



PROJECT MANUAL

Oak Hill Elementary School Modernization

3909 North Loop Blvd
Antelope, CA 95843
(916) 338-6460

DSA Application Number: 02-121265
DSA File Number: 34-10

AC Martin Project No. CA5602
May 16, 2023

AC MARTIN
3009 DOUGLAS BLVD SUITE 290
ROSEVILLE CA 95661 T 916 772 1800

AC Martin
3009 Douglas Blvd., #290
Roseville, CA 95661
(916) 772-1800

DOCUMENT 00 0107

SEALS PAGE

ARCHITECT

AC Martin, Inc,
3009 Douglas Blvd., Suite 290
Roseville, CA 95661
(916) 772-1800



Richard A. Parks C28637

CIVIL ENGINEER

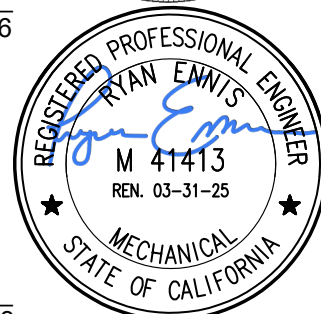
Warren Consulting Engineers, Inc.
1117 Windfield Way, Suite 110
El Dorado Hills, CA 95762
(916) 985-1870



Anthony J. Tassano C74696

MECHANICAL ENGINEER

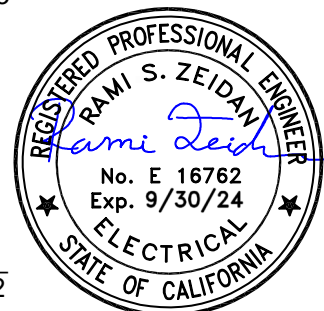
LP Consulting Engineers
1209 Pleasant Grove Blvd.
Roseville, CA 95678
(916) 771-0778



Ryan Ennis M41413

ELECTRICAL ENGINEER

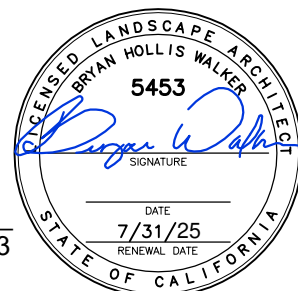
LP Consulting Engineers
1209 Pleasant Grove Blvd.
Roseville, CA 95678
(916) 771-0778



Rami S. Zeidan E16762

LANDSCAPE ARCHITECT

MTW Group
2707 K Street, Suite 201
Sacramento, CA 95816
(916) 369-3990



Bryan H. Walker LA5453

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

APP: 02-121265 INC:

REVIEWED FOR

SS ☐ FLS ☒ THE STATE ARCHITECT
DESIGN & CONSTRUCTION SERVICES

DATE: 05/24/2023

END OF DOCUMENT

THIS PAGE INTENTIONALLY BLANK

SECTION 00 0110

TABLE OF CONTENTS

Procurement and Contracting Requirements Group

00 0101	Project Title Page
00 0107	Seals Page
00 0110	Table of Contents

This project manual to include the following lease leaseback documents once executed:

1. Construction Services Agreement
2. Sublease
3. Site Lease

Divisions 02 through 033 may include the following reference:

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

Contractor to refer to the Construction Services Agreement for any General Conditions, Supplementary Conditions and Division 01 sections in governing this project.

Division 02 Existing Conditions

02 4100 Site Demolition

Division 03 Concrete03 1100 Concrete Forming
03 2000 Concrete Reinforcing
03 3000 Cast-In-Place Concrete
03 3500 Concrete Finishing**Division 04 Masonry**04 0500 Common Work Results for Masonry
04 2200 Concrete Unit Masonry**Division 05 Metals**

05 5000 Metal Fabrications

Division 06 Wood, Plastics and Composites06 1000 Rough Carpentry
06 4116 Plastic Laminated Clad Cabinets**Division 07 Thermal and Moisture Protection**07 2100 Thermal Insulation
07 2500 Weather Barriers
07 4113 Standing Seam Metal Roof Panels
07 5216 SBS Modified Bituminous Membrane Roofing, Hot Applied
07 6200 Sheet Metal Flashing and Trim
07 6500 Flexible Flashing
07 7123 Gutters and Downspouts
07 9200 Joint Sealants**Division 08 Openings**

08 7100 Door Hardware

Division 09 Finishes

09 2236	Lath
09 2423	Portland Cement Stucco
09 2816	Glass-Mat Faced Gypsum Backing Boards
09 2900	Gypsum Board
09 3000	Tiling
09 5113	Acoustical Panel Ceilings
09 6500	Resilient Flooring
09 6513	Resilient Base and Accessories
09 6813	Tile Carpeting
09 9100	Painting

Division 10 Specialties

10 1400	Signage
10 2113	Toilet Partitions
10 2813	Toilet Accessories
10 4400	Fire Protection Specialties

Division 12 Furnishings

12 3624	Plastic-Laminated-Clad Countertops
12 9300	Site Furnishings

Division 22 Plumbing

22 0510	Plumbing General Provisions
22 0553	Identification for Plumbing Piping and Equipment
22 0719	Plumbing Piping Insulation
22 1005	Plumbing Piping
22 1006	Plumbing Piping Specialties
22 4000	Plumbing Fixtures

Division 23 Heating, Ventilating and Air Conditioning

23 0510	Mechanical General Provisions
23 0553	Identification for HVAC Piping and Equipment
23 0719	HVAC Piping Insulation
23 8126.13	Small-Capacity Split-System Air Conditioners

Division 26 Electrical

26 0110	Electrical General Requirements
26 0526	Grounding and Bonding
26 0529	Supporting Devices
26 0534	Raceways
26 0537	Boxes
26 0553	Identification for Electrical System
26 2716	Electrical Cabinets and Enclosures
26 2726	Wiring Devices

Division 27 Telecommunications

27 0500	Common Work for Communications
27 0526	Communications Grounding and Bonding
27 0529	Communications Supporting Devices
27 0533	Communications Back Boxes
27 0539	Raceways for Communication Systems
27 1323	Fiber Optics Cabling
27 1500	Structured Cabling
27 5000	School Communication System Updated
27 5123	Educational Intercommunications and Program Systems
27 5126	Assistive Listening

Division 28 Electronic Safety and Security

28 2000	Digital Video Security System
28 3120	Fire Alarm System
28 3200	Intrusion Alarm System

Division 31 Earthwork

31 0000	Earthwork
31 2333	Trenching and Backfilling

Division 32 Exterior Improvements

32 1200	Asphalt Concrete Paving
32 1600	Site Concrete
32 1723	Pavement Markings
32 1726	Tactile Warning Surfacing
32 3113	Chain Link Fences and Gates
32 3119	Decorative Metal Fences and Gates
32 8000	Irrigation
32 9000	Landscaping

Division 33 Utilities

33 4000	Site Drainage
---------	---------------

END OF SECTION

SECTION 02 4100

SITE DEMOLITION

PART 1 – GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 50 00, Construction Facilities and Temporary Controls.
- B. Section 01 57 13, Erosion Control
- C. Section 31 00 00, Earthwork.

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable jurisdictional authority regulations and codes for disposal of debris.
- B. Coordinate clearing Work with utility companies.
- C. Maintain emergency access ways at all times.
- D. Contractor shall comply with all applicable laws and ordinances regarding hazardous materials, including contaminated soils, hazardous material transformers, and similar materials or components.

1.04 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.

1.05 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.

1.06 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, the Contractor shall be solely and completely responsible for working conditions at the job site, 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 on site. Demolish roofs, walls and other building elements in such manner that demolished materials fall within foundation lines of building. Do not allow demolition debris to accumulate on site. Pull down hazardous work at end of each day; do not leave standing or hanging overnight, or over weekends.
 - 1. Protect existing items which 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: The 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 the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- G. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The 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.

PART 2 - PRODUCTS

Not Used

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine conditions of work in place before beginning work; report defects.
- B. Report existence of hazardous materials or unsafe structural conditions.

3.02 PREPARATION

A. Scheduling:

1. General: Coordinate and schedule demolition work as required by the 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 the 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 Owners 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. The 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 the Owner and all protective measures are in place.

E. Coordinate the time and duration of all system disconnects with Owner.**3.03 DEMOLITION****A. General Requirements**

1. Clear areas required for access to site and execution of Work, including pavements, 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.

3.04 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 the 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.

3.05 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.

3.06 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 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 which 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 1 inch in diameter to a depth of two feet below existing or finished grades, whichever is lower and a minimum of five feet beyond the edge of paving, structure, wall or walkway.
 4. Hand cut existing tree roots over 1 inch 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 drying 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.
 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.

3.07 DISPOSAL

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

- A. Dispose of all demolished material, trash, debris, and other materials not used in the work in accordance with the regulations of jurisdictional authority.
- B. 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) in compliance with the 2022 CalGreen Section 5.408.
- C. Burning and Burying of Materials: NOT ALLOWED.
- D. 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.
- E. Remove demolished materials and debris from site on a daily basis.

3.08 CLEANING

- A. Upon completion of work of this Section promptly remove from the working area all scraps, debris.
- B. Clean excess material from 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

SECTION 03 1100**CONCRETE FORMING****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Furnish, install and remove forms for cast-in-place concrete including shoring and form supports.
- B. Related Sections:
 - 1. Section 03 2000, Concrete Reinforcing.
 - 2. Section 03 3000, Cast-In-Place Concrete.
 - 3. Section 03 3500, Concrete Finishing.
 - 4. Section 06 1000, Rough Carpentry.
 - 5. Section 32 1600, Site Concrete.

1.02 REFERENCES

- A. The following references, codes and standards are hereby made a part of this Section. Formwork shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.
 - 1. "Recommended Practice for Concrete Formwork", ACI 301,318 & 347,2014.
 - 2. California Building Code (CBC), current edition.

1.03 QUALITY ASSURANCE

- A. Allowable Tolerances: Design, construct, set and maintain the formwork so as to insure complete work within the suggested tolerance limits specified in ACI 347-78, Section 3.3.1. See Section 03 3500 for slab tolerances.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Earth Forms: Unless otherwise indicated or required by the Structural Drawings, concrete for footings may be placed directly against vertical excavated surfaces provided the material will stand without caving and provided that minimum reinforcing steel clearances indicated on Drawings are maintained and suitable provisions are taken to prevent raveling of top edges or sloughing of loose material from walls of excavation. Sides of excavation shall be made with a neat cut and the width made as detailed on Drawings. Concrete which is exposed to view on exterior shall be formed to a minimum depth of 0'-6" below finished grade.
- B. Wood Forms:
 - 1. Exposed Concrete Not Otherwise Noted or Specified: APA Plyform, Grade B-B, Class I or II (as per strength and tolerance requirements), Exterior Grade.
 - 2. Unexposed Concrete Not Otherwise Specified: Of sufficient design and strength to hold concrete properly in place and alignment.
 - 3. Framing: At Contractor option subject to meeting necessary strengths and surface tolerances.

- C. Form Release Agents:
 - 1. Exposed Concrete Including Surfaces to Receive Paint and Other Coatings: Chemically active type producing water insoluble soaps. Form release agents shall be delivered in manufacturer's sealed and trademarked containers and shall be guaranteed to provide clean, stain-free concrete release and not to interfere with future applied coatings and finishes. Release agents shall contain no petroleum solvents such as creosote, paraffin, waxes or diesel oil.
 - 2. Unexposed Concrete: Contractor option except that release agents shall not interfere with bond of any applied finish.
- D. Form Ties: Contractor option except that wire ties and wood spreaders are not allowed for exposed concrete. Wood spreaders shall not remain in concrete.

PART 3 EXECUTION

3.01 PREPARATION

- A. Vertical and Horizontal Controls: Establish and maintain necessary benchmarks, lines, or controls throughout construction.
- B. Secure information and provide for openings, sleeves, chases, foundation vents, pipes, recesses, nailers, anchors, ties, inserts, and similar embedded items. Coordinate with concrete work for requirements governing embedment and sleeving of pipes and conduit.

3.02 ERECTION

- A. Formwork - General: Construct wood forms of sound lumber, straight and rigid, thoroughly braced, mortar tight, and of such strength that the pressure of concrete and the movement of men and equipment will not displace them. Visible waves in exposed concrete surfaces after stripping of forms may result in rejection of that portion of the concrete. The design and engineering of formwork shall be the complete responsibility of the Contractor.
- B. Plywood Forms for Exposed Concrete: Plywood panels shall be clean, smooth, uniform in size, and free from damaged edges or faces (including holes other than those required for form ties). Make joints plumb. Block plywood edges which do not occur at bearing points in order to eliminate joint offsets.
- C. Framing and Bracing: Framing, bracing and supporting members shall be of ample size and strength to safely carry, without excessive deflection (exceeding allowable tolerances), all dead and live loads to which formwork may be subjected, and shall be spaced sufficiently close to prevent any apparent bulging or sagging of forms.
- D. Form Ties: Form ties shall be of sufficient strength and used in sufficient quantities to prevent spreading of the forms. Ties for exposed concrete surfaces shall be arranged symmetrically.
- E. Arrange forms to allow proper erection sequence and to permit form removal without damage to concrete.
- F. Form Release Agent: Thoroughly clean forms and coat with release agent prior to initial use and before each reuse. Apply release agent in strict accordance with manufacturer's directions and coverage recommendations avoiding starved areas or excessive applications. Apply release agents before reinforcing steel is placed.
- G. Prior to placement of concrete, remove dirt, debris and foreign material from forms. Leave no wood in concrete except nailers or dividers.

- H. Provide chamfer strips at all concrete edges; use $\frac{3}{4}$ " x $\frac{3}{4}$ " except as noted on drawings.

3.03 INSTALLATION

- A. Provide formed openings where required for work embedded in or passing through concrete.
- B. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.04 CONSTRUCTION

- A. Falsework: Contractor shall be fully responsible for proper strength, safety and adequacy of falsework, supports and bearing surfaces therefor used on and in connection with the work. Falsework shall be designed to support imposed loads without deformation, deflection or settlement.
- B. Removal Of Forms And Falsework:
 - 1. The removal of forms and falsework shall be carried out in such manner as to ensure the complete safety of the structure. Supports shall not be removed until members have sufficient strength to safely support their own weight and any superimposed loading with proper factor of safety.
 - 2. After concrete is placed, the following minimum times shall elapse before the removal of forms:
 - a. Side Forms (Foundations): 24 hours.
 - 3. Upon removal of forms, bolts, wires, clamps, rods, etc., not necessary to the work, shall be removed to a minimum of 1 inch from the surface. The Contractor shall so conduct his operations as to eliminate any danger of rust stains from form tie materials or other unprotected ferrous materials embedded in or adjacent to exposed concrete surfaces.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 03 2000**CONCRETE REINFORCING****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Reinforcement for cast-in-place concrete work.
- B. Related Sections:
 - 1. Section 03 1100, Concrete Forming
 - 2. Section 32 1313, Concrete Paving
 - 3. Section 03 3000, Cast-In-Place Concrete
 - 4. Section 05 5000, Metal Fabrications
 - 5. Section 06 1000, Rough Carpentry

1.02 REFERENCES

- A. The following references, codes and standards are hereby made a part of this Section. Reinforcement shall conform to the applicable requirements therein except as otherwise specified herein or shown on the drawings. Nothing contained herein shall be construed as Permitting work that is contrary to code requirements.
- B. American Concrete Institute, ACI:
 - 1. ACI 301 – Specifications for Structural Concrete.
 - 2. ACI 315 – Details and Detailing of Concrete Reinforcement.
- C. ANSI/AWS D1.4 – Structural Welding Code, Reinforcing Steel.
- D. Concrete Reinforcing Steel institute, CRSI:
 - 1. CRSI - Manual of Standard Practice, latest edition.
 - 2. CRSI 65 – Recommended Practice for Placing Reinforcing.
- E. American Society for Testing and Materials, ASTM:
 - 1. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 2. ASTM A706 – Standard Specification for Low-alloy Steel Deformed Bars for Concrete Reinforcement.
- F. California Building code (CBC) Current edition.

1.03 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit fully detailed shop drawings, including bending schedules and bending diagrams to the Architect for review. Shop drawings shall show placing details and size and location of reinforcing steel.
 - 2. Shop drawing shall be of such detail and completeness that fabrication and placement at the site can be accomplished without the use of project or contract drawings for reference.
 - 3. Check civil, landscape, architectural, structural, mechanical, plumbing, electrical and fire protection project or contract drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, and other items which are required to be cast in concrete. Make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

4. Reinforcing steel shall not be fabricated or placed before the shop drawings have been reviewed by the Architect and returned to the Contractor. Review of shop drawings by the Architect will not relieve the Contractor of responsibility for errors or for failure in accuracy and complete placing of the work.
- B. Mill Test Reports: Submit certified mill test reports, tensile and bending, for each heat or melt of steel shall be submitted to the Architect before delivery of material to the site. Where reinforcing is required to be welded, mill test reports shall verify the weldability of the steel.

1.04 QUALITY ASSURANCE

- A. Where certified mill test reports are not furnished, conform to the following:
- B. Test reinforcing bars in tension and bending per ASTM A 615. Testing shall be done by the Owner's testing agency. Furnish one copy of test reports to Architect, Structural Engineer, Owner and Contractor.
- C. The testing agency will take samples from bundles as delivered from the mill. Where bundles are identified by a heat number and a mill analysis accompanies to report, one tensile and one bending test specimen will be taken from each 10 tons or fraction thereof, of each size and kind of bar. Where positive identification of heat numbers cannot be made or where random samples are taken, one series of tests shall be made from each 2-1/2 tons or fraction thereof, of each size and kind of bar.
- D. The cost of tests, sampling and handling of reinforcing steel shall be paid by the Owner. Re-testing by Contractor.
- E. Include material required to provide samples for testing.
- F. The following is subject to Special Inspection as required by the CBC. Costs for the following will be paid by the Owner.
 1. Placement and welding of reinforcing steel in masonry walls requiring special inspection.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcing to project site properly bundled and tagged, and stored so as to prevent excessive rusting or fouling with grease or other coating that will interfere with bond. Segregate so as to maintain identification after bundles are broken. Do not use damaged, reworked, or deteriorated material.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Bars:
 1. New, free of loose rust.
 2. Billet Steel Bars: ASTM A 615, Grade 60, including supplementary requirements S1, weldable where indicated or required.
- B. Welded Wire Fabric: STM A 185.
- C. Tie Wire: #16 minimum, black and annealed.

- D. Accessories: Metal or plastic spacers, supports, ties, etc., as required for spacing, assembling, and supporting reinforcing in place. Legs of accessories to be of type that will rest on forms without embedding into forms. Galvanize metal items where exposed to moisture, or use approved other non-corrodible, non-staining supports.

2.02 FABRICATION

- A. Comply with details on Drawings.
- B. Where specific details are not shown or noted, do detailing and fabrication in conformance with, or superior to, requirements contained in ACI 315.
- C. Clean bars of loose rust, loose mill scale and substance which may decrease bond. Bend bars cold and accurately to details on reviewed shop drawings.
- D. Shop fabricate reinforcing.

PART 3 EXECUTION

3.01 ERECTION

- A. General: Place reinforcing steel in accordance with the Drawings, reviewed shop drawings and these Specifications. Install reinforcing accurately and secure against movement, particularly under the weight of workmen and the placement of concrete.
- B. Reinforcing Supports:
 - 1. Accurately locate reinforcing in the forms and hold in place by means of supports adequate to prevent displacement and to maintain reinforcing at proper distance from form face. Supports and their placement shall comply with CRSI "Placing Reinforcing Bars". The use of wood supports and spacers inside the forms is not permitted except as noted in Concrete Forming Section.
 - 2. Support reinforcing for on-grade slabs by wiring to precast concrete blocks spaced 3 feet on center maximum both ways, staggered. Size blocks so that reinforcing is maintained at the center line of the slab.
- C. Obstructions: Where conduit, piping, inserts, sleeves, etc., interfere with placing of reinforcing steel, obtain approval of method of procedure before concrete is placed. Bending of bars around openings or sleeves is not permitted.
- D. Tying: Rigidly and securely tie reinforcing with steel tie wire at splices, crossing points and intersections in the position shown. After cutting bend tie wires in such a manner that concrete placement will not force the wire ends to the surface of exposed concrete.
- E. Welded Wire Fabric: Fabric shall be in as long lengths as practicable and shall be wired at laps.
 - 1. Edge Laps: 2 inches minimum of selvage wires.
 - 2. End Laps: 2 inches minimum greater than transverse wire spacing. Offset end laps in adjacent widths.
- F. Dowels: Tie securely in place before concrete is deposited. In the event there are no bars in position to which dowels may be tied, add bars to provide proper support and anchorage. Minimum bar size for added reinforcing is number 3. Bending of dowels after placement of concrete is not permitted.
- G. A minimum class [C] [B] lap splice as defined by ACI 318 is required for each case not otherwise shown on Drawings. Stagger splices where possible.

- H. Welding: Do welding by Cadweld T series for bars #10 and larger or as noted on Drawings. No welding of reinforcing steel or of attachments to reinforcing steel will be permitted unless the chemistry of the steel conforms to AWS D12.1 and is so established by the mill certificates. If welding is to be done, welds must be approved by the Structural Engineer and welding shall comply with requirements and procedures established by AWS D12.1. Thoroughly clean welding material, wire cuttings, and tramp metal from forms for exposed concrete before concrete is placed.
- I. Minimum coverages for reinforcement:
 - 1. Wall Surface Exposed to Weather: 1-1/2 inches
 - 2. Formed Surface in Contact with Earth: 2 inches
 - 3. Unformed Surface in Contact with Earth: 3 inches
- J. Reinforcing laps and splices shall be a minimum of 64 bar diameters in concrete, but never less than 24 inches for cases not otherwise shown on drawings.
- K. At time of placing concrete reinforcing must be free of coatings that would impair bond.

END OF SECTION

SECTION 03 3000**CAST-IN-PLACE CONCRETE****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Furnish and install cast-in-place concrete required for the project as shown on the Drawings and specified herein. This Section also includes:
 - 1. Concrete for work specified in Mechanical and Electrical Divisions unless specifically included therein.
 - 2. Grouting of bases and equipment not specified under other Sections.
 - 3. Coordination with other trades with regard to requirements for special bases, sleeves, chases, inserts, finishes or other provisions.
 - 4. Curing of formed concrete surfaces.
- B. Related Sections:
 - 1. Section 03 1100, Concrete Forming.
 - 2. Section 03 2000, Concrete Reinforcing.
 - 3. Section 03 3500, Concrete Finishing.
 - 4. Division 22, Plumbing.
 - 5. Division 26, Electrical.
 - 6. Section 32 1600, Site Concrete.
 - 7. Section 33 4000, Storm Drainage.

