OSHA as either a Certified Asbestos Consultant or a Site Surveillance Technician. The activities they are certified to provide include conducting asbestos surveys; writing work plans or specifications for abatement; monitoring the work of abatement contractors; collecting air samples; and determining if the work area is safe for re-occupancy by non-asbestos workers. Regulation: Cal-OSHA 8 CCR 1529 (q)(1).

- Notify employees, tenants and contractors who perform work in the building of the presence, locations, and quantities of asbestos in accordance with California Health and Safety Code Section 25915 and Proposition 65, California (8 CCR 1529 (k)) and Federal OSHA (1926.1101) regulations.

- If more than 100 square feet of materials that contain greater than 0.1% asbestos will be abated, they must be abated by a Cal-OSHA registered asbestos abatement contractor. Regulation: Cal-OSHA 8 CCR 1529 (R).

- ACMs that are classified by OSHA as other/miscellaneous materials are present. Removal of these materials is considered a Class II activity, respectively according to Cal-OSHA regulations. Work practices and engineering controls for Class II work is specified in Cal-OSHA 8 CCR 1529 (g) (4-8).

- Friable ACMs greater than 1% asbestos must be manifested, transported, and disposed of as hazardous waste in accordance with the Department of Toxic and Substances Control (DTSC), a division of Cal-EPA. DTSC regulates disposal of asbestos waste. DTSC issues U.S. EPA hazardous waste generator identification numbers.

- If more than 160 square feet or 260 linear feet of friable ACM will likely be removed, the abatement contractor must notify the San Joaquin Valley Air Pollution Control District (SJVAPCD) ten (10) days prior to removing the material. Regulation: SJVAPCD under Rule 4002.

- Class III asbestos work includes the repair and maintenance operations where ACMs, including TSI and surfacing materials, are disturbed. This work should be conducted and supervised by personnel who have a minimum of 16-hour Asbestos Operations and Maintenance (O&M) training. Work practices and engineering controls for Class III work are specified in Cal-OSHA 8 CCR 1529 (g) (9).

- Class IV asbestos work includes maintenance and custodial activities where personnel contact but do not disturb ACMs (i.e., buffing of asbestos-containing floor tile, changing a battery in a smoke detector attached to an acoustical plaster ceiling). This work should be conducted by personnel with a minimum of 2-hour asbestos awareness training and supervised by personnel who have a minimum of 16-hour Asbestos O&M training. Work practices and engineering controls for Class IV work are specified in Cal-OSHA 8 CCR 1529 (g) (10).

VII. LIMITATIONS

Terracon Consultants warrants that the findings contained herein have been prepared in general accordance with accepted professional practices as applied by similar professionals in the community at the time of its preparation. Changes in the state of the art or in applicable regulations cannot be anticipated and have not been addressed in this report.

No additional sampling was performed during the course of field inspections summarized in this report. Terracon is unable to comment on and in no way merits the data and field activities performed by other parties.

The inspections performed during the course of this project were limited to visual and tactile assessments of known and/or assumed ACMs. None of the data contained herein are sufficient to serve as surveys for construction, demolition, or other similar activities. Additional sampling may be required to adequately characterize each site prior to commencing such projects.

APPENDIX A

AHERA School Reinspection Summaries

Type of Inspection: _____ Initial Inspection ___X___ Re-inspection **Date of Inspection:** 6/8/23

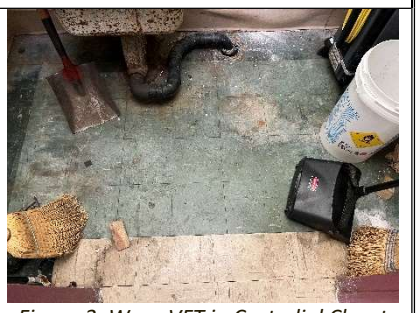
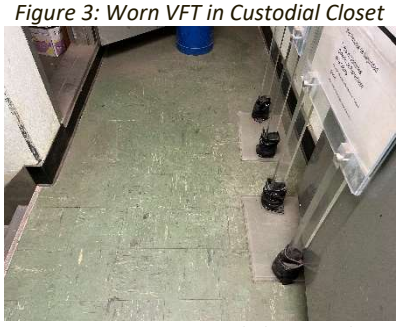
Inspector: Wyatt Renner SST 15-5504 **Consulting Firm**: Terracon