1.02 REFERENCES

- A. The following references, codes and standards are hereby made a part of this Section. Concrete work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.
- B. "Building Code Requirements for Reinforced Concrete", ACI 318, 2018 Edition.
- C. California Building Code, CBC, current edition.

1.03 SUBMITTALS

- A. Comply with requirements of Section 01 3323, Submittals. Place no concrete until submittals have been accepted.
- B. Mix designs, submit information as specified herein.
- C. Construction Joints: Submit shop drawings showing proposed locations and details.
- D. Structural Engineer of Record and District's testing laboratory must approve all mix designs.
 - 1. Submit manufacturer's standard details for sealing penetrations of the membrane and/or installers recommended sealing details.

1.04 QUALITY ASSURANCE

- A. Tests and inspections shall be performed by qualified individuals, engineering companies or testing laboratories who shall perform those special inspections required by CBC, those tests and inspections specified below and such other tests and inspections as the

Architect or Owner may require to establish the acceptability of the work.

- B. Testing and inspection services shall be retained by the Owner at his expense except that when tests or inspections reveal failure of materials to meet the contract requirements, costs for subsequent tests and inspections will be deducted from monies due the Contractor. Excessive inspection time required by Contractor's failure to provide sufficient workmen or to properly pursue the progress of the work shall likewise be deducted.
- C. Furnish material and handling for test cylinders and other samples which testing agency requires for analysis of concrete work.
- D. Compression Tests: 3 compression test cylinders as per ASTM C 31. One cylinder will be broken at 7 days; one at 28 days; and one retained as a spare. Cylinders will be numbered in sets (1A, 1B, 1C; 2A, 2B, 2C; etc.) and a record kept of extent of pour represented by each set and type of concrete tested. Cylinders will be broken in accordance with ASTM C 39. If a test report indicates 28-day specimen below required strength (within standard of acceptability established by ACI 318), and if required by Architect, testing agency will take test cores of hardened concrete in accordance with ASTM C 42. Such concrete shown to be defective shall be removed and replaced. Cost of core tests, repairs and removal and replacement of defective concrete shall be paid by Contractor.
- E. Cold Weather Concreting: Take one additional test cylinder and cure on project site under same conditions as concrete it represents.
- F. Slump Test: Take one for each set of test cylinders taken.
- G. Testing agencies will supervise preparation and selection of samples taken at job site.
- H. The following is subject to Special Inspection as per CBC. Costs therefore will be paid by the Owner.
 - 1. Taking of compression test specimens.
 - 2. Placement of reinforced structural concrete.

1.05 PROJECT CONDITIONS

- A. Project Environmental Requirements:
 - 1. Cold Weather Requirements: Comply with "Recommended Practice for Cold Weather Concreting", ACI 306R, latest edition.
 - 2. Hot Weather Requirements: Comply with "Recommended Practice for Hot Weather Concreting", ACI 305R, latest edition.

1.06 WARRENTY

- A. Require unconditional two (2) year installation warranty commencing on date of "Substantial Completion" for cracking.
- B. Require a site review with the District Project Manager prior to expiration of warranty as condition to end installation warranty period.

1.07 PRE-INSTALLATION MEETING

- A. Schedule a pre-installation meeting with Architect, Owner's Representative, Project Inspector, and Contractor in attendance.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All concrete to be batched in a certified plant capable of achieving DSA waiver of continuous batch plant inspection in accordance with CBC. 1705A.3.3
 - 1. All concrete to be produced by the same batch plant.
 - 2. Structural concrete mix design shall yield specified strength prior to 28 days.
- B. Cement: ASTM C 150, Type I or II, Portland Type. Cement shall be of same brand, type and source throughout project. Where aggregates are potentially reactive, use low alkali cement.
- C. Aggregates: ASTM C 33 and C 88 from sources with proven history of successful use. Source shall be constant unless 10 days' prior notice is given for approval after recheck of mix design.
 - 1. Fine Aggregate: Natural sand with sand equivalent of not less than 75 when tested as per Test Method Calif. 217-E.
 - 2. Coarse Aggregate: Fine grade, sound crushed stone, natural gravel or granite with cleanness value not less than 75 when tested as per Test Method Calif. 227.
- D. Water: Clean and potable, free from impurities detrimental to concrete.
- E. Admixtures:
 - 1. Air Entrainment Admixtures: ASTM C R60.
- F. Expansion Joint Fillers (On-Grade Slabs, Walks, Curbs, Gutters and Similar Flatwork Where Joints Are Not Otherwise Noted or Specified): ASTM D 994-71, asphaltic compound strips, 1/4" thick unless otherwise noted, precut to proper size.
- G. Non-Shrink Grout (Metallic): Master Builders "Embeco 636", Sonneborn-Contech "Ferrolith G", or approved equal, premixed metallic grout.
- H. Non-Shrink Grout (Non-Metallic): Sauereisen No. F-100, Sonneborn Contech "Fondag", Upco "Upcon", 5-Star, Master Builders "Masterflow 713", or approved equal, nonmetallic, nonstaining, premixed grout having a compressive strength at 28 days of not less than 6800 psi.
- I. Curing Compounds: Comply with the requirements of Section 03 3500 Concrete Finishing, and Section 07 2613 Above Grade Vapor Retarder.
- J. Bonding Agent: Polymer Resin Emulsion.
- K. Fly Ash: Fly ash which may be used to reduce cement content shall conform to ASTM C618, Class F. Fly ash may replace up to 15 percent of cement by the use of 125 pounds of fly ash for each 100 pounds of cement removed. Submit mix design and test reports verifying compliance.

2.02 MIXES

- A. Concrete: Ready mixed as per ASTM C 94. Equipment shall be adequate for the purpose and kept in good mechanical condition. Mix and deliver concrete in accordance with ASTM L94 Alternative 4.
- B. Provide concrete in the following strength:
 - 1. 3000 psi (28 days) normal weight (145 pcf) concrete for spread footings and grade beams.
 - 2. 3000 psi normal weight (145 pcf) concrete for slab on grade.
 - 3. 3000 PSI (28 Day) Normal Weight (145 PCF) for concrete equipment pad and curbs.
 - 4. 2500 psi (28 day) normal weight 145 plf for miscellaneous concrete, non-structural flatwork.

- C. Select admixture proportions for normal weight concrete in accordance with ACI 318.
- D. The water/cement ratio for concrete slabs/mats should be in the range of 0.45 to 0.50.
- E. Add air-entraining agent to concrete mix for work exposed to exterior.
- F. Walks, Curbs and Paving: Comply with the requirements of Section 32 1600, Site Concrete.
- G. Mix designs for concrete shall be Contractor-designed at his expense. Designs shall be prepared by a qualified agency approved by the Architect. Submit four copies of mix designs for Architect's review prior to placing concrete. Indicate brands, types and quantities of admixtures included. If concrete is to be placed by pumping, follow recommendations of ACI Committee 304. Mix designs must include strengths and slumps. Concrete mix design shall be per Section 1905A.1 of CBC 2022.

PART 3 EXECUTION

3.01 PREPARATION

- A. Notify Architect 48 hours minimum prior to placing of concrete.
- B. Thoroughly wet absorbent forms before concrete is placed. Aggregate base for slabs on grade shall be moist but not saturated when concrete is placed.
 - 1. Remove debris, mud and water from places to receive concrete.
- C. Place no concrete until reinforcing for same is fastened in place and until forms are complete. Place no concrete before work that is to be embedded has been set. Notify other trades so they may deliver anchors, inserts, etc., or other work to be embedded in ample time and also notify them when their assistance in setting is required. Do not disturb reinforcing or other materials that have been set in place.
- D. No pipes- except electrical conduits 1-1/4 inches and less in diameter shall be embedded in structural concrete. Before placing concrete, such pipes and large conduits shall be sleeved providing minimum 1/4 inch clearance all around. Position sleeves so as not to impair strength of surrounding elements. Sleeves and inserts will be provided and set under other sections of the work.

3.02 INSTALLATION

- A. Place concrete immediately after mixing. Do not place or use concrete after it has begun to set. Retempering is not allowed. Convey and deposit concrete into place without separation of the ingredients. No concrete shall be placed with a free unconfined fall in excess of five feet nor shall it be allowed to cascade through reinforcing steel in such manner as to promote segregation. Do not support runways on reinforcing steel.
- B. Deposit concrete in approximate horizontal layers not exceeding 18 inches in thickness, unless otherwise authorized. Place concrete in a continuous operation without interruption until placing of course, section, panel or monolith is completed.
- C. Distribution of concrete shall be even and continuous and no pour joints shall show. Before a pour is started, make certain that adequate equipment; men and concrete will be available to pour in cycles which will permit proper and thorough integration of each layer of concrete. Upon stopping off a pour, the top surface shall be on a level. Space points of deposit in walls so that it will not be necessary for concrete to flow laterally more than 24 inches.

1. Place concrete continuously between expansion joints, control joints, and construction joints.
2. Maintain continuous and accurate log of placing of concrete in structure.

- D. Install various inserts, anchorages, etc., required by public and private utility companies to accommodate miscellaneous metal items and equipment furnished by them.
- E. Provide formed openings where required for work passing through or embedded in concrete members.
- F. Place no concrete in water unless written permission has been obtained from Structural Engineer.

3.03 CONSTRUCTION

- A. Vibration and Compaction: Concrete shall be thoroughly compacted by means of internal mechanical vibrators. Such compaction shall be produced as will be obtained by placing the vibrator directly in concrete at 18 inch to 30 inch intervals for a period of approximately 5 to 15 seconds and withdrawing slowly or as directed, depending on the consistency of concrete.
 - 1. One vibrator will be required for each location where simultaneous placing takes place, to ensure thorough vibrating of each section. Provide sufficient spare vibrators on the project so as to have them readily available in case a vibrator in use should suddenly cease to function properly. Where spare vibrators are employed, provide additional spares.
 - 2. Under no condition shall vibrator be placed against reinforcing steel or attached to forms. Use no vibrators to transport material.
 - 3. Vibrator shall be of the flexible immersion type having a frequency of not less than 7,000 rpm. Submit manufacturer's specifications of vibrator.
 - 4. Eliminate voids and rock pockets.
- B. Construction Joints: Placement of construction joints and the manner in which they are provided for shall be as approved by Architect or as shown on the Drawings. Construction joints shall be as few as possible and will not be permitted simply to save forms.
 - 1. Under no condition will construction joints be permitted in exposed concrete surfaces other than where specifically shown and specified.
 - 2. Clean and roughen construction joints including keys by removing entire surface and exposing clean aggregate solidly embedded by means of sandblasting or other approved methods. Clean forms and reinforcing of drippings, debris, etc.
 - 3. Just before starting of new pour, cover horizontal surfaces with 1/2 inch to 1 inch thickness of grout composed of cement and fine aggregate of the same proportion as that used in concrete work, but omitting the 1-1/2 inch aggregate where 1-1/2 inch is the maximum size, or 1/2 of the 3/4 inch aggregate where 3/4 inch is the maximum size. Proportions will be determined by the testing agency.
- C. Curing Formed Concrete: Keep formed concrete surfaces continuously wet both in forms and after removal of forms for at least seven days after placing. Keep wood forms wet. If forms are permitted to be removed prior to expiration of curing period, keep exposed concrete surfaces continuously wet. Application of curing compounds shall conform to requirements of Concrete Finishing Section.
- D. Equipment Bases: Verify sizes and shapes required by items specified elsewhere. Install concrete bases for special equipment in strict accord with Drawing details and the specifications and recommendations of the equipment manufacturer.
- E. Expansion Joint Fillers: Place asphaltic filler material so that top of surface is level and aligned uniformly 1/4 inch below adjacent concrete surface. Provide where slabs abut vertical surfaces, at not over 24 ft. centers horizontally in paving and at other locations so noted on Drawings. Follow Drawings for pattern where indicated; where not indicated, coordinate locations with Architect before proceeding.

- F. Grouting: Grout shall be metallic or non-metallic, non-shrink grout mixed and applied in strict accordance with manufacturer's directions, except use non-metallic only where grouting is exposed in the finished work.

3.05 REPAIR/RESTORATION

- A. Modify or replace concrete not conforming to required lines, details and elevations, as directed by Architect.

3.06 CLEANING

- A. Remove splash or accumulations of hardened or partially hardened concrete. Protect contact faces of forms for exposed concrete from splash during placing of adjacent concrete. Place concrete containing piping in a manner that will prevent damage to pipes.

END OF SECTION

SECTION 03 3500**CONCRETE FINISHING****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Finishing required on exposed cast-in-place concrete surfaces including patching and curing of cast-in-place concrete.
- B. Related Sections:
 - 1. Section 03 3000, Cast-In-Place Concrete.
 - 2. Section 07 9200, Joint Sealants.
 - 3. Section 09 6500, Resilient Flooring.
 - 4. Section 09 6513, Resilient Base and Accessories.
 - 5. Section 09 6813, Tile Carpeting.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Curing Materials:
 - 1. Curing Paper: ASTM C 171-69, non-staining waterproof paper, regular type.
 - 2. Curing Compounds: ASTM C 309-74, Type 1, clear resin type free of oil, wax grease, or other substance which might prove deleterious to any material to be applied to concrete. Curing compounds for exposed class shall be a multi-purpose curing-hardener-sealer type equivalent to Sonneborn-Contech "Kure-N-Seal", L&H "Dress & Seal" or Protex "Triple Seal".

PART 3 EXECUTION**3.01 CURING**

- A. Cure concrete by use of curing paper or curing compounds, as specified herein.
- B. Do not use curing compounds on surfaces when their use may be detrimental to bonding of concrete, joint sealants or the specified surface finish or coating. Use curing-hardener-sealer type compounds for exposed slabs.
- C. Curing Compound - General:
 - 1. Apply immediately following completion of specified finishing.
 - 2. When applying compound, the surfaces shall be damp but free from standing water.
 - 3. Cover surfaces with a uniform and even film of compound, as supplied. Using pressurized spray equipment, apply in a single coat to achieve total coverage as recommended by manufacturer.
 - 4. When curing compound is applied inside enclosed spaces, provide and maintain adequate ventilation throughout the periods of application.

- D. Paper Curing: Concrete not otherwise permitted to be cured by curing compound shall be paper cured as follows:
1. Saturate slabs such that free moisture occurs over the entire area.
 2. After dampening, immediately cover slabs with curing paper lapped 4 inches at joints and sealed with adhesive tape or waterproof glue. Curing paper shall remain in place for not less than 10 calendar days. During curing period, scuffed or torn areas must be promptly recovered with additional papers. Do not use curing papers, which contain a distinct thread design that may leave an impressed pattern on the slab.

3.02 FINISHING

- A. Flatwork:
1. Unless otherwise noted or specified, all slabs shall be finished monolithically. Floor slabs, which are indicated as sloped to floor drains, shall be sloped uniformly so as to provide positive drainage of the indicated areas. Special care shall be taken that a smooth, even joint is obtained between successive pours.
 2. Tolerances:
 - a. Exposed concrete slabs and slabs to receive carpet: 1/8 inch in 8 feet with maximum high and low variance not occurring in less than 16 feet and with 1/16 inch tolerance in any one running foot with no abrupt variations.
 - b. Slabs to receive resilient flooring: 1/8 inch in 10 feet with maximum high and low variance not occurring in less than 20 feet, and with 1/16 inch tolerance in any one running foot with no abrupt variations.
 - c. Slabs to receive tile set with dry-set mortar: 1/4 inch in 10 feet.
 3. Trowel Finish (Typical for exposed interior slabs and under carpeting, resilient flooring, and all other areas not specifically noted): After the concrete slab has been screeded to finish grade and float finished, the floating shall be followed by steel troweling after the concrete has hardened sufficiently to prevent excess fine material from working to the surface. Jitterbugs shall not be used where slabs are exposed. The finish shall be brought to a smooth uniform surface free from defects and blemishes. No dry cement or mixture of dry cement and sand shall be sprinkled on the surface.
 4. Broom Finish (Typical for exterior flatwork unless noted otherwise): After screeding and floating, the concrete slab shall be given a light steel troweling to seal the surface and remove any irregularities left by the wood float. Just before the concrete becomes non-plastic, the surface of the concrete shall be given a broom finish with a broom not less than 18 inches wide. The broom shall be pulled gently over the surface of the concrete from edge to edge. Adjacent strokes shall be slightly overlapped. Unless direction of brooming is indicated on Drawings, brooming shall be perpendicular to the line of traffic and so executed that the corrugations thus produced will be free from porous spots, irregularities, depressions, and small pockets or rough spots such as may be caused by accidentally disturbing particles of coarse aggregate embedded near the surface. See Section 32 1600, Site Concrete for broom finishes at all accessible paths of travel.
 5. The surface of exterior concrete slabs and walks shall be scored as shown on Drawings or as directed by Architect using a tool which will produce a groove 1/4 inch wide at top and a depth of 1/2 inch with rounded corners. All lines shall be straight, parallel, and/or square, all intersections square cut. Edges of slabs shall be rounded in the same manner. Provide medium broom finish at horizontal concrete unless notes otherwise on drawings.
 6. Special concrete exterior slab finishes. See Drawings.
 7. Vertical and decorative concrete shall be sacked and patched.

- B. Curbs:
 - 1. Top surfaces of curbs shall be steel trowel finished as specified for slabs, edges tooled.
 - 2. Face forms shall be removed as soon as concrete has set sufficiently to retain shape. Vertical surfaces exposed in the finish work shall be plastered with cement grout where necessary and troweled smooth.

3.03 REPAIR/RESTORATION

- A. Defective Work: Finish which is not true to line and plane, which is not in conformance with specified finish and appearance requirements, which exceeds specified tolerances, which does not properly connect to adjoining work, which does not slope to drain and which has been improperly cured, will be deemed as defective. All such defective work shall be removed and replaced with proper work meeting Drawing and Specification requirements and at no added cost to the Owner.
- B. Patching: Within 3 days after stripping formwork, surface defects such as rock pockets, honeycombs, cracks, and holes shall be filled and patched. The Architect shall distinguish between concrete, which requires replacement or repair and surface defects, which require patching. Permission to patch an area shall not be construed as a waiver of the Architect's right to require complete removal of the defective work if the patching, in his opinion, does not satisfactorily restore the quality and appearance of the surface.
 - 1. At areas to be patched, chip away loose material and thoroughly wet area to at least 6 inches entirely surrounding the patch area. Coat areas with thin brush coat of fine sand-cement grout followed by patching mortar. Prepare patching mortar of the same material and proportions as used for concrete, except remove coarse aggregate. Keep water in the mix to a minimum. Do not retemper mortar by adding water. Allow mortar to stand for one-hour prior to use and mix thoroughly to prevent setting. Thoroughly compact mortar into place and screed to leave patch slightly higher than surrounding surfaces and then leave undisturbed for 1 to 2 hours to permit initial shrinkage. Finish patch to match adjacent surface.
 - 2. Solidly fill form tie holes with patching mortar as specified above and finish to match adjacent surface.

3.04 PROTECTION

- A. Contractor shall employ security forces to protect all concrete finishes during curing.
- B. Protect exposed surfaces including flat work as required to prevent damage by impact or stains from rubbish and the work of other trades. Employ security personnel for the protection of flatwork during curing.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 04 0500

COMMON WORK RESULTS FOR MASONRY

PART 1 GENERAL

1.01 SUMMARY

- A. Mortar and grout for masonry.
- B. Related Sections:
 - 1. Section 03 2000, Concrete Reinforcing.
 - 2. Section 04 2200, Concrete Unit Masonry.

1.02 SUBMITTALS

- A. Submit mix designs for mortar and grout.

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 530 and ACI 530.1.
- B. Maintain mortar mixture ingredients in quantities needed for immediate use per ASTM C279, and so as not to delay progress of the project.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
- B. Hot Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Masonry Cement: ASTM C150 Type I or II.
- B. Mortar Aggregate: ASTM C144, standard masonry type.
- C. Hydrated Lime: ASTM C207.
- D. Grout Aggregate: ASTM C404.
- E. Water: Clean and potable.
- F. Bonding Agent: Epoxy type.

2.02 MIXES

- A. Mortar: ASTM C270, Type S using the Property Method.
- B. Grout: 2000 psi strength at 28 days; 8-11 inch slump.

PART 3 EXECUTION

3.01 PREPARATION

- A. Mortar Mixing: Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.
 - 1. Add mortar color and admixtures in accordance with manufacturer's instructions, to match block color.
 - 2. Do not use anti-freeze compounds to lower the freezing point of mortar.
- B. Grout Mixing: Mix grout in accordance with ASTM C94.

3.02 INSTALLATION

- A. Install mortar in accordance with ASTM C780.
- B. Work grout into masonry cores and cavities to eliminate voids. Do not displace reinforcement.

3.03 FIELD QUALITY CONTROL

- A. Test mortar and grout in accordance with the Special Inspection Requirements specified by the plans.
- B. Testing of Mortar Mix: In accordance with ASTM C780.
- C. Testing of Grout Mix: In accordance with ASTM C1019.

END OF SECTION

SECTION 04 2200**CONCRETE UNIT MASONRY****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Concrete block masonry including reinforcing, grouting and cleaning.
- B. Related Sections:
 - 1. Section 03 2000, Concrete Reinforcing.
 - 2. Section 04 0500, Common Work Results for Masonry.
 - 3. Section 09 9100, Painting.

1.02 REFERENCES

- A. The following references and standards are hereby made a part of this Section. Masonry work shall conform to applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.
- B. International Masonry Industry Advancement Committee, IMIAC:
 - 1. IMIAC - Masonry Design Manual.
 - 2. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
 - 3. Hot Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.
- C. American Concrete Institute, ACI: ACI 530 and ACI 530.1 – Building Code Requirements and Specification for Masonry Structures.
- D. American Society for Testing and Materials, ASTM C90 – Specification for Load-Bearing Concrete Masonry Units, Current Addition.
- E. California Building Code, 2022 Edition.

1.03 SUBMITTALS

- A. Samples: Submit in duplicate for Architect's approval of color, texture and pattern of split-face block.
- B. Certificates: Provide certificates in duplicate verifying that concrete block meets the requirements of the Specifications.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver cementitious or other material to the site if the site has become lumpy, caked, hardened or air slaked from absorption of moisture.
- B. Store materials where protected from weather, contact with soil, traffic and construction operations.
- C. Handle blocks in manner to prevent chipping and breakage. Protect reinforcing steel from kinking and bending and from contamination with dirt, mud, oil and other foreign matter detrimental to bond.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Concrete Block Smooth: ASTM C 90, CBC Standard 21-4, latest edition, Type 1 - moisture controlled, Grade N, load-bearing, two cell, open end and bond beam units where indicated on Drawings or required, fm = 1500 psi.
 - 1. Size: 8 inches by 8 inches by 16 inches nominal.
 - 2. Hollow, Load Bearing Concrete Blocks.
 - 3. Max. Linear Shrinkage (ASTM C 426-70): 0.045 percent.
 - 4. Min. Tensile Strength: 135 psi.
 - 5. Color: Gray
- B. Reinforcing Steel: Conform to requirements of Drawings and Section 03 2000, Concrete Reinforcing. Provide positioning devices or other approved means for maintaining vertical and horizontal reinforcing in the locations indicated on the Drawings. Devices shall occur at top and bottom of vertical steel and at intermediate points not to exceed 192 bar diameters.
- C. Mortar: See Section 04 0500, Common Work Results for Masonry.
- D. Grout: See Section 04 0500, Common Work Results for Masonry.
- E. Preformed Control Joints: Rubber Material. Provide with corner and tee accessories, heat fused joints.
- F. Joint Filler: Closed cell polyvinyl chloride oversized 50 percent to joint width; self expanding.
- G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials, as recommended by masonry unit manufacturer.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Clean and roughen concrete at bonding surface, sandblasting where required. Bend dowels into proper alignment, straight and unkinked.

3.02 CONSTRUCTION

- A. Construct concrete block masonry in accordance with Reference Standards except where otherwise qualified or modified herein. Where standards conflict, assume the more stringent condition.
- B. Bond Pattern and Joint Treatment: Common running bond with joints tooled to a dense concave finish.
- C. Masonry units shall not be wet prior to laying.
- D. Set masonry units plumb, true to line, with level courses accurately spaced. Keep bond pattern plumb and in alignment full height of wall, corners and reveals plumb and true. Do not use line pins unless absolutely necessary and, if used, fill holes immediately with mortar when pin is withdrawn. Do cutting of facing units with a power driven Carborundum saw. No chipped faces, corners or edges permitted.
- E. Lay block with head and bed joints solidly filled with mortar for a distance in from the face of the unit equal to the thickness of the face shell.

- F. Provide cleanouts at bottom of grouted cells except that cleanouts are not required in walls four feet high and less where "low-lift" grouting is employed. Where cleanouts are required to occur on exposed masonry surface, remove entire face shell.
- G. Build in anchors, inserts, bolts, flashings, frames, etc., furnished by others, as the work progresses.
- H. Lay blocks to preserve unobstructed vertical continuity of cells.
- I. Remove overhanging mortar or obstructions from inside of cells to be grouted using high pressure jet stream or approved mechanical means.
- J. Grouting: Fill all cells with grout. Grout spaces shall not be wet at the time grout is placed. Spaces to be filled with grout shall be free from debris, mortar, etc. before filling.
 - 1. Reinforce bond beams as detailed in the plans.
 - 2. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensional position.
 - 3. Place and consolidate grout fill without displacing reinforcing.
- K. As work progresses, install built-in work furnished by other Sections.
- L. Cutting and Fitting: Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.
- M. The exposed exterior surfaces of some masonry work shall receive a cement plaster finish. See Section 09 2423, Portland Cement Stucco.

3.03 FIELD QUALITY CONTROL

- A. Tolerances:
 - 1. Maximum Variation from Plumb: 1/4 inch per story non-cumulative.
 - 2. Maximum Variation from Level Coursing: 1/8 inch in 3 ft.; 1/4 inch in 10 ft.; and 1/2 inch in 30 ft.
- B. Tests and inspections shall be performed by qualified individuals, engineering companies or testing laboratories who shall perform those special inspections required by the California Building Code, those tests and inspections specified below and such other tests and inspections as the Architect or Owner may require to establish the acceptability of the Work. Testing and inspection services shall be retained by the Owner at the Owner's expense. When tests or inspections reveal failure of materials to meet contract requirements, costs for subsequent tests and inspections shall be paid by the Contractor.
 - 1. Concrete block masonry is subject to special inspection by testing agency at Owner's expense.
 - 2. Furnish materials required for analysis of masonry work.

3.04 CLEANING

- A. Clean work as it progresses keeping exposed finished portions of the work free of soil and mortar stains. Use no acid cleaners.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 05 5000**METAL FABRICATIONS****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Items of miscellaneous metal and related accessory items required for the project and which are not specified elsewhere. Such items include, but are not necessarily limited to:
 - 1. Structural Straps/Connectors.
 - 2. Sleeves for miscellaneous metal items.
 - 3. Grouting required for setting miscellaneous metal items.
- B. Related Sections:
 - 1. Section 09 9100, Painting.
 - 2. Division 26, Electrical.

1.02 WARRANTY

- A. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion.
- B. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

1.03 SUBMITTALS

- A. Shop Drawings: Show dimensions, sizes, thicknesses, gages, finishes, joining, attachments, and relationship of work to adjoining construction. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from Drawings.
 - 1. Where materials must be set to exact locations to receive work, furnish assistance and direction necessary to permit other trades to properly locate their work.
 - 2. Where welded connectors and inserts are required to receive work, show exact locations required. Furnish drawings to the trades responsible for installing the connectors or inserts.
 - 3. Catalog work sheets showing illustrated cuts of item to be furnished, scale details and dimensions may be submitted for standard manufactured items.
 - 4. Design shop drawings under direct supervision of professional engineer experienced in design of this work, licensed in the State of California.

1.04 QUALITY ASSURANCE

- A. Qualifications: Welding procedures, welders, and tackers for structural metal work shall be qualified in accord with CBC.
- B. References and Standards: The following references and standards are hereby made a part of this Section. Miscellaneous and ornamental metal work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements or governing rules and regulations.
 - 1. "Code for Arc and Gas Welding in Building Construction" of the American Welding Society, AWS D1.1, latest edition with current supplements, revisions and addenda. Welded connections; use standard AWS A2.0 welding symbols. Indicate net weld lengths.
 - 2. "Pipe Railing Manual", published by National Assn. of Architectural Metal

- Manufacturers (NAAMM).
3. "Metal Bar Grating Manual", published by National Assn. of Architectural Metal Manufacturers (NAAMM).
 4. Steel Structures Painting Council (SSPC) Surface Preparation Specifications, Vol. 2, Painting Manual.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Standard Structural Steel Shapes, Bars and Plates: ASTM A36, latest edition and ASTM 283, latest edition.
- B. Architectural and Miscellaneous Steel Items: ASTM A 283, latest edition, grade optional.
- C. Steel Tubing:
 1. Cold Formed: Grade A or B per ASTM A 500 latest edition.
 2. Hot Formed: Welded or seamless per ASTM A 501 latest edition.
- D. Steel pipe:
 1. Type E or S: ASTM A 53, latest edition.
 2. Grade B: Structural pipe.
 3. Grade A or Type F for railings where bending is required.
- E. Downspouts: Grade A standard steel pipe, hot dipped galvanized and then painted. All downspouts to be galvanized schedule 40 steel-pipe.
- F. Sheet steel: ASTM A 446, grade B, structural quality with galvanized coating.
- G. Fastenings - General: Furnish bolts, nuts, screws, clips, washers and other fastenings necessary for proper erection of items specified herein. Use stainless steel or hot dip galvanized on exterior. On interior, match adjacent material. Bolts, ASTM Grade A 307.
- H. Welding Electrodes: As permitted by AWS Code D1.1. Where exposed, select filler metal to match base metal. Use E70xx electrodes.
- I. Paint Primer: Fed. Spec. TT-P-86, Type II or TT-P-645, zinc chromate.
- J. Non-Shrink Grout: Sauereisen No. F-100, Sonneborn-Contech "Fondag", Upco "Upcon", 5-Star, Master Builders "Masterflow 713", or approved equal, non-metallic, non-staining, premixed grout having a min. compressive strength at 28 days as required by Structural Drawings.

2.02 FINISHES

- A. Finishes shall be as noted in the following paragraphs, except as otherwise noted on the drawings or specified.
- B. All exterior metal fabricated items to be hot-dipped galvanized after fabrication.
- C. Exterior Ferrous Metal and Interior Ferrous Metal Exposed to Continuing Moisture: Welds, burrs, and rough surfaces ground smooth after fabrication and completed assembly hot-dipped galvanized and then given one shop prime coat of paint.
- C. Interior Ferrous Metal: Welds, burrs, and rough surfaces ground smooth and completed assembly cleaned, hot phosphate treated, and given one shop prime coat of paint. Hot phosphate treatment not required on items that are not exposed in the finished work or on

those items where size prohibits such treatment. Indicate on shop drawings where size prohibits such treatment. Indicate on shop drawings where treatment is proposed to be omitted.

- D. Exposed Fastenings: Match color and finish of adjacent material.
- E. Metal stair nosing (where required): Balco cast iron stair nosing or approved equal. Extend nosing full length of steps.

2.03 QUALITY

- A. Structural steel used in lateral-force-resisting systems shall conform to A 36, A 500, A 501, A 992, A 572 (Grades 42 and 50), A 913 (Grades 50 and 65) and A 588. Structural steel conforming to A 283 (Grade D) may be used for base plates and anchor bolts.
- B. Other steels permitted by the CBC may be used for the following:
 - 1. One-story buildings.
 - 2. Light-framed wall systems in accordance with Division VIII.
- C. Welds used in primary members and connections in the lateral force-resisting systems shall be made with a filler metal that has a minimum Charpy V-notch toughness of 20 ft-lbs at minus 20 degrees Fahrenheit, as determined by AWS Classification or manufacturer certification.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect surfaces to receive metal work and report defects that would interfere with the installation to the Architect. Starting work implies acceptance of surfaces as satisfactory.

3.02 CONSTRUCTION

- A. General Requirements:
 - 1. Verify measurements at project site.
 - 2. Coordinate metal work with adjoining work for details of attachment, fittings, etc. Do cutting, shearing, drilling, punching, threading, tapping, etc., required for metal or for attachment of adjacent work. Drill or punch holes; do not use cutting torch. Shearing and punching shall leave true lines and surfaces.
 - 3. Conceal fastenings where practical. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Form joints exposed to weather to exclude water.
 - 4. Make permanent connections in ferrous metal surfaces using welds where possible; do not use bolts or screws where they can be avoided.
 - 5. Provide lugs, clips, anchors, and miscellaneous fastenings necessary for the complete assembly and installation.
 - 6. Set work plumb, true, rigid, and neatly trimmed out. Miter corners and angles of exposed moldings and frames unless otherwise noted.
 - 7. Do grouting of frames, plates, sills, bolts, and similar items with non-shrink grout.
 - 8. Where items must be incorporated or built into adjacent work, deliver to trade responsible for such work in sufficient time that progress of work is not delayed. Be responsible for proper location of such items.
 - 9. Protect dissimilar metals from galvanic corrosion.
 - 10. All downspouts to have welded joints. Threaded and collard joints are not acceptable.

11. Downspouts to be water tested in presence of the Project Manager.
- B. Welding:
1. Perform all welding in accord with AWS Code D 1.1.
 2. Welds shall be made only by operators experienced in performing the type of work indicated.
 3. Welds normally exposed to view in the finished work shall be uniformly made and ground smooth.
 4. Where welding is done in proximity to glass or finished surfaces, protect such surfaces from damage due to weld sparks, spatter, or tramp metal.
- C. Bolted, Screwed, and Riveted Connections:
1. In general, use bolts for field connections only and then only as detailed. Provide washers under all heads and nuts bearing on wood. Draw all nuts tight and upset threads of permanent connections to prevent loosening. Use beveled washers where bearing is on sloped surfaces.
 2. Where screws must be used for permanent connections in ferrous metal, use flat head type, countersunk, with screw slots filled and finished smooth and flush.
 3. Where rivets are used, they shall be machine driven tight, heads centered, countersunk, and finished flush and smooth.
- D. Surface Treatment and Protective Coatings:
1. Cleaning: Thoroughly clean mill scale, rust, dirt, grease and other foreign matter from ferrous metal prior to galvanizing, hot phosphate treatment or painting. Conditions that are too severe to be removed by hand cleaning methods shall be cleaned as per SSPC "Surface Preparation Specifications", "Solvent Cleaning, SSPC-SP1-63"; "Power Tool Cleaning, SSPC-SP 3-36"; or "Brush-Off Blast Cleaning, SSPC-SP 7-63", as required.
 2. Hot Phosphate Treatment: Conform to SSPC-PT-4.
 3. Painting: After material has been properly cleaned and treated, apply shop prime coat of paint to surfaces except those encased in concrete or masonry. Apply paint as per manufacturer's directions. Spot paint abrasions and field connections after assembly. Shop coat must be dry prior to shipment to project site. Unless otherwise specified or directed, do not apply shop prime coats or stenciled or painted identification markings to galvanized surfaces.
 4. Galvanizing: Conform to ASTM A 123-78 for rolled, pressed and forged shapes, plates, bar and strip; A 153-78 for hardware items and A 386-78 for assembled steel products. Conform to ASTM A 384-76 and A 385-76, Recommended Practices, pertaining to galvanized assembled steel products. Unless otherwise permitted, do galvanizing after fabrication, in largest sections practicable. Where galvanizing is removed by welding or other assembly procedure, touch-up abraded areas with molten zinc or zinc-rich paint.

3.03 PROTECTION AND CLEANING

- A. Remove soil and foreign matter from finished surfaces and apply such protective measures as may be required to prevent damage or discoloration until acceptance of project. Protection of work and initial cleaning shall be the responsibility of each installer or erector until the installation is completed, whereupon the responsibility for subsequent protection and final cleaning shall pass to the General Contractor for the entire project. Remove protective coverings prior to acceptance of Work.

END OF SECTION

SECTION 06 1000**ROUGH CARPENTRY****PART 1 GENERAL****1.01 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 millwork and casework items and which are an integral part of wall, floor and/or ceiling construction.
 2. Plywood sheathing.
- B. Related Sections:
1. Section 03 1100, Concrete Forming.
 2. Section 05 5000, Metal Fabrications.
 3. Section 06 4116, Plastic Laminated Clad Cabinets.
 6. Section 07 9200, Joint Sealants.
 7. Section 08 7100, Door Hardware.
 8. Section 09 2236, Lath.
 9. Section 09 2423, Portland Cement Stucco.
 10. Section 09 2900, Gypsum Board.

1.02 REFERENCES

- A. The following references, codes and standards are hereby made a part of this Section. 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.
1. "Standard Grading and Dressing Rule #17, of the West Coast Lumber Inspection Bureau".
 2. "Standard Grading Rules" of the Western Wood Products Assn.
 3. "Standard Specifications for Grades of California Redwood Lumber" of the Redwood Inspection Service.
 4. UBC Standard 23-2.
 5. American Wood Preservers Assn. (AWPA) Quality Control Standards C 1, C 2, C 3, C 4, C 9, C 14, C 15, C 16, C 22, C 23, C 24, C 28 and M 4.

1.03 QUALITY ASSURANCE

- A. Lumber and plywood shall be grade or quality marked by WWPA, WCLIB, APA, 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. Maximum moisture shall be 19% prior to installation. Lumber shall exhibit no growth of fungus when installed.

1.04 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**2.01 MATERIALS**

- A. Temporary Construction: Clean lumber at Contractor's option, rough or smooth, as usage requires.
- B. Lumber Not Otherwise Specified or Noted: Douglas fir or larch, graded and grademarked according to Reference Standard 1.02 A or B, #1 grade.
 - 1. Boards: #1 Grade.
- C. Sill Plates (On Concrete): Pressure treated Douglas Fir, or construction grade Redwood.
- 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: 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.
 - 1. Bolts and Nuts: ASTM A 307, Grade A.
 - 2. Lag Bolts: Fed. Spec. FF-B-561. Pre-drill per CBC.
 - 3. Nails: Fed. Spec. FF-N-105B, common unless otherwise noted or specified.
 - 4. Joist Hangers and Framing Connectors: Simpson or approved equal, unless otherwise noted.
 - 5. Explosive Driven Fasteners: Ramset, Remington, Omark, Driv-It, 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 A 6 and quality mark as per Reference Standard 1.02 A 7.
 - 3. Treat with either 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) AWWA UCS 1, 2 or 3B quality marked).
 - b. Ammoniacal copper arsenate (ACA) or chromated copper arsenate (CCA) in a water carrier (AWWA UCS 1, 2 or 3B quality marked).
 - c. Members treated with waterborne salts shall be dried to a moisture content not exceeding 19% after treatment.
 - 4. Where possible, precut material before treatment.
 - 5. Holes and cutoffs and handling and storage shall be in accordance with AWWA 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).
- 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.

2.02 SOURCE QUALITY CONTROL

- A. Moisture Content: 19% maximum for 2x thickness and less; 19% maximum for thickness greater than 2x and less than 4x; and 19% maximum for thickness greater than 4x.

- B. Sizes: Surfaced to "DRY" sizes. Sizes noted are nominal unless shown as net.
- C. Surfacing: Wood materials exposed in the finished work shall have resawn surfaces of clean natural color unless noted or specified otherwise. Concealed framing lumber shall be S4S.

PART 3 EXECUTION

3.01 ERECTION AND INSTALLATION

- A. Code references refer to California Building Code (CBC).
- B. 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.
- C. Except as specifically shown on Structural Drawings, cutting of wood, etc., is limited to those cuts permitted by CBC.
- D. Bridging and Blocking: Conform to CBC. Provide 2x 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.
- E. 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.
- F. 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.

3.02 CONSTRUCTION - FASTENING

- A. Nailing: Except as otherwise indicated on Drawings or specified, nailing shall be as scheduled on Drawings:
 - 1. Nails or Spikes shall be common wire unless noted otherwise. Penetration of nails or spikes shall be one-half the length of the nail or spike into the piece receiving the point. However, to connect pieces 2 inches in thickness, 16d nails shall be used unless noted otherwise.
 - a. Bore holes for nails wherever necessary to prevent splitting.
 - b. Use finish or casing nails for finish work.
 - c. Use of nailing guns is as limited by CBC, and must be approved by Architect and DSA. Submittal for guns and nails is required.
- B. Bolts: Bolts shall be of sizes indicated. Drive fit with washers under nuts. Tighten bolts and screws before closing in.
- C. Framing Devices: As specified under Products, sizes as indicated. Use half-length nails where required.
- D. Lag Screws: Pre-Bore lead holes and install per CBC Section 2337, Division III.

3.03 CONSTRUCTION - FRAMING AND ROUGH CARPENTRY

- A. Sills: Shall be in long lengths of sizes shown, fastened with anchor bolts at exterior walls and with powder driven fasteners at interior walls as indicated, a minimum of 2 fasteners per piece and a bolt within 9 inches but not nearer than 6 inches from end of piece. Place malleable iron or steel plate washers but not cut washers under nuts bearing on wood. Set sills level and true and bed exterior wall sills and interior bearing wall sills on 1/2 inch dry-pack or non-shrink grout.
- B. Studs, Posts and Columns: Shall be full length. Construct corners as detailed. Form partitions or walls containing plumbing, heating or other piping as to give proper clearance for materials. Cut members as required to provide full bearing at ends. Connect to structure as indicated.
- C. Plates: Shall be in long lengths and spliced as shown.
- D. Blocking: Shall be same thickness and width of studs or joists unless shown otherwise. Blocking shall not be spaced over 8 feet on center. Install fire blocking in accordance with C.B.C., Section 708.2.1. Install blocking at plywood joints unless otherwise noted on the drawings. Install blocking for fastening surface applied items.
- E. Joists and Beams: Shall be in long lengths and spliced over bearings unless shown otherwise. Install with crown side up. Beams or headers indicated to be built up of two or more joists shall be fabricated on the job using full length members. For two piece members, stitch nail pieces together with 16d common nails spaced not over 12" o.c. and staggered. Clinch nails protruding through members.
 - 1. Provide double joists and headers at openings through floors and roofs unless otherwise shown on Drawings.
 - 2. Provide typical headers at openings through walls where one or more studs are required to be cut. For penetration through walls narrower than stud spacing, provide solid backing on sides for fastening finish materials.
- F. Plywood Structural Sheathing: Install to pattern indicated and provide blocking at joints where noted on the drawings. Center joints over bearing supports. Nail to framing as indicated. Install plywood with face plies perpendicular to joists or studs unless indicated otherwise.
- G. Wood Furring, Stripping and Grounds: Install as shown or required to provide nailing of materials or passage of pipes, conduits, etc., not otherwise accommodated.
- H. Bridging: Space not over 8 feet on center for spans over 16 feet. Place bridging at midspan for spans over 8 feet and under 16 feet. Bridging shall be two 2 by 3's or solid blocking as indicated. Bridging is not required at joists 8 inches or less in depth unless specifically indicated.
- I. Backing: Provide for wall and ceiling finishes and for supporting of fixtures and equipment for trades, including toilet partitions, toilet room accessories, frames, case work, mirrors, trim, applied wall finishes, etc. Coordinate placement of backing and supports with manufacturer or supplier of mounted items.
- J. Building Paper: Install two layers in exterior locations. Install with weather lap edges a minimum of 2 inch horizontal and 6 inch vertical laps. Continue building paper minimum 6 inches around inside and outside corners. Fasten in place with appropriate staples.
- K. Treat cuts or holes in preservative treated wood in accordance with AWPB standard M4 in the field.

END OF SECTION

SECTION 06 4116**PLASTIC LAMINATE CLAD ARCHITECTURAL CABINETS****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Provide cabinets where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
 - 1. Cabinets shall be Plastic Laminate per the Millwork Manual Section 15 and meet the seismic requirements per Title 24 CCR.
- B. Related Sections:
 - 1. Section 06 1000, Rough Carpentry.
 - 2. Section 08 7100, Door Hardware.
 - 3. Section 09 9100, Painting.
 - 4. Section 12 3624, Plastic-Laminate-Clad Countertops.
 - 5. Division 26, Electrical.