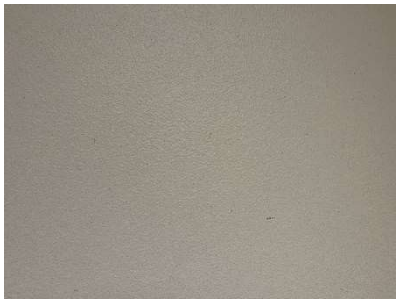
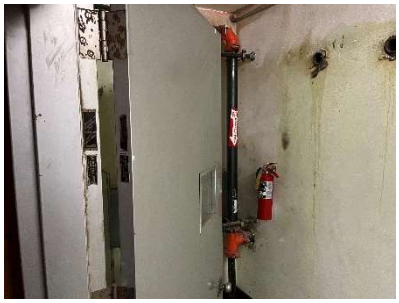
Building Name/Address: George Washington Elementary, 831 West Lockeford Street, Lodi, CA 95240-1633

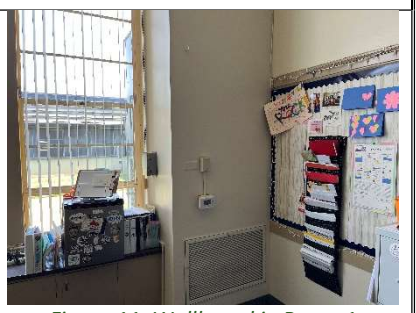
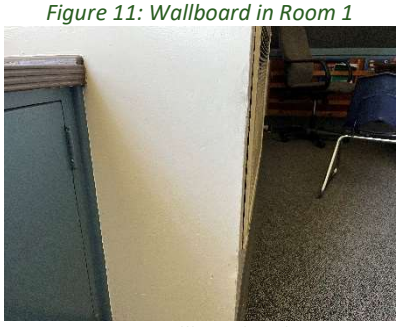
Response Action: Maintain Materials as Outlined in O&M Program

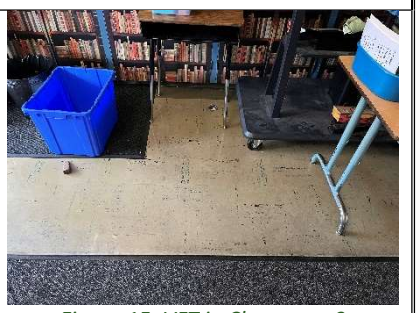
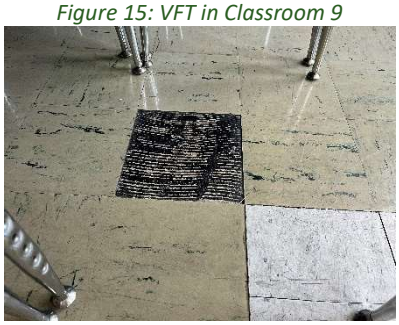
Building & Functional Space	Homogenous Area Number	Material Description - Friable/Non-Friable - TSI, Surfacing or Miscellaneous	AHERA Assessment	Date of Removal	Photo of Material/Comments
Mezzanine Stairs Landing, Workrooms, Cafeteria, and Storage Rooms Building A	1	Vinyl Floor Tile, 12”x12” White with Mastic - Non-Friable-Miscellaneous	5	N/A	 *Figure 1: VFT in Workroom*
Throughout A building Interior	2	Wall Plaster, White - Friable - Surfacing	5	N/A	 *Figure 2: Small Hole in Plaster, Janitors Closet*

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Building & Functional Space	Homogenous Area Number	Material Description - Friable/Non-Friable - TSI, Surfacing or Miscellaneous	AHERA Assessment	Date of Removal	Photo of Material/Comments
Toilets A Building	3	Linoleum White - Friable - Miscellaneous	5	N/A	*Note: Material Not Observed*
Custodian Closet Building A	4	Vinyl Floor Tile, 9”x9” Green with Mastic - Non-Friable - Miscellaneous	5	N/A	 *Figure 3: Worn VFT in Custodial Closet*  *Figure 4: VFT at Second Floor Landing*

Building & Functional Space	Homogenous Area Number	Material Description - Friable/Non-Friable - TSI, Surfacing or Miscellaneous	AHERA Assessment	Date of Removal	Photo of Material/Comments
Throughout A Building Interior	5	Gypsum Wallboard and Joint Compound - Friable - Miscellaneous	5	N/A	 *Figure 5: Drywall Outside Kitchen*
Throughout A Building Interior	6	Texture Coating on Gypsum Wallboard - Friable - Surfacing	5	N/A	 *Figure 6: Texture Coat Outside Kitchen*
Throughout School	7	Fire Doors - Friable - Miscellaneous	5	N/A	 *Figure 7: 2nd Floor Fire Door*
Staff Toilets A Building	8	Linoleum - Friable - Miscellaneous	5	Material Removed in 2019	 *Figure 8: Linoleum in Staff Bathroom Replaced with Epoxy*