1.02 DEFINITIONS

- A. Definitions:
 - 1. Exposed Work: Surfaces visible when doors and drawers are closed.
 - a. Bottoms of cases more than 4'-0" above the floor will be considered as exposed.
 - b. Visible members in open cases, or behind doors of clear glass, will be considered as exposed.
 - 2. Semi-Exposed Work: Members behind opaque doors, such as shelves, divisions, interior faces of ends, case backs, drawer backs and bottoms, and the back face of doors.
 - 3. Concealed Work: Sleepers, web frames, dust panels, and other surfaces not visible after installation.
 - a. The flat tops of cabinets 72 inches or more above finish floor shall be considered concealed except when visible from an upper floor or building level.

1.03 REFERENCES

- A. The following references and standards are hereby made a part of this Section. Cabinetry shall conform to applicable requirements therein except as otherwise specified herein or shown on the Drawings. If a conflict is found in the contract documents, the more stringent requirement shall govern.
 - 1. Architectural Woodwork Standards, Woodwork Institute (WI), latest edition.
- B. Composite Wood Products: Hardwood plywood, particleboard and medium density fiberboard composite wood products shall meet the requirements for formaldehyde limits as specified in Section 5.504.4.5 of the California Green Building Standards Code (CalGreen), current edition.

1.04 SUBMITTALS

- A. Submit shop drawings in conformance to Architectural Woodwork Standards - Section 1, "Submittals".
- B. Furnish a Woodwork Institute - Certified Compliance Label on the first page of shop drawings.

- C. Product data: After receiving the Owner's Notice to Proceed, submit the following:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
 - a. Identify cabinets, fixtures, moldings, and other items in accordance with the system used on the Drawings.
 - b. Show overall dimensions, and call specific attention to all dimensions and conditions which vary from those shown on the Drawings.
 - c. Indicate compliance with the selected Institute standards.
- D. Samples:
 - 1. Accompanying the Shop Drawings, submit Samples of all items of finish hardware, metal work, trim, plastic overlays, and similar items proposed to be provided under this Section.
 - 2. After general colors and types of finish have been selected by the Architect, prepare and submit Samples of the selected finishes on species of the actual cabinet and fixture material.
 - a. Prepare Samples by successive masking in such a manner that the completed will display examples of each step in the total finish system.
 - b. Make each step example not less than 2 inches by 4 inches.
 - c. Clearly identify the total finish system represented by the Sample, and clearly identify each step in the total system.
 - 3. Revise and resubmit the Samples as needed to secure the Architect's approval.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent provisions of Delivery, Storage and Handling Section 01 6500 and refer to Architectural Woodwork Standards, Woodwork Institute (WI), latest edition.
- B. Do not deliver cabinets and fixture materials or products to the project site until concrete and plaster installation are completed and dry, and not until the building interior has attained a relative humidity of 45 percent to 65 percent at 60 to 90 degrees Fahrenheit, and a equilibrium moisture content between 8 percent to 12 percent.
- C. Provide additional protection as needed to assure that the work of this Section remains undamaged during fabrication, installation, and the time between completion of installation and actual acceptance of the total work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Cabinet Grade: Cabinets shall be constructed according to W.I. Custom Grade, Frameless, Flush Overlay unless otherwise noted.
- B. Cabinet Cores: MDF.
- C. Door and Drawer Front Cores: MDF in compliance with ANSI A-208.1 (2016).
- D. Shelves: Minimum of 1 inch in thickness except at shelves in the laptop cabinet, which shall be a minimum of 3/4 inch in thickness.
- E. Plastic laminates: Cover exposed surfaces with laminated plastic. Provide patterns and colors selected by the Architect from standard patterns and colors of products approved for use in this work, and complying with NEMA LD3.

1. Minimum thickness.
 - a. Horizontal surfaces: 0.050"
 - b. Vertical surfaces: 0.028"
 - c. Post forming: 0.042"
 - d. Self-edge bands: 0.030"
 - e. Cabinet liners: 0.020"
 - f. Backing sheets: 0.020"
2. Finish: Suede, "Velvet" or equal.

2.02 HARDWARE

- A. General: ANSI/BHMA Grade1, meeting highest load or duty rating for product as allowed for WI Custom Grade or meet or exceed the quality and duty rating of the basis of design products specified herein. Finishes shall be selected from the standard finishes of the required or specified product.
 1. Where manufacturer's name or catalog number is not indicated, provide ANSI/BHMA Grade 1, high quality, for institutional applications.
- B. Hinges: Rockford Process Control 5 Knuckle, Hospital grade.
- C. U-Shaped Wire Pulls: 4" corrosion resistant, satin chrome finish. Acceptable manufactures:
 1. RCP
 2. Epco
 3. Builders Brass
- D. Drawer Guides and Slides: Heavy duty with steel ball bearing, with full extension. Acceptable products:
 1. Accuride C-40 32, 150 # load rating for drawers up to 27 inches in width maximum.
 2. Accuride C-3640, 200# load rating for drawers 27 to 42 inches in width.
- E. Adjustable shelf clips: With earthquake pins, nickel finish.
 1. Vasa, No. 2-7875-104
- F. Locks: For cabinet drawers and doors throughout at every drawer and cabinet door, two keys per lock, master keyed to classroom lock, steel with chrome finish, by Schlage:
 1. CL Series with accessories, 626 satin chrome finish.

2.03 ACCESSORIES

- A. Adhesives:
 1. For woodwork and millwork, use water resistant and mold resistant adhesive complying with Fed Spec MM-A-125, type II. Type I in sink areas.
 2. For plastic laminates, use phenol, resorcinol, or melamine base, complying with Fed Spec MM-A-181, in type, grade, and class best suited for the intended use. Typically Type II, Type I in sink areas.

2.04 FABRICATION

- A. General:
 1. For units with sectional construction:
 - a. Accurately fit and align the separate parts.

- b. Provide ample screw, glue-and-bolt blocks, drawbolts, tongues, grooves, splines, dowels, tenons, mortises, and other means of fastening to render the work of this Section substantial, rigid, and permanently secured in the proper position.
 2. Fabricate and assemble units complete at the mill insofar as their dimensions access openings will permit.
- B. Scribe Members:
 1. Provide sufficient additional material to permit scribing to walls, floors, and related work.
 2. Provide adequate allowance for shrinkage occurring after installation.
- C. Framing and blocking:
 1. Assemble with bolted and screwed connections, securing to structural backings with cinch anchors, expansion screws, or toggle bolts as necessary.
 2. Mortise-and-tenon rails and stiles, neatly miter and member throughout, make butt joints flush and smooth, and make up permanent joints with water resistant glue.
 3. Assemble fixtures without face nails or face screws except as needed to attach trim.
 - a. Countersink face nails and face screws, fill with plastic wood or wood plugs, sand smooth, and touch up to be nearly invisible.
 - b. Countersink the heads of all screws in every surface.
 4. Cut and fit the work of this Section as necessary to receive, clear, engage, or support other parts of the Work, and as needed for interface with electrical, plumbing, and other units.
- D. Cabinet Construction:
 1. General:
 - a. Bottom and sides to be 3/4 inch core.
 - b. Concealed backs to be 1/4 inch core. Exposed backs to be 3/4 inch.
 - c. Use solid stock for frames, jambs, heads, stops and edges.
 2. Drawers:
 - a. Provide slip dovetail construction, well glued.
 - b. Fronts: Flush type, provide solid stock or provide not less than 3/4 inch MDO core covered with plastic laminate matching the face.
 - c. Sides and backs: Provide extension slides at all drawers, and provide 5/8" thick sides and backs of solid Birch, Beech, or Ash, with no defects, plugs, or patches.
 - d. Bottoms: Provide 1/4 inch thick, except 3/8 inch thick for bottoms over four sq.ft., of Birch, Beech, or Ash plywood dadoed into sides, fronts, and backs.
 3. Cabinet Doors:
 - a. 3/4 inch MDF core, flush type laminated plastic covered doors, provide matching plastic on exposed edges and provide cabinet liner or other appropriate material approved by the Architect on semi-exposed side to achieve equal tension.
 - b. Provide rubber stoops at ends and backs of doors.
 - c. Fit and adjust as necessary to achieve smooth and noiseless operation.
 4. Rout, drill, and otherwise prepare the surfaces as needed, and firmly install finish hardware and accessories in accordance with the approved design and the manufactures' recommendations.
- E. Miscellaneous surfaces:
 1. Concealed surfaces of cabinets and fixtures: Apply a single coat of sealer.
 2. Where cabinet doors are cut to let in hinges: Apply a single coat of sealer.
 3. Drawers: Laminated plastic at interior surfaces and at exterior surfaces of sides and backs.

4. Exposed wood shelves: Match the finish of cabinet unit in which they are located or to which they are adjacent.
5. Cabinet interiors: Semi-Exposed surfaces: Shall be the same as Exposed Surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Make necessary measurements in the field to assure proper fit of shop fabricated items.
- C. Prior to start of installation, verify that the work of other trades is sufficiently complete to properly permit this installation to proceed.

3.03 INSTALLATION

- A. Install the work of this Section at the locations on the Drawings, and in accordance with the approved Shop Drawings and Part 3 of Section 15 of the Manual of Millwork.
 1. Install work in this section as specified in the WI Manual of Millwork, and provide a WI Certified Compliance Certificate for Installation at the completion of project installation.
 2. Scribe units to wall, floor, and other surfaces as appropriate, with not more than 1/32 inch clear between the cabinet or fixture and the abutting permanent surface, and with no change of clearance in excess of 0.01 inch in 4 inches.
 3. Set each unit square, level, plumb, and aligned within a tolerance of one in 1000 vertically and horizontally, and within 1/4 inch of the designated location for freestanding work.
- B. Coordinate the time of installation with availability of other trades to make required utility connections.
 1. Provide access panels as needed for connection and maintenance of utilities.
 2. Test each plumbing and electrical item through at least 5 operating cycles, and adjust as needed to achieve optimum operation.

3.04 CLEANING

- A. Upon completion of installation, thoroughly clean each item by use of only such cleaning materials as are recommended by the manufacturer of the item being cleaned.
- B. Touch-up scratches and abrasions to be completely invisible to the unaided eye from a distance of 5 feet.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 07 2100

THERMAL INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Work Included:
 - 1. Provide glass fiber thermal insulation for exterior walls, glass fiber thermal insulation for roof and ceiling assembly and acoustical insulation for interior partitions.

1.02 DELIVERY, STORAGE AND HANDLING:

- A. Deliver insulation materials in labeled packages bearing manufacturer's name, 'R' value and fiber material.
- B. Store all materials on the site in a dry area protected from the weather and moisture before, during and after installation.

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM)
 - 1. E84 Test Method for Surface Burning Characteristics of Building Materials.
 - 2. E 96 Test Method for Water Vapor Transmission of Materials.
 - 3. E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
 - 4. C 177 Test Method for Steady-State Thermal Transmission Properties by means of the Guarded Hot Plate.
 - 5. C 423 Test Method for Sound Absorption and the Sound Absorption Coefficient by the Reverberation Room Method.
 - 6. C 518 Test Method for Steady-State Thermal Transmission Properties by means of the Heat Flow Meter.
 - 7. C 553 Standard Specifications for Mineral Fiber Blanket and Felt Insulations.
 - 8. C 612 Standard Specifications for Mineral Fiber Block and Board Thermal Insulation.
 - 9. C 665 Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

1.04 DELIVERY, STORAGE AND HANDLING:

- A. Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.
- B. Label insulation packages to include material name, production date and/or product code.

1.05 SUBMITTALS:

- A. Comply with pertinent provisions or Submittal Section 01 33 00.

106 LIMITATIONS:

- A. Do not use unfaced insulation in exposed applications where there is potential for skin contact and irritation.
- B. Kraft and standard foil facings will burn and must not be left exposed. The facing must be installed in substantial contact with the unexposed surface of the ceiling, wall or floor finish. Protect facing from any open flame or heat source.

PART 2 - PRODUCTS

2.01 BATT THERMAL INSULATION AT EXTERIOR WALLS

- A. R-value 21
When tested in accordance with ASTM C 518.
- B. Vapor Retarder Perm Rating:
FRK facing Perms Maximum 0.10.
PSK facing Perms Maximum 0.10
When tested in accordance with ASTM E 96.
- C. Surface Burning Characteristics:
Maximum flame spread: 25
Maximum smoke developed: 50
When tested in accordance with ASTM E 84.
- D. Combustion Characteristics:
Classified non-combustible by model building codes.
Not required to be covered. May be left exposed.
- E. Dimensional Stability:
Linear shrinkage less than 0.1%
- F. Manufacturer:
Owens-Corning, or approved equal

2.02 BATT THERMAL INSULATION AT ROOF AND CEILING

- A. Glass fiber thermal insulation complying with ASTM C 665, Type I, Class A.
- B. Quiet zone Acoustical Batt Insulation manufactured by Owens Corning.
R-Value 30 when tested in accordance with ASTM C 518.
- C. Vapor Retarder Perm Rating:
FRK (foil) facing Perms Maximum 0.10
PSK (white) facing Perms Maximum 0.10
When tested in accordance with ASTM E 96.
- D. Surface Burning Characteristics:
Maximum flame spread: 25
Maximum smoke developed: 50
When tested in accordance with ASTM E 84.

- E. Combustion Characteristics:
Classified non-combustible by model building codes.
Not required to be covered. May be left exposed.
- F. Dimensional Stability:
Linear shrinkage less than 0.1%.
- G. Quiet Zone Acoustical Batt Insulation manufactured by Owens-Corning or approved equal

2.03 ACOUSTICAL BATT INSULATION AT INTERIOR PARTITION

- B. Type: Unfaced glass fiber thermal insulation
Complying with ASTM C 665, Type I.
- C. Wood Frame Insulation
Thickness 3 ½" and 5 ½" as indicated.
- D. Surface Burning Characteristics:
 - 1. Maximum flame spread: 25
 - 2. Maximum smoke developed: 50 when tested in accordance with ASTM E 84.
- E. Combustion characteristics:
Unfaced insulation passes ASTM E 136 test.
- F. Fire Resistance Rating:
Passes ASTM E 119 as part of a complete fire tested wall assembly.
- G. Dimensional Stability:
Linear shrinkage less than 0.1%.
- H. Quiet Zone Acoustical Batt Insulation manufactured by Owens Corning or approved equal.

PART 3 – EXECUTION

3.01 BATT THERMAL INSULATION AT EXTERIOR WALLS

INSPECTION AND PREPARATION:

- 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 wall 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.

INSTALLATION:

- A. Comply with manufacturer's instruction for particular conditions of installation in each case.
- B. Mechanical Fasteners
 - 1. Apply insulation directly to the interior surface of the exterior wall with appropriate spindle or prong-type anchors.

- a. Fasten anchors to wall by welding the pin to metal and then impale the insulation, or by using pre-attached heads and welding them through the insulation.
 - b. Fasten anchors to wall with adhesive. Follow manufacturer's recommendations for surface preparation and adhesive pattern.
 - c. Impale insulation on anchor and secure with washer. Select pin lengths to ensure tight fit. Protect pin tips where subject to human contact. See manufacturer's diagram for impaling pin pattern.
1. Friction-fit unfaced insulation between studs after cover material has been installed on one side of the cavity. When unfaced insulation is used, and in applications without a cover material, use wire or metal straps to hold insulation in place. When faced insulation is used staple attachment flanges to face or side of stud every 8 to 12 inches to prevent gaps along the edge of the vapor retarding facing.
- D Vapor Retarders
1. Maintain vapor retarder integrity by tightly abutting adjacent insulation. Repair punctures or tears in vapor retarder facing by taping. Follow tape manufacturer's application recommendations.
- E Material Storage and Protection
1. Protect insulation from damage and from becoming wet before, during and after installation.
 2. Insulate non-standard width spaces by cutting insulation at least one inch wider than space to be filled.
 3. Install friction fit (faced) insulation in stud framing with insulation extended fully into stud cavities. Staple to back of wallboard and/or stud where required to maintain position.

3.02 BATT THERMAL INSULATION AT ROOF AND CEILING

- 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 the above ceiling space 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.

INSTALLATION:

- A. Comply with manufacturer's instructions for particular conditions of installation in each case.
- B. Between Wood Roof Rafters
 1. Staple insulation to the bottom face of the roof rafter at 8 to 12 inch intervals. Staple the first flange on inside face of roof rafter. Staple every 6-8" apart with a staple within 1" of each end of the batt. Position batt in cavity and staple the other flange to the adjoining rafter.
- C. Cathedral Ceiling
 1. Where Gypsum Board is attached directly to joists, provide high performance insulation with 8-1/4" thickness (R30C) with an integral kraft paper flanged vapor retarder. Maintain a 1 inch minimum air space at the top of the insulation and shave insulation as required adjacent vent holes through blocking to allow free flow of air. If required, use vent baffle to assure proper clearance.
- D. Over Suspended Ceilings
 1. Install insulation over ceiling panels. Butt insulation together tightly to prevent

thermal leaks.

- E. Vapor Retarders
 - 1. Maintain vapor retarder integrity by tightly abutting adjacent insulation. Repair punctures or tears in vapor retarder facing by taping. Follow tape manufacturers application recommendations.

3.03 ACOUSTICAL BATT INSULATION

- A. Examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified.
- B. Verify mechanical and electrical services within the shaftwall have been tested and inspected.
- C. Obtain installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.
- D. Clean substrates of substances harmful to insulation.

INSTALLATION:

- A. Comply with manufacturer's instructions for particular conditions of installation in each case.
- B. Batts may be friction-fit in place until the interior finish is applied. Install batts to fill entire stud cavity. If stud cavity is less than 96" 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.
- C. Where walls are not finished on both sides or insulation does not fill the cavity depth, supplementary support must be provided to hold product in place.
- D. Where insulation must extend higher than 8 feet, temporary support can be provided to hold product in place until the finish material is applied.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 07 2500

WEATHER BARRIERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Weather resistive barrier and flexible flashing.
- B. Related Sections:
 - 1. Section 06 1000, Rough Carpentry.
 - 2. Section 07 2116, Blanket Insulation.
 - 3. Section 09 2423, Portland Cement Stucco.
 - 4. Division 22, Plumbing.
 - 5. Division 23, Heating, Ventilating, and Air Conditioning.
 - 6. Division 26, Electrical.

1.02 SUBMITTALS

- A. Product Data: Manufacturer current technical literature for each type of product.
- B. Evaluation Reports: For water resistive barrier from ICC-ES.
- C. Samples: Weather barrier membrane, minimum 8.5 by 11 inches.

1.03 QUALITY ASSURANCE

- A. Pre-installation Conference: One week prior to commencing work of this Section. Ensure each sub-contractor responsible for creating a continuous plane of water tightness is present.
- B. Review related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, bundles, or rolls as applies, all properly labeled or identified as to contents and manufacturer.

1.05 WARRANTY

- A. Manufacturer's to warranty weather barrier for a period of 10 years from date of final weather barrier installation.
 - 1. Pre-installation meetings and project site observations by weather barrier manufacturer for warranty is required prior to assembly installation.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Water Resisive: ASTM E1677, Type 1 air barrier. Flame spread less than 25, and smoke developed less than 450, when tested according to ASTM E84. UV stabilized and acceptable to authorities having jurisdiction. Allowable products include:
- B. Products: subject to compliance with requirements, provide one of the following:
 - 1. DuPont: Tyvek CommercialWrap.
 - 2. Typar: Metro Wrap.
 - 3. Vaproshield: WallShield.
- C. Performance Characteristics:
 - 1. Air Penetration: 0.001 cfm/ft sq at 75 Pa, when tested in accordance with ASTM E2178. Type 1 per ASTM E1677. ≤ 0.04 cfm/ft sq at 75 Pa, when tested in accordance with ASTM E2357.
 - 2. Water Vapor Transmission: 12 perms, when tested in accordance with ASTM E96, Method B.
 - 3. Water Penetration Resistance: 280 cm when tested in accordance with AATCC Test Method 127.
 - 4. Basis Weight: 2.7 oz/ sq yd, when tested in accordance with TAPPI Test Method T-410.
 - 5. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
 - 6. Tensile Strength: 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
 - 7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
 - 8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 10, Smoke Developed: 10.
 - 9. Surface Abrasion Test: Air Barrier must have a water resistance of 280 cm as measured by AATCC 127 after ASTM D351 has been performed on material for 6 cycles.
- D. Building Wrap Tape: Pressure sensitive plastic tape recommended by building wrap manufacturer for sealing joints and penetrations in building wrap.

2.02 ACCESSORIES

- A. Window and Door Flashing: Self-adhesive butyl rubber compound, bonded to a high density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
- B. Products: subject to compliance with requirements, provide one of the following:
 - 1. DuPont: DuPont Flashing FlexWrap and StraightFlash.
 - 2. Typar: Flashing Fles and Flashing BA.
 - 3. Vaproshield: VaproFlashing and Vapro 3D Factory Formed Corner.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Cover sheathing with water resistive barrier as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion or control joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4 inch overlap unless otherwise indicated.

- B. Building Paper: Apply horizontally with a 2 inch overlap and a 6 inch end lap; fasten to sheathing with galvanized staples or roofing nails.

- C. Building Wrap: Comply with manufacturer's written instructions.
 - 1. Seal seams, edges, fasteners and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

- D. Flexible Flashing: Apply where indicated to comply with manufacturer's written instructions.
 - 1. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 2. lap flashing over water-resistive barrier at bottom and sides of openings.
 - 3. Lap water resistive barrier over flashing at heads of openings.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 07 4113

STANDING SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Shop Drawings and installation details.

1.2 SUMMARY

- A. Section Includes:
 - 1. Architectural standing-seam metal roof panels.
 - 2. Metal roof accessories.

1.3 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, metal roof panel Installer, metal roof panel manufacturer's representative,
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal roof panel installation, including manufacturer's written instructions.
 - 4. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 5. Review structural loading limitations of substrate during and after roofing.
 - 6. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - 7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
 - 8. Review temporary protection requirements for metal roof panel assembly during and after installation.
 - 9. Review roof observation and repair procedures after metal roof panel installation.
 - 10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.

- B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details specific to project, signed and sealed by the qualified professional engineer responsible for their preparation. Distinguish between factory- and field-assembled work.
- C. Accessory Details: Include details of the following items:
 - 1. Flashing and trim.
 - 2. Pipe penetration flashings.
 - 3. Roof curbs.
- D. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Metal Roof Panels: 12 inches long by actual panel width. Include fasteners, clips, closures, and other metal roof panel accessories.
 - 2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
 - 3. Accessories: 12-inch long Samples for each type of accessory.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer, Installer, and manufacturer's technical representative.
 - 1. Submit Installer qualifications in the form of an original letter on manufacturer's letterhead signed by authorized manufacturer representative.
- B. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal roof panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer of plant-fabricated metal roof panel systems listed in this Section and meeting performance requirements, with a minimum of five years experience providing metal roof panel systems for projects of similar type and scope, offering engineering, warranty, technical inspection, and maintenance inspection services specified.
- B. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years experience installing similar work, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to furnish warranty of type specified.
 - 1. Manufacturer's On-Site Roll Former Operators: Experienced full-time employees of metal roof panel manufacturer.
- C. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

- D. Source Limitations: Obtain metal roof panels and accessories and related engineered structural support members from a single source supplied or approved by metal roof panel manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.
- E. Protect foam-plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.11 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of substrate, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

- A. Warranty, General: Warranties specified shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

- B. Roof System Warranty, General: Warranties specified in this Section include the following components and systems specified in other sections supplied by the metal roof panel manufacturer:
1. Manufactured copings, roof edge, counterflashings, and reglets.
 2. Roof curbs, hatches, and penetration flashings.
 3. Roof expansion joint assemblies.
 4. Low slope-roofing system.
 5. Metal wall and soffit panels and trim.
 6. Penetration flashings.
 7. Wall expansion joint assemblies.
- C. Special Warranty for Metal Roof Panels: Written warranty in which Manufacturer agrees to repair or replace metal roof panels that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Period: 5 years from date of Substantial Completion.
- D. Special System Weathertightness Warranty for Metal Roof Panels: Written warranty in which Manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
1. Warranty Period: 20 years from date of Substantial Completion.
 2. Limit of Warranty Coverage: Not to exceed original installed cost of metal roof panel assembly including labor and materials.
 3. Qualified Installer Requirement: Installer must meet requirements in Quality Assurance Article.
 4. Installation Inspection Requirement: By manufacturer's technical representative in accordance with requirements of Part 3 Field Quality Control Article.
 5. Annual Manufacturer Inspection Requirement: By qualified manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's annual inspections is included in the Contract Sum. Inspections to occur in Years 2, 5, 10, and 15 following Substantial Completion.
- E. Special Warranty on Panel Finishes: Written warranty in which Manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes under normal atmospheric conditions within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturers/Products: Subject to compliance with requirements, provide products by one of the following manufacturers comparable to the Basis of Design product specified:
1. Tremco, Inc. or Architect Approved Equal.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
- B. FM Approvals Listing: Provide metal roof panels and component materials that comply with requirements in FM Approvals 4471 as part of a panel roofing system and that are listed in FM Approvals "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
 - 1. Fire/Windstorm Classification: Class 1A-90.
 - 2. Hail Resistance: SH Class 4.
- C. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.
- D. Hail Resistance: Provide metal roof panel assemblies listed with UL as Class 4 hail resistant panels.
- E. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

2.3 ARCHITECTURAL STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Factory-formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and mechanically seaming panels together.
 - 1. Basis-of-Design Product: Tremco, Inc., TremLock T-238.
 - a. Thickness: 24 ga. nominal thickness.
 - b. Surface: as shown in roof plans.
 - c. Color: As selected by Owner from manufacturer's standard colors meeting energy performance requirements.
 - 2. Clips: Low-movement floating clips to accommodate thermal movement; fixed clips where design permits; intermittent or continuous clips as required to meet performance requirements; and with clip bearing plate where required.
 - a. Material: 0.064-inch nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 - 3. Joint Type: Field mechanically seamed.
 - 4. Seam Cap: Match panel material and finish; provide with two rows of integral factory hot-applied sealant.
 - 5. Panel Seam Height: Not less than 2-3/8 inch.
 - 6. Panel Coverage: 16 inches.

2.4 METAL ROOF ACCESSORIES

- A. Metal Roof Accessories, General: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- B. Panel Sealants: Provide one of the following identical to that used in test panels meeting performance requirements:
1. Sealant Tape: Pressure-sensitive, 99 percent solids, gray polyisobutylene or butyl rubber compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1 inch wide and 1/8 inch thick, with nylon spacer beads to prevent overcompression of the sealant tape.
 2. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311, with nylon spacer beads to prevent overcompression of the sealant tape.
- C. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum 0.028 inch thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.
- D. Pipe Penetration Flashings: Flexible boot type, with stainless steel compression ring, and stainless steel pipe strap. Use silicone-type boot at hot pipes.
- E. Gutters: Formed from same material roof panels. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.
- F. Pipe Penetration Flashing: Premolded EPDM pipe collar with flexible aluminum ring bonded to base and stainless steel pipe clamp to secure collar to pipe.
- G. Roof Curbs: Fabricated from aluminum sheet, minimum 0.080 inch thick; with bottom of skirt profiled to match roof panel profiles, and welded top box, integral internal fastener flange, and water diverter. Fabricate curb subframing of minimum 0.0598-inch thick, angle-, C-, or Z-shaped galvanized steel sheet. Fabricate curb and subframing to withstand indicated loads, of size and height indicated. Finish roof curbs to match metal roof panels.
1. Insulate roof curb with 1-inch thick, rigid insulation.

2.5 SUBSTRATE BOARDS

- A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.
1. Thickness: 5/8 inch.
 2. Product: Subject to compliance with requirements, provide Dens-Dek by Georgia-Pacific Corporation.

- B. Substrate-Board Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FMG 4470, designed for fastening substrate board to substrate.

2.6 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
- B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.7 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Zee Clips: 0.079-inch nominal thickness.
- C. Base or Sill Channels: 0.079-inch nominal thickness.
- D. Hat-Shaped, Rigid Furring Channels:
 - 1. Nominal Thickness: As required to meet performance requirements, but not less than 0.025 inch.
 - 2. Depth: As indicated.
- E. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.8 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.9 FABRICATION

- A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.
- E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 3. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

2.10 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
 - 1. Examine solid roof substrate to verify that substrate joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - 2. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
 - 3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

- B. Substrate Board: Inspect existing substrate board and replace if existing board is wet or damaged.
 - 1. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 2. Comply with requirements for fire-rated construction.

3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.
 - 1. Apply over entire roof surface.
- B. Apply slip sheet over underlayment before installing metal roof panels.

3.4 METAL ROOF PANEL INSTALLATION, GENERAL

- A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
- B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Predrill panels for fasteners.
 - 1. Point of Fixity: Fasten each panel along a single line of fixing located as shown on drawings.
 - 2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.
- C. Install metal roof panels as follows:
 - 1. Commence metal roof panel in presence of factory-authorized representative.
 - 2. Field cutting of metal panels by torch or abrasive saw is not permitted.
 - 3. Install panels perpendicular to supporting purlins.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Provide metal closures at rake edges, rake walls, and each side of ridge and hip caps.
 - 6. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
 - 7. Install ridge and hip caps as metal roof panel work proceeds.
 - 8. Install metal flashing to allow moisture to run over and off metal roof panels.
- D. Fasteners:
 - 1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.
- E. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
 - 1. Use slip sheet where roof panels will contact wood, ferrous metal, or cementitious construction.

- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Erection Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of splices and alignment of matching profiles.
 4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 5. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.

3.6 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements and manufacturer's written installation instructions. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Form trim and transition joints using compressed joints with captive butyl sealant capable of resisting static water pressure. Cleated joints and exposed joint sealants do not meet this requirement.

2. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 3. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted and soldered or lapped, riveted, and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Technical Representative: Engage a qualified manufacturer's technical representative acceptable to Owner for a minimum of 5 full-time days on site to perform substrate examination, interim observations, and final roof inspections, and to prepare reports.
- B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 07 5216**SBS MODIFIED BITUMINOUS MEMBRANE ROOFING, HOT-APPLIED****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes: [Hybrid] Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing system on wood deck, including but not limited to:
 - 1. Roof insulation.
 - 2. Roof membrane and membrane base flashings.
 - 3. Roof surfacing consisting of mineral granulated cap sheet.
- B. Related Sections:
 - 1. Division 06 carpentry section for wood nailers, curbs, and blocking.
 - 2. Division 07 Section "Preparation for Re-Roofing" for existing roofing tearoff, patching, and substrate preparation for rehabilitation of roofing membrane.
 - 3. Division 07 Section "Roof Specialties" for manufactured copings, roof edge flashings, roof edge drainage systems, counterflashings, and reglets.

1.2 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg. F, measured at the mop cart or mechanical spreader immediately before application.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's Product Certificate: Submit notarized certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.
- B. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.
 - 1. Include letter from Manufacturer written for this Project indicating approval of Installer.
- C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of compliance with performance requirements, including UL listing certificate.
 - 2. Indicate that proposed system components are compatible.

- D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of built-up roofing.
- E. Warranties: Unexecuted sample copies of special warranties.
- F. Field Quality Control Reports: Daily reports of Roofing Inspector. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions taken to correct defective work.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: To include in maintenance manuals.
- B. Warranties: Executed copies of warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.
- B. Manufacturer Qualifications: Approved manufacturer with UL listed roofing systems comparable to those specified for this Project, with minimum five years' experience in manufacture of comparable products in successful use in similar applications, and able to furnish warranty with provisions matching specified requirements.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products.
- D. Preinstallation Roofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner, [Architect,] Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review drawings and specifications.
 - 3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 5. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 6. Review structural loading limitations of roof deck during and after roofing.
 - 7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 8. Review governing regulations and requirements for insurance and certificates if applicable.
 - 9. Review temporary protection requirements for roofing system during and after installation.
 - 10. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
 - 3. Remove temporary plugs from roof drains at end of each day.
 - 4. Remove and discard temporary seals before beginning work on adjoining roofing.

1.9 WARRANTY

- A. Warranty, General: Warranties specified shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Manufacturer's Warranty: Manufacturer's standard or customized form, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
 - 1. Manufacturer's warranty includes roofing membrane, base flashings, fasteners, roofing membrane accessories and other components of roofing system specified in this Section.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
 - 3. Add Alternate: Provide 30 year warranty roof.
- C. Installer's Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.
- D. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion in addition to the manufacturer's standard warranty.
- E. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Tremco Incorporated.
 2. Garland Company, Inc. (The).
- B. Basis-of-Design Manufacturer/Product: The roof system specified in this Section is based upon products of Tremco, Inc., www.tremcoroofing.com, named in other Part 2 articles. Subject to compliance with requirements, provide the named product or an approved comparable product by one of the following:
 1. Garland Company, Inc. (The).
- C. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Roofing shall withstand exposure to weather without failure or leaks due to defective manufacture or installation.
 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Flashings and Fastening: Comply with requirements of Division 07 Sections "Sheet Metal Flashing and Trim" and "Roof Specialties." Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:
 1. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.
 2. SMACNA Architectural Sheet Metal Manual (Seventh Edition) for construction details.
- D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- F. Energy Performance: Roofing system shall have an initial solar reflectance index of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

2.3 ROOFING MEMBRANE MATERIALS

- A. Sheathing Paper: Red rosin type, minimum 3 lb./100 sq. ft. (0.16 kg/sq. m).
- B. Hybrid System Asphalt Ply Sheets: ASTM D 2178 Type IV asphalt-impregnated glass-fiber ply sheet.
1. Basis of design product: Tremco, THERMglass Type IV.
 2. Net Dry Mass, ASTM D 146: 7.5 lb/100 sq ft.
 3. Breaking Strength, ASTM D 146: 44 lbf/in.
- C. SBS Modified Bituminous Cap Sheet: ASTM D 6163 Type I Grade G SBS-modified asphalt-coated glass-fiber-reinforced sheet, granular surfaced.
1. Basis of design product: Tremco, POWERply Standard FR.
 2. Exterior Fire-Test Exposure, ASTM E 108: Class A.
 3. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 80.0 lbf/in (14.0 kN/m); Cross machine direction 70.0 lbf/in (12.0 kN/m).
 4. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction, 100 lbf (440 N); Cross machine direction 100 lbf (440 N).
 5. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 7.5 percent; Cross machine direction 7.5 percent.
 6. Low Temperature Flex, maximum, ASTM D 5147: -15 deg. F (-26 deg. C).
 7. Thickness, minimum, ASTM D 5147: 0.120 inch (3 mm).
- D. Base Flashing Backer Sheet: ASTM D 4601 Type II nonperforated asphalt-impregnated, polyester reinforced, and asphalt coated glass-fiber sheet, dusted with fine mineral surfacing on both sides.
1. Basis of design product: Tremco, BURmastic Composite Ply HT.
- E. Base Flashing Sheet: ASTM D 6163 Type I Grade G SBS-modified asphalt-coated glass-fiber-reinforced sheet, granular surfaced.
1. Basis of design product: Tremco, POWERply Standard FR.
 2. Exterior Fire-Test Exposure, ASTM E 108: Class A.
 3. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 80.0 lbf/in (14.0 kN/m); Cross machine direction 70.0 lbf/in (12.0 kN/m).
 4. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction, 100 lbf (440 N); Cross machine direction 100 lbf (440 N).
 5. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 7.5 percent; Cross machine direction 7.5 percent.
 6. Low Temperature Flex, maximum, ASTM D 5147: -15 deg. F (-26 deg. C).
 7. Thickness, minimum, ASTM D 5147: 0.120 inch (3 mm).
- F. Detailing Fabric: Woven Glass Fiber Mesh, Vinyl-Coated: Non-shrinking, non-rotting, vinyl-coated woven glass mesh for reinforcing flashing seams, membrane laps, and other roof system detailing.
1. Basis of design product: Tremco, BURmesh.
 2. Tensile strength, 70 deg. F, ASTM D 146: Warp, 65 lbf/in (289 N); fill, 75 lbf/in (311 N).

2.4 ASPHALT MATERIALS

- A. Asphalt primer, water-based, polymer modified.
1. Basis of design product: Tremco, TREMprime WB.

2. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 2 g/L.
- B. ASTM D 312 Type IV hot-melt asphalt.
 1. Basis of design product: Tremco, Premium IV.
 2. Softening Point, min/max, ASTM D 36: 215–225 deg. F (102–107 deg. C).
 3. Ductility at 77 deg. F, minimum, ASTM D 113: 2.5 cm.
 4. Penetration at 77 deg. F (25 deg. C), min/max, ASTM D 5: 15–30 dmm.
- C. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.

2.5 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesives: 80 g/L.
 - f. Other Adhesives: 250 g/L.
 - g. Nonmembrane Roof Sealants: 300 g/L.
 - h. Sealant Primers for Nonporous Substrates: 250 g/L.
 - i. Sealant Primers for Porous Substrates: 775 g/L.
- B. Joint Sealant: Elastomeric joint sealant compatible with roofing materials, with movement capability appropriate for application.
 1. Joint Sealant, Polyurethane: ASTM C 920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable..
 - a. Basis of design product: Tremco, TremSEAL Pro.
 - b. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 40 g/L.
 - c. Hardness, Shore A, ASTM C 661: 40.
 - d. Adhesion to Concrete, ASTM C 794: 35 pli.
 - e. Tensile Strength, ASTM D 412: 350 psi.
 - f. Color: Closest match to substrate.
- C. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Global 4470, designed for fastening roofing components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- D. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."
- E. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.6 ROOF INSULATION

- A. Roof Insulation, General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
 - 1. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
- B. Roof Insulation: Polyisocyanurate board insulation, ASTM C 1289 Type II Class 1 CFC- and HCFC-free, with recycled content glass-fiber mat facer on both major surfaces.
- C. Roof Insulation Cover Board: Cellulosic-fiber Insulation Board ASTM C 208, Type II, Grades 1 and 2, with water-resistant binders, non-asphaltic primer coated on four sides and chemically treated for deterioration, 1/2 inch (13 mm) thick.
- D. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- E. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

2.7 SURFACING MATERIALS

- A. Acrylic Roof Coating, Highly-Reflective Elastomeric: high-solids acrylic latex elastomeric roof coating formulated for use on bituminous roof surfaces; water-based, Energy Star qualified, CRRC listed and California Title 24 Energy Code compliant.
 - 1. Basis of design product: Tremco, ICE Coating.
 - 2. Volatile Organic Compounds (VOC), ASTM D 3960: 40 g/L.
 - 3. Emissivity, minimum, ASTM C 1370: 0.83.
 - 4. Solar Reflectance Index (SRI), ASTM E 1980: 103.
 - 5. Reflectance, minimum, ASTM C 1549: 84 percent.
 - 6. Solids, by volume: 65 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - 2. Verify that, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation. wood cants
 - 3. Wood Roof Deck: Verify that wood deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.
 - 4. Verify that existing insulation and substrate is sound and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION, GENERAL

- A. Install roofing system in accordance with manufacturer's recommendations.

3.4 INSULATION INSTALLATION

- A. Comply with built-up roofing manufacturer's written instructions for installing roof insulation.
- B. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.
- C. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inch (70 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
- H. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg. F (14 deg. C) of equiviscous temperature.
- I. Cover Board Installation: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.
 - 1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. Apply hot roofing asphalt to substrate and immediately bond cover board to substrate.

3.5 HOT-APPLIED ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
 - 1. Deck Type: Wood deck.
 - 2. Number of Glass-Fiber Base-Ply Sheets: Three.
 - a. Adhering Method: Mopped.
 - 3. Granular-Surfaced SBS-Modified Asphalt Cap Sheet:
 - a. Adhering Method: Mopped.
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Cooperate with testing agencies engaged or required to perform services for installing roofing system.
- D. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work configured as recommended by NRCA Roofing Manual Appendix: Quality Control Guidelines - Insulation to protect new [and existing] roofing.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
 - 3. Remove temporary plugs from roof drains at end of each day.
 - 4. Remove and discard temporary seals before beginning work on adjoining roofing.
- E. Hot Roofing Asphalt Heating: Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application. Circulate asphalt during heating. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating. Do not heat asphalt within 25 deg. F (14 deg. C) of flash point. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.
 - 1. Apply hot roofing asphalt within plus or minus 25 deg. F (14 deg. C) of equiviscous temperature and adhere components to asphalt heated to not less than 425 deg. F (236 deg. C).
- F. Hot Roofing Asphalt Heating, SEBS-Modified Asphalt: Heat and apply SEBS-modified elastomeric roofing asphalt according to roofing system manufacturer's written instructions.
- G. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.6 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. Install modified bituminous roofing membrane [sheet and] cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:

1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
 2. Adhere to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg. F (236 deg. C).
- B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Install roofing membrane sheets so side and end laps shed water. Completely bond and seal laps, leaving no voids.
1. Repair tears and voids in laps and lapped seams not completely sealed.
 2. Apply roofing granules to cover exuded bead at laps while bead is hot.

3.7 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions, and as follows:
1. Extend base flashing up walls or parapets a minimum of 12 inches (300 mm) above built-up roofing and 6 inches (150 mm) onto field of roof membrane.
 2. Prime substrates with asphalt primer if required by roofing system manufacturer.
 3. Backer Sheet Application: Install backer sheet and adhere to substrate in a solid mopping of hot roofing asphalt.
 4. Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg. F (236 deg. C). Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
 5. Flashing Sheet Bottom Termination: Adhere flashing sheet to roof membrane sheet continuously along bottom of flashing sheet.
- B. Seal top termination of base flashing with a metal termination bar.
- C. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.
- D. Roof Drains: Set 30 by 30 inch (760 by 760 mm) square metal flashing in bed of asphalt roofing cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
1. Install stripping according to roofing system manufacturer's written instructions.

3.8 SURFACING AND COATING INSTALLATION

- A. Acrylic Emulsion Coating: Apply coating to roofing membrane and base flashings in not less than two coats, with number of coats, thickness of application, and application method as recommended in writing by coating manufacturer.

3.9 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation at commencement and upon completion.
1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

- B. Repair or remove and replace components of built-up roofing where test results or inspections indicate that they do not comply with specified requirements.
 - 1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 6200**SHEET METAL FLASHING AND TRIM****PART 1 - GENERAL****1.01 DESCRIPTION:**

- A. Work Included: All sheet metal work as indicated and specified except those items included in other Sections. This Section includes but is not limited to:
 - 1. Flashings at door and window head (drips) and sills.
 - 2. All caulking and sealants related to sheet metal work.
- B. Related Work Specified Elsewhere:
 - 1. Section 05 500, Metal Fabrications.
 - 2. Section 09 9100, Painting.
 - 3. Section 07 7123, Gutters and Downspouts.
 - 4. Ductwork and flashing and counter flashing of all pipe, conduits and other penetrations of mechanical and electrical equipment, both new and existing: See Mechanical and Electrical Divisions.

1.02 REFERENCES AND STANDARDS: The following references and standards are hereby made a part of this Section and all sheet metal work shall conform to the applicable requirements and recommendations therein except as otherwise specified herein or shown on the Drawings.

- A. "Architectural Sheet Metal Manual", Latest Edition, and "Architectural Sheet Metal Specifications", latest Edition, both published by Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA).

1.03 SUBMITTALS: Comply with requirements of Submittal Section 01 33 00.

- A. Shop Drawings: Show manner of forming, jointing and securing to adjacent work. Detail all waterproof connections including penetrations. Indicate all materials, thicknesses and dimensions, fastening and anchoring methods, details and locations of all seams, joints and other provisions necessary for thermal expansion and contraction.

1.04 DELIVERY, STORAGE AND HANDLING:

- A. Deliver all items to site unpainted and in sufficient time to enable incorporation into work of other trades.
- B. Store all galvanized metal under dry conditions and protect from moisture until installation commences.