Building & Functional Space	Homogenous Area Number	Material Description - Friable/Non-Friable - TSI, Surfacing or Miscellaneous	AHERA Assessment	Date of Removal	Photo of Material/Comments
Storage, electrical, and custodial Closets Building B	9	Vinyl Floor Tile, 9”x9” with Mastic - Non-Friable- Miscellaneous	5	N/A	 *Figure 9: VFT in Electrical Closet*
Throughout B Building Interior	10	Wall Plaster - Friable - Surfacing	5	N/A	 Figure 10: Wall Plaster in Room 6
Throughout B Building Interior	11	Gypsum Wallboard and Joint Compound With Texture Coat - Friable - Miscellaneous	5	N/A	 *Figure 11: Wallboard in Room 1*  *Figure 12: Wallboard with Minor Damage in Room 3*

Building & Functional Space	Homogenous Area Number	Material Description - Friable/Non-Friable - TSI, Surfacing or Miscellaneous	AHERA Assessment	Date of Removal	Photo of Material/Comments
Throughout B Building Classrooms in Rear	12	Linoleum - Friable - Miscellaneous	5	N/A	 *Figure 13: Linoleum in Classroom 5*
Throughout B Building Classrooms Under Carpet	13	Assumed Vinyl Floor Tile, 9”x9” with Mastic - Non-Friable - Miscellaneous	5	N/A	 *Figure 14: Assumed VFT Under Carpet in Classroom*
Throughout Classrooms Building C	14	Vinyl Floor Tile, 9”x9” White with Mastic - Non-Friable - Miscellaneous	4	N/A	 *Figure 15: VFT in Classroom 9*  *Figure 16: VFT with Missing Tiles in Room 15*

Building & Functional Space	Homogenous Area Number	Material Description - Friable/Non-Friable - TSI, Surfacing or Miscellaneous	AHERA Assessment	Date of Removal	Photo of Material/Comments
Custodial Closets Building C	15	Vinyl Floor Tile, 9”x9” White with Mastic - Non-Friable - Miscellaneous	5	N/A	 *Figure 17: Worn VFT in Custodial Closet*
Throughout Building C	16	Gypsum Wallboard and Joint Compound - Friable - Miscellaneous	5	N/A	 *Figure 18: Wallboard in Room 14*

APPENDIX B

AHERA School Reinspection Suggested Forms

Type of Inspection: _____ Initial Inspection ___X___ Re-inspection Date of Inspection:_____

Inspector:_____

Building Name/Address: George Washington Elementary, 831 West Lockeford Street, Lodi, CA 95240-1633

Response Action: Maintain Materials as Outlined in O&M Program

Building & Functional Space	Homogenous Area Number	Material Description - Friable/Non-Friable - TSI, Surfacing or Miscellaneous	AHERA Assessment	Date of Removal	Damage Observed
Mezzanine Stairs Landing, workrooms, cafeteria, and Storage Rooms Building A	1	Vinyl Floor Tile, 12"x12" White with Mastic - Non-Friable- Miscellaneous	5		
Throughout A building Interior	2	Wall Plaster, White - Friable - Surfacing	5		
Toilets A Building	3	Linoleum White - Friable - Miscellaneous	5		
Custodian Closet Building A	4	Vinyl Floor Tile, 9"x9" Green with Mastic - Non-Friable - Miscellaneous	5		
Throughout A Building Interior	5	Gypsum Wallboard and Joint Compound - Friable - Miscellaneous	5		
Throughout A Building Interior	6	Texture Coating on Gypsum Wallboard - Friable - Surfacing	5		
Throughout School	7	Fire Doors - Friable - Miscellaneous	5		
Staff Toilets A Building	8	Linoleum - Friable - Miscellaneous	5		

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Building & Functional Space	Homogenous Area Number	Material Description - Friable/Non-Friable - TSI, Surfacing or Miscellaneous	AHERA Assessment	Date of Removal	Damage Observed
Storage, electrical, and custodial Closets Building B	9	Vinyl Floor Tile, 9"x9" with Mastic - Non-Friable- Miscellaneous	5		
Throughout B Building Interior	10	Wall Plaster - Friable - Surfacing	5		
Throughout B Building Interior	11	Gypsum Wallboard and Joint Compound With Texture Coat - Friable - Miscellaneous	5		
Throughout B Building Classrooms in Rear	12	Linoleum - Friable - Miscellaneous	5		
Throughout B Building Classrooms Under Carpet	13	Assumed Vinyl Floor Tile, 9"x9" with Mastic - Non-Friable - Miscellaneous	5		
Throughout Classrooms Building C	14	Vinyl Floor Tile, 9"x9" White with Mastic - Non-Friable - Miscellaneous	4		
Custodial Closets Building C	15	Vinyl Floor Tile, 9"x9" White with Mastic - Non-Friable - Miscellaneous	5		
Throughout Building C	16	Gypsum Wallboard and Joint Compound - Friable - Miscellaneous	5		