1.05 WARRANTY:

- A. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion.
- B. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

PART 2 - PRODUCTS**2.01 MATERIALS:**

- A. Galvanized Sheet Steel: ASTM A 525 G90 BS 2989.75 and A 526, 1.25 oz galvanized coating, 24 gauge unless otherwise noted, except 22 ga. or heavier at caps and parapets; 20 gauge at vents. Where exposed and to be painted, use mill-phosphatized material. Use lock-forming quality (ASTM A 527) where so required by nature of fabrication. All downspouts to be galvanized schedule 40 steel pipe. Gutters to be minimum 22 gauge hot dipped galvanized.
- B. Solder: ASTM B 32, half lead and half tin (Alloy 50A).
- C. Flux: Muriatic acid cut with zinc or non-corrosive, as recommended for use with parent metals.
- D. Fastenings: Tinned or galvanized for galvanized metal; hard copper for lead. All nails into wood shall be annular ring type with large heads.
- E. Insulating Materials:
 - 1. Asphalt Saturated Felt: ASTM D 226, No. 30 type.
 - 2. Bituminous Coating (Sheet Lead): F.S. TT-C-494 or MIL-C-18480.
- F. Caulking and Sealing:
 - 1. For all concealed metal to metal contact, use polyisobutylene type, non-skinning, non-drying sealant, bulk or tape, as required by installation conditions (tape: 1" minimum width, 1/16" minimum thickness); Presstite Series", PPG "Duribbon 1072", or approved equal.
 - 2. At all other areas requiring calking and sealing, conform to silicone sealant material requirements of Caulking and Sealants Section.
- G. Plywood soffit vent: Fry DCS-625-V-300, 3" Aluminum
- H. Plywood soffit vent: 2" diameter open screen vents, Vent Master RS-100-2", Aluminum.

PART 3 - EXECUTION**3.01 CONDITION OF SURFACES:**

- A. Surfaces to receive sheet metal work shall be smooth, clean, and dry and free of rough or sharp ridges and projections. Nails shall be driven flush without projecting heads.
- B. Commencing installation implies acceptance of surfaces.

3.02 COORDINATION:

- A. Coordinate and schedule sheet metal work with installation of roofing, drains, piping, blocking, nailers, framed openings, curbs, parapets and other adjoining or substrate work where it is integral or contiguous therewith.
- B. Instruct other trades concerning location and placement of nailers, blocking, cleats, etc.

3.03 PREPARATION:

- A. Remove all grease, dirt and surface coatings from surfaces to be soldered.

- B. Apply all galvanized sheet metal over wood, over one layer of saturated felt; or, alternately, the metal may be back painted with a heavy coat of bituminous paint.

3.04 INSTALLATION:

- A. Where work is not otherwise shown or specified, conform to details and requirements set forth in the Reference Standards.
- B. Where materials or construction systems are specified with reference to a particular manufacturer (such as reglets, gravity ventilators and calking and sealants, make all installations in strict accord with the approved manufacturer's installation instructions.
- C. Except where otherwise noted or specified, all sheet metal work shall be galvanized sheet steel. Make all cleats and edge strips of the same metal as items with which they are used.
- D. Accurately reproduce profiles and bends; make intersections sharp, even and true. Make plain surfaces free from buckles and waves with as few joints as possible. Reinforce all work as required for strength and appearance.
- E. Bend all metals to minimum radius recommended by manufacturer for thickness used. (In general, the radius shall be not less than the thickness of metal.)
- F. Provide for proper expansion and contraction in all systems. Make all joints tight. Conceal all nails and other fastenings where possible. Face nailing through exposed surfaces is not permitted unless specifically shown. Secure exposed edges to underlying materials with clips or tabs (edge strips).
- G. Make all seams in direction of flow.
- H. Hem all exposed edges of sheet metal work ½ inch.
- I. Do all cutting, fitting, punching, etc., in sheet metal to accommodate work specified elsewhere and provide all necessary accessory items.
- J. Properly apply caulking and sealants to sheet metal items to permit movement between surfaces and to make entire installation watertight. Conform to requirements of Caulking and Sealants Section.
- K. Soldering: Roughen smooth surfaces with clean emery cloth or sandpaper; do not use steel wool. Use torch or well headed irons for all soldering. Solder slowly thoroughly heating seams and completely sweating solder through full width with at least 1" of solder evenly flowed along seams. Wherever possible, solder in a flat position. Solder seams on slopes greater than 45° a second time. Solder immediately after application of flux; after soldering, immediately neutralize any corrosive flux with 5% soda solution and flush with clean water. Soldering of exposed surfaces shall be neatly done. Exposed solder shall be dressed and finished. Soldering shall be employed only to seal or fill seams. Where structural strength is required, do not rely on solder alone but use supplementary mechanical fasteners.
- L. Flashings:
 - 1. Install all flashings required to provide watertight protection. Except where composition flashings are used, flash intersections of decks and roofs or other horizontal surfaces with vertical surfaces of every kind. Make flashings base and counter type or cap type unless otherwise shown.
 - 2. Assemble and install flashings at roofing and conditions to conform to approved

manufacturer's recommendations and the requirements of the Built-Up Roofing Section.

4. Roof flashings and related metal shall be installed with flanges on top ply of roofing felt and reinforced as per Roofing Section. Installation of flange below or between roofing plies is not permitted.
5. Unless metal manufacturer has more stringent requirements, make up continuous straight runs of flashings in 24 ft. maximum lengths. Unless otherwise shown or specified, connect continuous runs together with 3-inch loose lock expansion joints sealed water-tight with sealant. Provide expansion joints at 10 ft. maximum from any external or internal corners, and in straight runs less than 24 ft. but more than 10 ft., make expansion joints at center of run. Running joints between expansion joints shall be locked and soldered or lapped and riveted/soldered.

- 3.05 PROTECTION: Protect dissimilar metals subject to galvanic corrosion from contact with each other and from other surfaces which cause corrosion of metal.

END OF SECTION

SECTION 07 6500
FLEXIBLE FLASHING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Self adhesive elastomeric sheet waterproofing membrane.
 - 2. Self adhering flexible strip flashing for louvers, doors and windows.
 - 3. Corner flashing at sills of louvers, doors and windows.
- B. Related Sections:
 - 1. Section 07 4113, Preformed Metal Roofing.
 - 2. Section 07 6200, Sheet Metal Flashing and Trim.
 - 3. Section 07 9200, Joint Sealants.
 - 4. Section 08 1113, Hollow Metal Doors and Frames.
 - 5. Section 08 5113, Aluminum Windows.

1.02 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM D412 - Rubber Properties in Tension.
 - 2. ASTM E96 - Water Vapor Transmission of Materials.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittals: Requirements for submittals.
- B. Product Data: Submit manufacturer's product data and installation instructions.

1.04 QUALITY ASSURANCE

- A. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with three years documented experience.
- B. Strip Flashing: Company specializing in self adhering strip flashing with three years documented experience.
- C. Applicator: Company specializing in application of specified waterproofing and flashing with three years documented experience and approved by manufacturers.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Maintain products dry. Do not store in direct sunlight.
- C. Maintain minimum ambient temperature of between 50 and 90 degrees F.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements: Do not install waterproofing membrane or strip flashing during inclement weather or when air temperature is below 40 degrees F.

1.07 WARRANTY

- A. Provide five year manufacturer's warranty.
- B. Warranty: Include coverage of materials and installation and resultant damage from failure

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. Materials shall be as provided by one of the following manufacturer's, or equal having products conforming to Specification requirements.
 - 1. Elastomeric Sheet Membrane:
 - a. W.R. Grace, Vycor Ice and Water Shield.
 - b. Carlisle Coatings & Waterproofing, CCW WIP 300HT.
 - c. Henry Company; Blueskin SA.
 - 2. Elastomeric Flexible Strip Flashing:
 - a. Fortifiber "Fortiflash-40" flashing: www.fortifiber.com .
 - b. Fortifiber "Moistop Corner Shield" door and window sill flashing.
 - c. W.R. Grace, Vycor V40 Weather Barrier Strips.
 - d. Henry Company; Blueskin SA.

2.02 MATERIALS - ELASTOMERIC SHEET MEMBRANE

- A. Elastomeric Sheet Waterproofing: W.R. Grace Vycor Ice and Water Shield:
 - 1. Cross laminated high density polyethylene film and a rubberized asphalt adhesive, to withstand puncture and severe stress,
 - 2. 40 mil thickness.
 - 3. Width: 36 inch minimum.
 - 4. Tensile Strength (ASTM D412): 250 psi.
 - 5. Elongation(ASTM D412): 250 percent.
 - 6. Water Vapor Transmission (ASTM E96): 0.05 perms.
- B. Primer: Bituthene Water-Based Primer as recommended by manufacturer.

2.03 MATERIALS - ELASTOMERIC FLEXIBLE STRIP FLASHING

- A. Elastomeric Sheet Waterproofing: FortiFlash 40.
 - 1. Thickness: 40 mils.
 - 2. Modified elastomeric composition reinforced with an inert reinforcing to withstand puncture and severe stress.
 - 3. Elongation (ASTM D412): 200%.
 - 4. Puncture Resistance (ASTM E154): 40 lbf.
 - 5. Water Vapor Permeance (ASTM E96): 0.05 perms.
- B. Primer: Water-based primer as recommended by manufacturer.

2.04 ACCESSORIES

- A. Corner Flashing: Fortifiber "Moistop Corner Shield"; or equal. Provide at doors, louvers, and window sills.
- B. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.
- C. Sealants: As recommended by membrane manufacturer.

3.01 EXAMINATION

- A. Verify items which penetrate surfaces to receive waterproofing are rigidly installed.
- B. Verify surfaces are free of cracks, depressions, waves, or projections which may be detrimental to successful installation.
- C. Do not apply waterproofing to damp, frozen, dirty, dusty, or deck surfaces unacceptable to manufacturer.
- D. Correct unacceptable conditions prior to commencing work.

3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.
- B. Seal cracks and joints with recommended material and sealant. Use proper depth-width ratio as recommended by sealant manufacturer and in accordance with Section 07 92 00 – Joint Sealants.
- C. Clean surfaces of foreign matter detrimental to installation of membrane or flashing. Vacuum horizontal substrates clean.

3.03 INSTALLATION - ELASTOMERIC SHEET MEMBRANE

- A. Apply elastomeric sheet waterproofing membrane in accordance with manufacturer's instructions.
- B. Roll out waterproofing. Minimize wrinkles and bubbles.
- C. Apply primer in accordance with manufacturer's instructions. Completely bond sheet to substrate, except those areas directly over or within 3 inches of a working crack or expansion joint.
- D. Remove release paper layer. Roll out on surfaces receiving membrane to encourage contact bond.
- E. Overlap edges and ends minimum 3 inches.
- F. Shingle joints on vertical substrate in direction of drainage.
- G. Seal to adjoining surfaces.
- H. Seal items penetrating flashing with mastic material.

3.04 INSTALLATION – ELASTOMERIC FLEXIBLE STRIP FLASHING

- A. Apply strip flashing and corner flashing at louvers, doors and windows in the sequence required by manufacturer's installation instructions.
- B. Install corner flashing at louvers, door and window sill locations.
- C. Install strip flashing at exterior wall locations as indicted on Drawings.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 07 7123

GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Gutters
 - 2. Downspouts
- B. Related Sections:
 - 1. Section 07 6200: Sheet Metal Flashing and Trim.

1.03 SUBMITTALS

- A. Product Data: Catalog sheets and specifications for sealant.
- B. Samples:
 - 1. Gutter: 12 inches long, full section.
 - 2. Downspout: 12 inches long, full section.
 - 3. Hanger Brackets, Braces, and Stiffeners: one, each type.
 - 4. Fasteners: Six, each type.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: To include in maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Engage an experienced contractor specializing in gutters and downspout work with a minimum of fifteen (15) years' experience.
- B. Maintain a full-time supervisor/foreman who is on the job-site at all times during installation. Foreman must have a minimum of ten (10) years' experience with installation of similar system to that specified.

1.06 WARRANTY

- A. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion.
- B. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Prefinished Steel: Galvalume steel sheet, ASTM A792, fabricated from "tension leveled" coil stock.
 - 1. Finish: Full strength 70 percent Kynar 500 Fluorocarbon Coating (polyvinylidene fluoride, PVF) applied by the coil coating process. Minimum dry film thickness 1.0 mil.
 - 2. Components:
 - a. Hung Gutter: 22 gage galvalume steel.
 - b. Downspouts: G-90 galvanized schedule 40 pipe.
 - c. Outlet Tube, Offsets, and Elbows: 24 gage galvalume steel.
 - d. Gutter Hanger Brackets: 1/8 inch by one inch galvalume steel bar with Kynar finish.
 - e. Gutter Braces: 1/4 inch by one and one half inch galvalume steel bar with Kynar finish.
 - f. Gutter Stiffener: 1/8 inch x 3/4 inch galvanized steel bar.
 - g. Downspout Support Hanger: 26 gage galvalume steel.
 - h. Wire Strainers: Copper or stainless steel wire type.
 - 3. Fasteners:
 - a. Screws, Bolts, and Other Fastening Accessories: galvanized steel.
 - b. Rivets: Stainless steel, minimum diameter 3/16 inch.
- B. Sealant:
 - 1. Silicone, one part, low modulus.
 - 2. Butyl rubber, one part
- C. Polyester Fabric, non-woven, ASTM D5034.
- D. Splash Pad: Precast concrete, 3500 psi. Form splash pads with a sloped depressed center area. Approximate size, one foot x two feet long.

2.02 FABRICATION

- A. Fabricate gutters, downspouts, and fittings to the shape and profile indicated on the Drawings. When fabrication details are not indicated follow the applicable requirements of the Architectural Sheet Metal Manual of the Sheet Metal and Air Conditioning Contractors National Association, Inc.
 - 1. Form gutters in longest sections possible.
 - 2. Form downspouts in 10 foot long sections minimum.

PART 3 - EXECUTION**3.01 PREPARATION**

- A. Do not install the Work of this Section unless all necessary nailers, blocking and other supporting components have been provided.

3.02 JOINING

- A. Join steel sections with one inch wide lapped, riveted, and sealed seams. Seal seams with butyl tape sealant within the lap and polyester cloth embedded in silicone sealant over the entire joint. Use 3/16 inch diameter rivets spaces one inch on center.

3.03 INSTALLATION

- A. Connection to Existing Construction: Tie the items of Work in with the existing work to obtain watertight installation. Match the existing installation as much as practicable, unless otherwise specified. Repair and dress adjacent existing components as required to make secure and neat connections with new items.
- B. Installation of Hung Gutters:
 - 1. Install gutter hanger brackets 3 feet on center. Install the brackets so there will be a slight pitch in the gutter towards the downspouts.
 - 2. Join the gutter sections, end pieces, mitered corners and outlet tubes.
 - 3. Install expansion joints where indicated on drawings. If not indicated, place the expansion joints at mid points between the downspouts at maximum intervals of 48 feet.
 - a. Form the expansion joint with end baffles conforming to the shape of the gutter. Join the baffles to the gutter section.
 - b. Install a cover plate over the baffle.
 - 4. Install a continuous stiffener bar along the top front edge of the gutter. Fold the gutter around the stiffener bar so it is securely locked in place.
 - 5. Install gutter braces 3 feet on center, staggered from the gutter hanger brackets. Secure the braces to the stiffener bar and to the back vertical portion of the gutter with brass or copper bolts.
 - 6. Secure the top back edge of the gutter to the gravel stop, eave flashing, or continuous clear as indicated on the drawings.
- C. Installation of Downspouts:
 - 1. Join the downspout sections with end joints that telescope at least 1 1/2 inches.
 - 2. Install necessary offsets and elbows.
 - 3. Provide wire strainer at each gutter opening to downspout.
 - 4. Secure downspout with hangers 5'-0" on center and with a minimum of 2 hangers at each downspout section. Form hangers to keep downspouts 1 inch away from wall.
 - 5. Fasten downspouts to hangers with sheet metal screws.
 - 6. Secure hangers to masonry and concrete walls with machine bolts in lead shields and to wood walls with screws.
 - 7. Discharge Elbows: Fasten leader shoes to downspouts with a minimum of 3 sheet metal screws.
 - 8. Connection to Underground Drains: Fit the downspout neatly into the drain pipe or boot. Caulk the joint with lead wool and seal with sealant.
- D. Installation of Splash Pads: Install splash pads under discharge elbows unless otherwise indicated.
- E. All gutters and downspouts to be water tested in presence of project inspector.

3.04 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove coating that does not comply with requirements, repair substrates, and reapply coating.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 07 9200**JOINT SEALANTS****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Caulking and sealant work required for the project and not specified elsewhere.
- B. Related Sections:
 - 2. Section 07 6000, Flashing and Sheet Metal.
 - 3. Section 09 2900, Gypsum Board.
 - 4. Division 22, Plumbing.
 - 5. Division 26, Electrical.

1.02 SUBMITTALS

- A. Samples: Samples of exposed caulking and sealants are required for Architect's approval of colors. Unless otherwise directed, apply samples in 6-inch runs in actual joints at the project site.
- B. Manufacturer's Specifications and Materials List: At least 30 days prior to commencing work, furnish to Architect, 2 copies of manufacturer's specifications for installations indicated, listing specific materials proposed. Specifications shall indicate completely, recommendations for use of primers, joint preparation and sealant dimensions.

1.03 QUALITY ASSURANCE

- A. Exterior, elastomeric type sealants shall be applied by a firm normally in the business of applying sealants similar to those specified.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver caulking and sealants and related accessories to the job site in factory sealed, unopened containers bearing manufacturer's name and product designation.
- B. Storage: Store in unopened containers. Follow manufacturer's recommendations for storage temperatures and shelf life.
- C. Handling: Follow manufacturer's recommendations for handling products containing toxic materials. Keep flammable material away from heat, sparks and open flame. Use recommended solvents and cleaning agents for cleaning tools, equipment and skin.

1.05 PROJECT CONDITIONS

- A. Environmental Conditions: Schedule caulking and sealing operations so that working joints are most likely to be normal size. Apply materials within manufacturer's recommended surface and ambient temperature ranges.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. General: Caulking and sealants, primers and accessories shall be non-staining to adjacent exposed materials. Products having similar application and usage shall be of the same

manufacturer and type. Unless otherwise specified, colors will be selected from approved manufacturer's standard range. Use gun consistency compounds unless otherwise required by job conditions.

- B. Butyl Sealant: One component, butyl based sealant, skinning type; DAP "Butyl-Flex", Pecora BC-158, Tresco "Butyl Sealant", or approved equal.
- C. Silicone Sealant for Exterior: One component, low modulus, silicone based sealant; Dow-Corning "791" or "795", General Electric "Silpruf", or approved equal.
- D. Silicone Sealant for Interior: Dow-Corning "8640", or approved equal, white color.
- E. Primers, If Required: As manufactured and recommended for each substrate by approved manufacturer of each caulking and sealant material used.
- F. Back-Up Materials: As recommended for and compatible with each caulking and sealant used. In general, use closed cell, bead or rope shaped, expanded polyethylene or polyurethane foam. Do not use bituminous, oily or solvent containing materials or incompressible materials. In general, width or diameter of preformed; back-up material shall be 1-1/3 to 1-1/2 times the width of the joint to be sealed.
- G. Release Materials: Polyethylene film.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect surfaces to receive caulking and sealant materials and report defects. Starting work implies acceptance of surfaces as satisfactory.
- B. Verify that joints and spaces to be caulked or sealed is of proper width.
- C. Concrete, masonry, and plaster surfaces shall be thoroughly cured.
- D. Apply no caulking or sealant materials in contact with surfaces contaminated with oil, grease, bituminous materials, form release agents, bond breakers, and deleterious curing compounds, water repellents and other special surface treatments. Aluminum surfaces must be free of lacquer and other oxidizing coatings. Costs occasioned by removal of such contaminants shall be responsibility of the trade having caused their presence.

3.02 PREPARATION

- A. Thoroughly clean joints, removing foreign matter such as dirt, dust, moisture, frost, rust, mill scale, paint, lacquer and protective coatings. Blow joints free of loose particles.
- B. Use no cleaning solvents that leave residue. Wipe joints free of solvent using clean, dry white cloths or white lintless paper. Do not permit solvent to air dry.
- C. Follow the Manufacturer's directions for products and surfaces.

3.03 INSTALLATION

- A. Unless otherwise required by these Specifications, install materials in strict accordance with Manufacturer's specifications and recommendations using approved equipment.
- B. Usage:
 - 1. Use butyl sealant for interior static joints not otherwise noted.

2. Use interior type silicone sealant for caulking around ceramic tile and similar conditions at vertical surfaces.
 3. Use exterior type silicone sealant for joints not otherwise noted or specified.
- C. Prime surfaces as recommended by manufacturer immediately prior to caulking or sealing. Make preliminary tests to ensure that primers will not stain exposed materials or deteriorate back-up material.
- D. Unless otherwise required by caulking and sealant manufacturer's specifications and recommendations, use back-up material to control caulking and sealant depths as follows, depths are measured at bond face:
1. Silicone Sealants at Exterior: Make depth half of width but not less than 3/16 inch or more than 3/8 inch.
 2. Do not twist or stretch preformed bead or rope type back-up material during installation.
- E. At joints subject to movement, where required by nature of back-up material used or where sealant contacts back of joint, use release material between back-up material or back of joint and sealant to confine adhesion to surfaces of materials being joined. Follow manufacturer's recommendations exactly. Release material is not required over polyethylene backing.
- F. Neatly tool joints to slightly concave surface using tooling agent recommended by sealant manufacturer. Repair any air pockets exposed by tooling. Tool so as to compress material and improve adhesion to surfaces joined.
- G. Use masking tape where practical to control lap of materials onto adjacent surface or to facilitate tooling. Remove tape immediately after caulking and sealing.

3.04 REPAIR/RESTORATION

- A. Patch or replace defective or damaged sealants. Be responsible for damage to adjacent surfaces caused by caulking and sealant operations.

3.05 CLEANING

- A. Clean adjacent surfaces soiled by caulking and sealing operations. Remove wet material before it sets. Follow manufacturer's recommendations for cleaning procedures. Cleaning agents shall not stain or be injurious to exposed surfaces nor shall they be potentially dangerous to glass and metal surfaces due to wash-off by rain.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 08 7100

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions of Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following, but is not necessarily limited to:
 - 1. Door Hardware, including electric hardware.
 - 2. Storefront and Entrance door hardware.
 - 3. Thresholds, gasketing and weather-stripping.
 - 4. Door silencers or mutes.
- C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
 - 1. Division 8: Section - Steel Doors and Frames.
 - 2. Division 8: Section - Wood Doors.
 - 3. Division 8: Section - Aluminum Storefront
 - 4. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.03 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

- A. 2022 California Building Code, CCR, Title 24.
- B. BHMA – Builders' Hardware Manufacturers Association
- C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.
- D. DHI – Door and Hardware Institute
- E. NFPA - National Fire Protection Association.
 - 1. NFPA 80 - Fire Doors and Other Opening Protectives
 - 2. NFPA 105 - Smoke and Draft Control Door Assemblies
- F. UL - Underwriters Laboratories.
 - 1. UL 10C - Fire Tests of Door Assemblies
 - 2. UL 305 - Panic Hardware

G. WHI - Warnock Hersey Incorporated

H. SDI - Steel Door Institute

1.04 SUBMITTALS & SUBSTITUTIONS

- A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.
- B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Submit six (6) copies of schedule organized vertically into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
1. Include a Cover Sheet with;
 - a. Job Name, location, telephone number.
 - b. Architects name, location and telephone number.
 - c. Contractors name, location, telephone number and job number.
 - d. Suppliers name, location, telephone number and job number.
 - e. Hardware consultant's name, location and telephone number.
 2. Job Index information included;
 - a. Numerical door number index including; door number, hardware heading number and page number.
 - b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
 - c. Manufacturers' names and abbreviations for all materials.
 - d. Explanation of abbreviations, symbols, and codes used in the schedule.
 - e. Mounting locations for hardware.
 - f. Clarification statements or questions.
 - g. Catalog cuts and manufacturer's technical data and instructions.
 3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)					
			(a) 1 Single Door #1 - Exterior from Corridor 101	(b) 90°	(c) RH
			(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea	(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS	(m) 626	(n) IVE
2	6AA	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.

- D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.
- E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.
- F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.
- I. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.
- J. LEED Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification; coordinate and cooperate with Owner and Architect in providing information necessary for required LEED rating.

1.05 QUALITY ASSURANCE

- A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
 - 1. Responsible for detailing, scheduling and ordering of finish hardware.
 - 2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing. To maintain the integrity of patented key systems provide a letter of authorization from the specified manufacturer indicating that supplier has authorization to purchase the key system directly from the manufacturer.
 - 3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.
- C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".
- E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- F. Product packaging to be labelled in compliance with CA Prop 65, Safe Drinking Water and Toxic Enforcement Act of 1986.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.
- B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.
- C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.
- D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.07 WARRANTY

- A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
 1. Locksets: "L" Series (3) years – "ND" Ten (10) years.
 2. Electronic: One (1) year.
 3. Closers: Thirty (30) years –1260 twenty (20) years –Concealed High Security fifteen (15) years --except electronic closers shall be two (2) years.
 4. Exit devices: Three (3) years.
 5. All other hardware: Two (2) years.

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.09 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at least one week prior to beginning work of this section.
- B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, and Key Owner Personnel.
- C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review Owner's keying standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal
Exit Devices	Von Duprin	Or Approved Equal
Closers	LCN	Or Approved Equal
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

2.02 MATERIALS

- A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
1. Hinges shall be sized in accordance with the following:
 - a. Height:
 - 1) Doors up to 42" wide: 4-1/2" inches.
 - 2) Doors 43" to 48" wide: 5 inches.
 - b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
 - c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
 2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
- B. Floor Closers: Shall be equipped with compression springs, cam and roller operating mechanism and a one piece spindle-cam for maximum operating performance and longevity.
- C. Pivots: High strength forgings and castings with precision bearings for smooth operation. Positive locking vertical adjustment mechanism to allow installer to precisely position the door and balance the load.
- D. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.

- E. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" design, fastened with through-bolts and threaded chassis hubs.
1. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
 - a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
 - b. Offset lever pull – minimum 1,600 foot pounds without gaining access
 - c. Vertical lever impact – minimum 100 impacts without gaining access
 2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers
 3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.
 4. Cylinders: Refer to "KEYING" article, herein.
 5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
 6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
 7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
 8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
 9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
 10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
 11. Provide wired electrified options as scheduled in the hardware sets.
 - a. 12 through 24 volt DC operating capability, auto-detecting
 - b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
 - c. 0.230A (230mA) maximum current draw
 - d. 0.010A (10mA) holding current
 - e. Modular / "plug in" request to exit switch
 12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
- F. Schlage "L" Series as scheduled with "06" Style Lever and "A" Style Rose.
1. Locksets to comply with ANSI A156.13, Series 1000, Operational Grade 1 and Security Grade 1 with all standard trims. Locksets shall also comply with UL10C Positive Pressure requirements
 2. Lock case shall be manufactured with heavy 12 gauge steel with fully wrapped design. Lock cases with exposed edges are not acceptable. Lock case shall be multi-functional allowing transformation to a different function without opening lock case.
 3. Latchbolt shall have 3/4" throw and be non-handed, field reversible without opening the lock case. Solid latchbolts and / or plastic anti-friction devices are not acceptable.
 4. The deadbolt, when used, shall be 1" throw stainless steel with a 3/4" internal engagement when fully extended.
 5. All trim shall be through-bolted with the spring cages supporting the trim attached to the lock cases to prevent torqueing.
 6. Levers to have independent rotation in both directions. Exterior lever assembly to be one-piece design attached by threaded bushing. Interior lever assembly shall be attached by screwless shank
 7. Thru-bolt lever assemblies through the door for positive interlock. Locks using a through the door spindle for attachment are not acceptable. Spindles shall be independent, designed to "break-away" at a maximum of 75psi torque.
 8. Hand of lock chassis to be changeable by simply moving one screw from one side to the case to the other and pulling and reversing the latchbolt.

9. Cylinders to be secured by a cast stainless steel, dual retainer. Locks utilizing screws and / or stamped retainers are not acceptable.
- G. Deadlocks: Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of 1/4" diameter steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike alloy deadbolt with reinforcer and two 3" long screws. ANSI A156.5, 2001 Grade 1 certified.
- H. Exit devices: Von Duprin as scheduled.
1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
 2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
 3. Mechanism case shall have an average thickness of .140".
 4. Compression spring engineering.
 5. Non-handed basic device design with center case interchangeable with all functions.
 6. All devices shall have quiet return fluid dampeners.
 7. All latchbolts shall be deadlocking with 3/4" throw and have a self-lubricating coating to reduce friction and wear.
 8. Device shall bear UL label for fire and or panic as may be required.
 9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
 10. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.
 11. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
 12. Furnish glass bead kits for vision lites where required.
 13. All Exit Devices to be sex-bolted to the doors.
 14. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
 - a. The unlatching force shall not exceed 15 lbs. applied in the direction of travel.
- I. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.
1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
 2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
 3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
 4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
 5. Closers shall be installed to permit doors to swing 180 degrees.
 6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.

7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
 8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.
- J. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
 2. Provide dust proof strikes at openings using bottom bolts.
- K. Door Stops:
1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
 2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
 3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.
- L. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.
- M. Thresholds: As Scheduled and per details.
1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
 2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection".
 3. Use 1/4" fasteners, red-head flat-head sleeve anchors (SS/FHSL).
 4. Thresholds shall comply with CBC Section 11B-404.2.5.
- N. Seals: Provide silicone gasket at all rated and exterior doors.
1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
 2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
 3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on "S" labeled Positive Pressure door assemblies.

- O. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.
- P. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

- A. Furnish a Proprietary Schlage masterkey system as directed by the owner or architect. Key system to be designated and combined by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer. This is to be a Schlage Everest keying system
- B. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.
- C. Extend the original Schlage masterkey system established for the project named _____ located in _____ under Schlage Structure # _____

-OR-

- D. Establish a new masterkey system for this project as directed by the keying schedule.
- E. Furnish all cylinders in the Schlage conventional style except the exit device and removable mullion cylinders which will be supplied in Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI).
- F. Furnish construction keying for doors requiring locking during construction.
 - 1. For FSIC systems provide 23-030-ICX Full Size Construction Cores
 - 2. For FSIC systems provide ten 48-101-ICX Construction Keys
 - 3. For FSIC systems provide two 48-056-ICX Control Keys (const.)
 - 4. For FSIC systems provide two control keys for installing the permanent cores (49-056 for "Classic" keyways, 48-052-XP for "Classic Primus") (49-003 for "Everest Conventional", 48-005-XP for "Everest Primus")

-OR-

- G. Furnish construction keying for doors requiring locking during construction.
 - 1. For "Split Key" Construction Cylinders (non-IC cylinders) specify "CK" for each keyed cylinder.
 - 2. Provide ten Construction Keys (48-104 "Classic", 48-008 "Everest")
 - 3. Provide two Extractor Tools (35-057)
- H. Furnish all keys with visual key control.
 - 1. Stamp key "Do Not Duplicate".
 - 2. Stamp (BHMA) key symbol on key.
 - 3. Stamp unique owner identifier from the key bow.
 - 4. Delete key section identifier from the key bow.
 - 5. Delete key "bitting" from the key bow.

- I. Furnish mechanical keys as follows:
 - 1. Furnish 2 cut change keys for each different change key code.
 - 2. Furnish 1 uncut key blank for each change key code.
 - 3. Furnish 6 cut masterkeys for each different masterkey set.
 - 4. Furnish 3 uncut key blanks for each masterkey set.
 - 5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
 - 6. Furnish 1 cut control key cut to each SKD combination.
- J. Furnish Key System Management Software (SM01-287 Windows on CD)
- K. Furnish Keying Transcript (50-123 in SM form) to owner for loading into key system software. End-user to provide letter of authorization to hardware dealer to allow Schlage to e-mail transcript (bitting list) to the end-user.

-OR-

- L. Furnish Keying Transcript (50-123) to owner. End-user to provide letter of authorization to hardware dealer to allow Schlage to mail transcript (bitting list) to the end-user or designated representative.
- M. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.
 - 1. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47-413 (conventional) or 47-743-XP (PrimusXP) with above.
 - 2. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
 - 3. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.
- N. Furnish one Schlage cabinet lock for each cabinet door or drawer so designated on the drawings or keying schedule to match the masterkey system.
 - 1. Furnish CL100PB for use with non-I/C Schlage cylinders.
 - 2. Furnish CL77R for use with FSIC Schlage cylinders.
 - 3. Furnish CL721G for use with SFIC Schlage cylinders.

2.04 FINISHES

- A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.
- B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.
- C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.
- D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

- A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flathead, countersunk, full-thread type.
- C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
- D. Provide expansion anchors for attaching hardware items to concrete or masonry.
- E. All exposed fasteners shall have a phillips head.
- F. Finish of exposed screws to match surface finish of hardware or other adjacent work.
- G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.
- C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2013 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.

- G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.
- H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.
- I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.
- J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.
- K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.
- L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation.

3.03 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surface soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.04 HARDWARE LOCATIONS

- A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

- A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.06 SCHEDULE

- A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.
- B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.
- C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

GLY	=	Glynn-Johnson Corporation	Overhead Door Stops
IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
LCN	=	LCN	Door Closers
PEM	=	Pemko	Weatherstrip
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
TRI	=	Trimco	Lock protector
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

92315 OPT0078165 VERSION 2

GROUP NO. 1

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	VANDL VESTIBULE LOCK	ND93PD RHO XN12-035	626	SCH
1	EA	LOCK PROTECTOR	1082-6	630	TRI
1	EA	SURFACE CLOSER	4041 DEL EDA TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 1A - NOT USED

GROUP NO. 1B

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	VANDL VESTIBULE LOCK	ND93PD RHO XN12-035	626	SCH
1	EA	LOCK PROTECTOR	1082-6	630	TRI
1	EA	SURFACE CLOSER	4041 DEL SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 2

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	VANDL CLASSROOM LOCK	ND94P6D RHO	626	SCH
1	EA	SURFACE CLOSER	4041 DEL EDA TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	DOOR SWEEP	8192AA	AA	ZER
	EA	THRESHOLD	PER DETAIL		

GROUP NO. 2A - NOT USED

GROUP NO. 2B - NOT USED

GROUP NO. 2C

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	VANDL CLASSROOM LOCK	ND94P6D RHO	626	SCH
1	EA	SURFACE CLOSER	4041 DEL SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	DOOR SWEEP	8192AA	AA	ZER
	EA	THRESHOLD	PER DETAIL		

GROUP NO. 3

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	VANDL STOREROOM LOCK	ND96PD RHO	626	SCH
1	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 4 - NOT USED

GROUP NO. 5

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	VANDL STOREROOM LOCK	ND96PD RHO	626	SCH
1	EA	LOCK PROTECTOR	1082-6	630	TRI
1	EA	SURFACE CLOSER	4041 DEL SHCUSH	689	LCN
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	DOOR SWEEP	8192AA	AA	ZER
	EA	THRESHOLD	PER DETAIL		

GROUP NO. 6 - NOT USED

GROUP NO. 7

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	VANDL OFFICE LOCK	ND91PD RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	FLOOR STOP	FS436	626	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 8

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	PANIC HARDWARE	CD-PA-AX-99-NL	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
2	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4041 DEL EDA TBWMS	689	LCN
1	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 9

6	EA	HINGE	EXISTING TO REMAIN		
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	CD-PA-AX-99-DT	626	VON
1	EA	PANIC HARDWARE	CD-PA-AX-99-NL	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
4	EA	FSIC CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4041 DEL EDA TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 10

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	VANDL OFFICE LOCK	ND91PD RHO	626	SCH
1	EA	LOCK PROTECTOR	1082-6	630	TRI
1	EA	SURFACE CLOSER	4041 DEL EDA TBWMS	689	LCN
1	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	DOOR SWEEP	8192AA	AA	ZER
	EA	THRESHOLD	PER DETAIL		

GROUP NO. 11

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	CORRIDOR W/DEADBOLT	LV9456PD 06A L583-363	626	SCH
1	EA	SURFACE CLOSER	4041 DEL EDA TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 12

6	EA	HINGE	EXISTING TO REMAIN		
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	VANDL VESTIBULE LOCK	ND93PD RHO XN12-035	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4041 DEL EDA TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	ASTRAGAL	43SP	SP	ZER
2	EA	DOOR SWEEP	8192AA	AA	ZER
	EA	THRESHOLD	PER DETAIL		

GROUP NO. 13

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB457	626	IVE
1	EA	VANDL STOREROOM LOCK	ND96PD RHO	626	SCH
2	EA	FLOOR STOP	FS436	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 14

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	CD-PA-AX-99-DT	626	VON
1	EA	PANIC HARDWARE	CD-PA-AX-99-NL	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
4	EA	FSIC CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4041 DEL EDA TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS436	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 15

3	EA	HINGE	EXISTING TO REMAIN		
1	EA	VANDL OFFICE LOCK	ND91PD RHO	626	SCH
1	EA	LOCK PROTECTOR	1082-6	630	TRI
1	EA	SURFACE CLOSER	4041 DEL SHCUSH	689	LCN
1	SET	SEALS	45041CNB (PER FOOT)	AL	PEM
1	EA	DOOR SWEEP	8192AA	AA	ZER
	EA	THRESHOLD	PER DETAIL		

END OF SECTION

SECTION 09 2236**LATH****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Lathing work required for the project including repair of water damage, window replacement, and mechanical/plumbing penetrations in existing Portland Cement Stucco walls.
- B. Related Sections:
 - 1. Section 06 1000, Rough Carpentry.
 - 2. Section 07 2100, Thermal Insulation.
 - 3. Section 09 2423, Portland Cement Stucco.
 - 4. Section 09 9100, Painting.
 - 5. Division 22, Plumbing.
 - 6. Division 23, Heating, Ventilating, and Air Conditioning.
 - 7. Division 26, Electrical.

1.02 REFERENCES

- A. References, Codes and Standards: The following references, codes and standards are hereby made a part of this Section. Lathing work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing in the Drawings or these Specifications shall be construed as permitting work that is contrary to code requirements.
- B. "Specifications for Metal Lathing and Furring", and "Technical Bulletins", all published by Metal Lath/Steel Framing Association, latest editions.
- C. "Reference Specifications for Lathing, Furring and Plastering in California", published by California Lathing and Plastering Contractors' Association, Inc., latest edition.
- D. California Building Code, 2022 Edition.

1.03 SYSTEM DESCRIPTION

- A. Fire-Rated Assemblies: Fire-rated plaster assemblies including materials and methods of application used shall be approved by the Building Code.

1.04 SUBMITTALS

- A. Samples of Lath, Paper and Accessories.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, bundles, or rolls as applies, all properly labeled or identified as to contents and manufacturer. Protect metal items from rusting.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. The following specific brands, or model numbers are designated for standards of quality only.
- B. Paper Backing: ASTM D-779 Water Resistance Grade "D", 60 minute. Waterproof paper per CBC Standard 14-1, Fed. Spec. UU-B-790a, Type I, Grade D, Style 2, two layers minimum over solid sheathing.
- C. Wire Lath for Walls, Stucco Netting:
 - 1. Self-furring, galvanized welded wire fabric, 1-1/2 inch by 2 inch mesh, 16 by 16 ga. Keystone "Keymesh". Comply with the requirements in CBC Section 2507.2.
 - 2. Galvanized woven wire, 1-1/2 inch x 17 gauge mesh with 18 gauge horizontal line wires at 6 inches on center and Grade "D" waterproof paper backing.
- D. Rib Lath for horizontal surfaces: [3/8" Rib Lath](#), galvanized, 3.4 pounds per square yard by Western Metal Lath.
- E. Expanded metal lath:
 - 1. At walls without solid sheathing: Self-Furring Lath, 3.4 pound galvanized, with Continuous V-Groove, ASTM C-1063, by Western Metal Lath.
 - 2. At walls with solid sheathing: Self-Furring, 1.75 pound galvanized, with Continuous V-Groove, ASTM C-1063, by Western Metal Lath.
- F. Accessories: Products noted are listed to establish minimum function and quality standards. Products listed are as manufactured by Stockton Products, except as noted.
 - 1. Casing Beads: "J-B" J Bead, 26 ga galvanized steel. Use to terminate plaster as indicated at hollow metal frames.
 - 2. External Corner Reinforcing: [Corneraid](#), galvanized.
 - 3. Internal Corner Reinforcing: 2 inch by 2 inch Galvanized [Cornerite](#).
 - 4. Base Screeds: "J-B" J Bead, 7/8 inch by 3½ inch, 26 ga galvanized steel, with 1/2 inch diameter weep holes.
 - 5. Control Joints: "NVS" Narrow V Screed, 7/8 inch by 1/4 inch, 26 ga galvanized steel.
 - 6. Plaster Reveal Screed: "PCS" Plaster Channel Screed, 3/4 inch by 1 inch wide, aluminum alloy 6063 T-5, non-vented.
 - 7. Drip screed: "DS" Drip Screed, 7/8 inch, aluminum alloy 6063 T-5, non-vented. Reveal width 3/4 inch. At out side corners of soffits and as indicated.
 - 8. Soffit Vent: "PCS" Plaster Channel Screed, 7/8 inch by width indicated on drawings, 26 ga galvanized steel, with 1/4 inch diameter vent holes.
 - 9. Door and WindowHead Drip: "BSS" Blind Stop, 7/8 inch by 3½ inch, 26 ga galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect surfaces to receive lathing materials and report defects. Commencing work implies acceptance of surfaces.

3.02 COORDINATION

- A. Coordinate lathing work with other work supporting, adjoining, or fastening to same.
- B. Coordinate with trades responsible for access doors and plaster frames with exact locations subject to Architect's approval.
- C. Plaster moldings, reveal expansion joints, ventilating screeds and other similar trim items embedded in plaster surfaces shall be protected to facilitate painting.

3.03 INSTALLATION

- A. Except where modified herein, conform to requirements of listed References, Codes and Standards and to approved manufacturer's specifications. In event of conflict, assume most stringent requirements and secure instructions from Architect before proceeding.
- B. Include all non-structural welding required for proper installation of lathing work.
- C. Install accessory trim with pieces straight, aligned, plumb, and level, corners mitered and smooth. Provide plaster accessories as specified herein and as indicated on the drawings. Provide outside corners in Portland cement plaster with corner-aids. Provide metal plaster grounds at edges of plasterwork. Cut lath full length at expansion and control joints. Hold metal lath 1/4 inch clear of items such as electrical boxes, columns, etc., projecting through plaster surfaces. Install aluminum moldings level or plumb and aligned without offsets. Fasten with concealed galvanized fasteners at each bearing point, maximum 24 inches on center. Lap felt over flanges to prevent direct contact between lath and molding.
- D. Lathing: Where not otherwise noted or specified, weights and types of metal lath shall be in accordance with requirements of the listed References, Codes and Standards documents for sizes, spacings, and types of framing used.
 - 1. Underlayment:
 - a. Install 2 layers of backing paper, over solid sheathing or structural members in shingle fashion.
 - b. Install window opening perimeter flashing and sill pan flashing lapped in shingle fashion with the underlayment per manufacturer instructions.
 - 2. Lath Attachment:
 - a. Vertical: Attach stucco netting to wall framing at 6 inch intervals with 1-1/2 inch by 11 gauge galvanized and barbed, 7/16 inch head roofing nails, or 7/8 inch leg by 16 gauge power driven, galvanized staples, attachments at furring crimps. Lath/fabric shall fur out from vertical supports not less than 1/4 inch. Comply with the requirements in CBC Section 2507.2.
 - b. Horizontal: Comply with the requirements in CBC Section 2507.2.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 09 2423

PORTLAND CEMENT STUCCO

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Plaster, underlayment, metal accessories and finish for a complete and water resistant installation.
- B. Related Sections:
 - 1. Section 07 6200, Sheet Metal Flashing and Trim.
 - 2. Section 07 9200, Joint Sealants.
 - 3. Section 08 1100, Hollow Metal Frames.
 - 3. Section 09 2236, Lath.
 - 4. Section 09 9100, Painting.
 - 5. Division 22, Plumbing.
 - 6. Division 26, Electrical.

1.02 REFERENCES

- A. The following references, codes and standards are hereby made a part of this Section and all plastering work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing in the Drawings or these Specifications shall be construed as permitting work that is contrary to code requirements.
- B. "Reference Specifications for Lathing, Furring and Plastering in California" published by California Lathing and Plastering Contractors' Assn., Inc., latest edition.
- C. California Building Code, 2022 Edition, Chapter 25.

1.03 SYSTEM DESCRIPTION

- A. Fire Rated Assemblies: Fire rated plaster assemblies, including materials and methods of application used, shall be approved by the Building Code.

1.04 SUBMITTALS

- A. Samples: Submit samples for approval of all textured plaster finishes, 12" x 12" minimum size for each sample.
- B. Color selections for integral color finish coat.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Only unopened packages of material (except aggregates) bearing manufacturer's and brand names will be permitted. Store cement and lime under watertight cover away from sweating walls and damp surfaces until ready for use. Remove from site any damaged or deteriorated materials.

1.06 PROJECT CONDITIONS

- A. Existing Conditions: Protect adjacent finishes and surfaces from damage or stains during plastering operations. Where machine application of plaster is employed, mask or similarly protect adjacent surfaces. Remove overspray and droppings before material sets. Pay

particular attention to protection of glass and metal surfaces against etching caused by alkaline materials and moisture runoff or drainage therefrom.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Stucco Finish Coat: Formulated for machine application, mill-mixed and waterproofed.
- B. Lime: ASTM C 206, Type "S" finishing hydrate.
- C. Portland Cement: ASTM C 150, Type II. Plastic cement is not acceptable.
- D. Aggregates: Sand for Portland Cement Plaster: ANS A 42.2, natural or manufactured sand graded as follows:

Sieve Size	Percent Retained Each Sieve By Weight	
	Min.	Max.
#4	95	100
#8	70	90
#16	30	16
#30	10	40
#50	0	10
#100	0	0

- E. Fiber Reinforcement: Chopped strands of alkali-resistant polypropylene fiber, ASTM C 116, ½ inch long, for use in scratch coat only.
- F. Water: Clean and potable, free of silt and impurities detrimental to plaster.

2.02 MIXES

- A. Proportions for Portland Cement Plaster:
 - 1. Scratch and Brown Coats (By Volume): 1 part Portland Cement, 3-1/2 to 4-1/2 parts sand, 1/10 part maximum dry hydrated lime or equivalent in lime putty.
 - 2. Scratch coat ingredients to include polypropylene fiber reinforcement at the rate of 1 pound per 94 pound bag of cement. Comply with the manufacturer's recommendations.
 - 3. Finish Coat: Prepared finish coat requiring addition of water only, texture shall be Sand Float finish. It is essential that proportions of water material be kept constant to produce an even, uniform surface.
 - 4. The finish coat shall be integrally colored, selected from manufacturer's standard colors by La Habra Stucco or Davis Colors.
 - 5. The finish coat shall be La Habra Acrylic Finish-Medium Finish and with Acrylic Primer. Integral colors selected from manufacturer's standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect surfaces to receive plaster finishes and report defects. Starting work implies acceptance of surfaces as satisfactory.
- B. Apply no plaster to concrete or masonry surfaces that have been coated with bituminous compounds or other detrimental waterproofing agents.

- C. Examine lath, grounds, beads, screeds, etc., and determine that they are straight, curved, plumb, level or square and fastened as required per Section 09 2236, Lath.

3.02 PREPARATION

- A. Prepare surfaces to receive plaster in accordance with manufacturer's written directions and the requirements of the listed References documents.

3.03 APPLICATION

- A. General:
 - 1. Methods of mixing and application of plaster shall conform to requirements of the listed References documents and the specifications of particular products or systems.
 - 2. Measure material for plastering work in calibrated measuring boxes. Shovel measurement is not acceptable.
 - 3. Make overnight joining at natural breaking points such as vertical arises, expansion joints, angles, and changes in plane. Each coat of plaster for an entire surface from top to bottom and between natural breaking points shall be applied in one day.
 - 4. Where basecoat plaster finishes flush with metal frames, etc., cut plaster free from such materials before set. Neatly groove finish coat at such junctions.
- B. Application - Portland Cement Plaster:
 - 1. Unless otherwise noted, apply plaster on metal lath in 3 coats with a minimum thickness of 7/8 inch, finished face to back of lath.
 - 2. Do all leveling of scratch and brown coats of Portland Cement plaster surfaces with a straightedge (rod) only and not with a darby or float.
 - 3. Not less than 48 hours shall elapse between application of scratch and brown coats and not less than 7 days between application of brown and finish coats. Allow 10-14 days minimum when using a wire lath.
 - 4. Moist cure base coat when ambient temperature is 77 degrees Fahrenheit or higher and/or when the relative humidity is 70 percent, and the conditions are windy.
 - 5. Moist cure each base coat of plaster for not less than 48 hours, only when the base coat is set and is hard. In hot, dry, windy weather, fog spray periodically as required to prevent dryouts, glazed areas and bloom. Cover with polypropylene sheets to retard evaporation during extreme weather conditions.
 - 6. Do not moist cure base coat subject to freezing.
 - 7. Apply finish coats over uniformly damp surfaces free of surface water.
 - 8. Do not moist cure finish coat except in severe climatic conditions, such as extreme heat, strong winds, and low relative humidity and in compliance with the finish coat manufacturer instructions.
 - 9. Separate structural members, outlet boxes, frames, louvers, and similar penetrations from the plaster by a neat trowel cut.
- C. Surfaces and Tolerances: Finish all exposed surfaces true and even, without objectionable waves, cracks, or imperfections. Provide plaster suitable to form proper foundation for trim, moldings, paint and other finishing materials.

3.04 PATCHING

- A. Prior to acceptance of the project, all damage, cracks, checks, discolorations and other imperfections in the work, including damage caused by other trades and damage due to shrinkage and minor structure movements of the building, shall be cut out full depth and patched to match adjoining surfaces. Costs for repair of damage caused by other trades shall be borne by those responsible for the damage.

3.05 CLEANING

- A. Upon completion of plastering work, remove scaffolding, extra materials, and waste materials from the project site.

END OF SECTION

SECTION 09 2816

GLASS-MAT FACED GYPSUM BACKING BOARDS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Work in this section includes, but is not necessarily limited to:
 - 1. Thermal barrier.
 - 2. Roofing protection board.
 - 3. Roof insulation protection board.
 - 4. Re-cover board.
- B. Related Sections:
 - 1. Section 07 4113, Metal Roof Panels.
 - 2. Section 07 5216, SBS Modified Bituminous Membrane Roofing, Hot Applied.

1.02 REFERENCES

- A. Standards Compliance:
 - 1. DensDeck roof boards in 1/4, 1/2 and 5/8 inch thick: ASTM C 1177. Also DensDeck and DensDeck Prime meet Factory Mutual 4450 criteria for Class 1 insulated steel roof decks.
 - 2. 5/8 inch DensDeck Type 'X' roof board is a gypsum board classified by Underwriters Laboratories and can be used in many UL "P" and ULC "R" assemblies.
 - 3. 1/4 inch DensDeck, DensDeck Prime and DuraGuard roof boards: UL 790 Class A listing as a barrier board overlayment and UL 1256 as a thermal barrier underlayment over steel decks.
 - 4. FM tested for uplift resistance.
 - 5. 1/4 inch DensDeck and DensDeck Prime as an overlayment qualifies in FM Class 1 assemblies.
 - 6. 1/4 inch DensDeck and 1/4 inch DensDeck Prime as an overlayment qualify in FM Class 1 assemblies.

1.03 SYSTEM DESCRIPTION

- A. Design and Performance Requirements:
 - 1. Conditions such as weather conditions, dew, application temperatures and techniques, may cause adverse effects with adhered roofing systems. Consult roofing system manufacturer for their specific instructions on applying their products to gypsum backing board.
 - 2. The need for a separator sheet between the DensDeck roof board and the roofing membrane must be determined by the roof membrane manufacturer or roofing systems designer.
 - 3. Maximum flute span is 2 5/8 inches for 1/4 inch DensDeck products; 5 inches for 1/2 inch DensDeck products; and 8 inches for 5/8 inch DensDeck Type X products.
 - 4. Do not subject DensDeck, DensDeck Prime and DensDeck DuraGuard roof board to abnormal or excessive loads or foot traffic such as on plaza decks or under steel wheeled equipment that may fracture or damage the panels. Provide suitable roofing system protection when required.
 - 5. Confirm priming requirements of DuraGuard with membrane manufacturer.
- B. Fire Resistance:

1. DensDeck and DensDeck Prime: Flame Spread 0, smoke developed 0, when tested in accordance with ASTM E 84. Noncombustible when tested in accordance with ASTM E 136.
 - a. DensDeck 5/8" Type X Roof Board: UL-classified Type DD when tested in accordance with ASTM E 119.
 - b. DensDeck 5/8" Type 'X' Prime Roof Board: UL-classified.
2. DensDeck Duraguard: Flame spread 15, smoke developed 0, when tested in accordance with ASTM E 84. Noncombustible when tested in accordance with ASTM E 136.
 - a. Class A when tested to UL 790.
3. Code alternate to 15 minute thermal barrier as tested to UL 1256.

1.04 SUBMITTALS

- A. Product data: Submit manufacturer's descriptive literature indicating material composition, thickness, sizes and fire resistance.
- B. Shop drawings: Submit shop drawings indicating fastener and adhesive patterns for FM wind uplift resistance specified.
- C. Certification: Submit manufacturer's written certification that product meets specified fire-resistance requirements.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials to the project site in manufacturer's original packaging, containers and bundles with manufacturer's brand name and identification intact and legible.
- B. Storage and Handling: Keep materials dry before, during and after application. Outside storage must be off ground and protected by a breathable waterproof covering.
- C. This product contains continuous filament fiberglass. Fiber released during normal handling of this product can cause skin, eye and respiratory irritation. Avoid breathing dust and contact with skin and eyes. Follow these standard work practices:
 1. Wear long-sleeved, loose-fitting clothing, gloves and eye protection.
 2. Use an approved respirator, such as a 3M Model 9900 or equivalent.
 3. Wash exposed areas with soap and warm water after handling.
 4. Wash work clothes separately from other clothing; rinse washer thoroughly. Operations which generate high airborne fiber concentrations (over 10 fibers/cc) require additional respiratory protection.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glass-Mat faced gypsum backing boards shall be as manufactured by G-P Gypsum Corporation, or equal as approved by Architect, with products in conformance with specification requirements.

2.02 MATERIALS

- A. DensDeck: Nonstructural, glass mat faced gypsum panel with water-resistant core.
 1. Size: Nominal 4 feet by 8 feet, and 4 feet by 4 feet. Edges: Square.
 2. Thickness: 1/4 inch and 1/2 inch DensDeck Roof Board and 5/8" DensDeck Type 'X' Roof Board.

- B. DensDeck Prime: Glass mat faced gypsum with non-asphaltic, highly filled proprietary heat-cured coating on one side.
 - 1. Size: Nominal 4 feet by 8 feet, and 4 feet by 4 feet. Edges: Square.
 - 2. Thickness: 1/4 inch and 1/2 inch DensDeck Prime Roof Board and 5/8 inch thick DensDeck Type 'X' Prime Roof Board.
- C. DensDeck DuraGuard: Glass mat faced gypsum panel with blue low-perm, durable, integrated-coating on one side and coated glass mat on the back.
 - 1. Size: Nominal 4 feet by 8 feet, and special order 4 feet by 4 feet. Edges: Square.
 - 2. Thickness: 1/4 inch and 1/2 inch DensDeck DuraGuard and 5/8 inch DensDeck Type 'X' DuraGuard.

2.03 ACCESSORIES

- A. FM-approved plates and fasteners: Provide size and type in accordance with FM requirements and roof membrane manufacturer's written recommendations.
- B. Adhesives: As recommended by roof system manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide DensDeck roof board where indicated on drawings using fastening system specified.
- B. Use maximum lengths possible to minimize number of joints. Support edge joints with deck ribs. Stagger end joints of adjacent lengths of DensDeck roof board. Ends and edges are typically butted.
- C. Apply only as much DensDeck as can be covered by a roof membrane system in the same day.

3.02 INSTALLATION - ROOF BOARD

- A. In typical installations butt board edges and ends together. However long, uninterrupted runs of 1/4 inch thick DensDeck Prime may require slight gapping due to higher surface temperature gain.
- B. Avoid accumulation of water due to leaks or condensation in or on DensDeck roof board during and after construction. During winter months avoid overuse of non-vented, direct-fired heaters. Do not apply DensDeck during rains, heavy fogs and other conditions that may deposit moisture on the surface.
- C. When applying solvent-based adhesives or primers, allow sufficient time for the solvent to flash off to avoid damage to roofing components.
- D. Adhered Systems: As recommended by roof system and adhesive manufacturers.
- E. Mechanically Attached Systems: Install per FM guidelines for wind uplift resistance.
- F. Hot Mopping directly to DensDeck or DensDeck Prime: Consult and follow roofing system manufacturer's specifications for full mopping applications and temperature requirements. In case of conflicting recommendations, roofing system manufacturer's recommendations will prevail.

1. When using DensDeck or DensDeck Prime, maintain maximum asphalt application temperatures for Type III asphalt of 425° to 450°F. Application temperatures above these recommended temperatures may adversely affect roof system performance.
 2. Follow accepted roofing industry guidelines for full mopping applications such as EVT temperature guidelines, brooming and proper applications rates of asphalt.
 3. For application temperatures in excess of 450°F and for mopping of Type IV asphalt, ribbon or spot mopping or the installation of a perforated base sheet are acceptable methods of bonding asphalt in lieu of full mopping.
- G. Hot Mopping asphalt or coal tar directly to DensDeck DuraGuard: Follow the manufacturer's recommended system application temperature guidelines and good roofing practices.
- H. Torch applied directly to DensDeck:
1. DensDeck Prime is the preferred substrate for torch application.
 2. Ensure proper torching technique. Limit the heat to the DensDeck Prime. Maintain a majority of the torch flame directly on the roll.
 3. When using DensDeck in lieu of DensDeck Prime, prime the surface of the DensDeck and allow to dry thoroughly prior to torch application.
 4. When torching to DensDeck DuraGuard, maintain the majority of the torch flame on the Modified Bitumen roll rather than the surface of the board.

3.03 INSTALLATION - PARAPET AND WALL

- A. Use appropriate corrosion-resistant fasteners.
- B. Maximum parapet framing space for 1/2 inch DensDeck products is 16 inches on center
Maximum framing for 5/8 inch DensDeck products is 24 inches on center.
- C. Fasten a maximum 8 inches on center around the perimeter and 8 inches on center on framing members in the field of the panel.

END OF SECTION

SECTION 09 2900**GYPSUM BOARD****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Gypsum board systems as shown on the Drawings or specified herein. This Section also includes:
 - 1. Cementitious Backerboard.
 - 2. Installation of access doors in finished gypsum board surfaces.
 - 3. Caulking and sealants related to gypsum board systems sound retardant construction.
 - 4. Cementing and taping.
- B. Related Sections:
 - 1. Section 06 1000, Rough Carpentry.
 - 2. Section 07 2100, Thermal Insulation.
 - 3. Section 08 1100, Hollow Metal Frames.
 - 4. Section 09 3000, Tiling.
 - 5. Section 09 9100, Painting.
 - 6. Division 22, Plumbing.
 - 7. Division 23, Heating, Ventilating, and Air Conditioning.
 - 8. Division 26, Electrical.

1.02 REFERENCES

- A. The following references, codes and standards are hereby made a part of this Section. Gypsum board work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing in the Drawings or these Specifications shall be construed as permitting work that is contrary to code requirements.
- B. Gypsum Association, latest editions:
 - 1. [GA-216](#) "Application and Finishing of Gypsum Panel Products".
 - 2. [GA-214](#) "Recommended Levels of Gypsum Board Finish".
 - 3. Drywall Information Trust-Textures for Drywall Systems Used in California.
- C. California Building Code.

1.03 SYSTEM DESCRIPTION

- A. Fire-rated gypsum wallboard assemblies, including materials and methods of application used, shall be as approved by the Building Code.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12 inch long length for each trim accessory indicated.
 - 2. Textured Finishes: 12 inch by 12 inch sample for each textured finish indicated and on same backing indicated for Work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand and manufacturer's names.
- B. Store materials in protected dry storage areas. Neatly stack in flat position with suitable stickers to prevent sagging and contact with concrete slabs.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Gypsum Board: ASTM C36 and C1396. Pieces to be 4 feet wide, lengths as required for minimum of end joints. Tapered edge for finish surfaces butt edge for concealed surfaces.
 - 1. Standard: 5/8 inch thickness unless otherwise noted.
 - 2. Moisture Resistant: Special Fire Resistant and Water Resistant. ASTM C 630, Type "X", 5/8 inch thickness.
- B. Gypsum Board Accessories:
 - 1. Metal Edge Trim: USG 200-A, National Gypsum No. 100, or equivalent, where board edge is exposed; where edge is not exposed, USG 200-B, National Gypsum No. 00, or equivalent, may be used. Corner bead to be USG "Dur-A-Bead, 1-1/4 inch by 1-1/4 inch or National Gypsum Wallboard corner bead 1-1/8 inch by 1-1/8 inch.
 - 2. Fasteners: ASTM C 1002.
 - a. Wood Framing: Type 'W' drywall screws. 1 1/4 inch long screws for 5/8 inch board.
 - b. Metal Framing: Type 'S' self-drilling and self-tapping drywall screws. 1 inch long screws for 5/8 inch board.
 - c. Screw sizes given are for material applied directly to framing; where material is applied over backing, increase screw size for a minimum 5/8 inch penetration into wood bearing and 3/8 inch minimum into metal bearing.
 - d. Conform to CBC, Table 25-G and manufacturer's assembly approvals.
 - 3. Tape and Cement: As recommended by gypsum board manufacturer and meeting ASTM C 475 non-asbestos containing.
 - 4. Caulking and Sealant:
 - a. Concealed: Inmont "Presstite" 579.64, polyisobutylene, non-drying, non-skinning, gun grade; Tremco or USG "Acoustical Sealant", synthetic rubber, non-drying, non-skinning, gun grade; or approved equal or Coplanar Corp. "Polycel One", Pecora "Dyrafoam I", or approved equal, polymeric foam sealant.
 - b. Exposed: Pecora, DAP, Tremco, or approved equal, one component butyl sealant, skinning type, gun grade, white or gray color.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect surfaces, backing, structural systems, etc., to receive wallboard, and report discrepancies. Starting work implies acceptance of existing conditions.

3.02 PREPARATION

- A. Coordinate with other trades for provisions for insulation, blocking, backing, special anchors, etc., and ensure that such items are properly installed and located prior to installing wall finish.

- B. Coordinate with trades responsible for furnishing access doors with exact locations subject to Architect's approval.

3.03 INSTALLATION

- A. Erect gypsum wallboard systems in accord with applicable requirements of References, Codes and Standards Article, referenced manufacturer's specifications and governing codes. In event of conflict with Gypsum Association Standards, Code and manufacturer's specifications shall govern.
- B. Install wallboard plumb, level, and/or plane, applied vertically or horizontally with vertical edges and ends on bearing except that gypsum board applied over sound deadening board shall be applied vertically only.
 - 1. Where board is applied horizontally, place rippers, if required, so that the cut edge is at the ceiling or floor; cut edges and ends will not be acceptable within the field of the gypsum board.
 - 2. Properly space fastenings as per manufacturer's specifications and code requirements, with heads driven slightly below surface for proper cementing, but without breaking paper covering.
 - 3. Loosely butt joints to be taped; firmly butt concealed joints to be left untreated.
 - 4. Stagger end joints and joints in finish material 12 inches minimum with those in backing. Joints on opposite sides of partition shall occur on different studs.
 - 5. Install backing for finish material to present no surface imperfections in applied finish.
 - 6. Make holes and cutouts by sawing or by such method as will not fracture core or tear covering and with such accuracy that plates, escutcheons, trim, etc. will cover edges. Clearance for cutouts in partitions shall not exceed 1/4 inch.
- C. Caulking for Sound Control: Insulate construction with caulk as indicated on Drawings. In addition, caulk penetrations of sound insulated construction such as conduit, pipes, ducts, registers, etc., so that such openings are sealed tight against passage of airborne sound.
 - 1. Holes smaller than 1 inch but too large to caulk shall be packed with glass fiber, sealed over with 1/16 inch thick sheet lead and then caulked airtight.
 - 2. Seal the backs of electrical boxes in sound insulated construction airtight using specified resilient sealer pads.
 - 3. Conceal caulking and sealing where possible; where caulking must remain exposed, use skinning type material and neatly tool.
- D. Install metal edge trim at exposed edges and ends and at untrimmed joints between wallboard finish and other material. Where edge trim is required at wallboard edge, and headers, studs, sill or other backing are not available for positive fastening of trim, apply trim to board with contact type of adhesive.

3.04 TAPING AND FINISHING

- A. Environmental conditions: Control heating and ventilation during finishing operations to ensure the maintenance of 55 degree F. minimum temperature at least 48 hours prior to, during, and following the application of the gypsum board and joint treatment material or the bonding of adhesives.
- B. Tape and finish gypsum board in accordance with ASTM C 840 and GA-214.
 - 1. Provide a level 1 finish in mechanical rooms and plenums.
 - 2. Provide a level 3 finish in all areas to be covered with acoustical tile, vinyl wall covering, or vinyl covered tack board.
 - 3. Provide a Knock Down texture over a level 3 finish at all exposed areas.
 - 4. Provide a level 4 finish in Storage rooms.
 - 5. Provide a Level 5 finish at all exposed areas in Toilet and Locker rooms.

3.05 CLEANING

- A. Do not allow the accumulation of scraps and debris arising from the work of this Section but maintain the premises in a neat and orderly condition. In the event of spilling or splashing compound onto other surfaces, immediately remove the spilled or splashed material and trace residue to the approval of the Architect.

END OF SECTION

SECTION 09 3000**TILING****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Ceramic tile and related items necessary to complete the project as indicated on the Drawings and specified herein.

1.02 REFERENCES

- A. The following references and standards are hereby made a part of this Section as if repeated fully herein. Ceramic tile material and installation must conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Use latest edition.
- B. American National Standards Institute (ANSI):
1. A108.1B – Installation of Ceramic Tile in a Cured Portland cement Mortar Setting Bed with Latex Portland Cement Mortar.
 2. A108.5 - Installation Specification for Ceramic Tile Installed with Dry-Set Portland cement Mortar or Latex-Portland Cement Mortar
 3. A108.6 – Installation Specification for Ceramic Tile Installed with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy
 4. A108.10 - Installation Specification for Installation of Grout in Tile Work
 5. A108.13 – Installation Specification for Installation for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic tile and Dimension Stone Installations
 6. A118.3 – Material Specification for Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy
 7. A118.4 - Material Specification for Latex–Portland cement Mortar
 8. A118.7 – Material Specifications for Polymer Modified Cement Grouts for Tile Installations
 9. A118.10 1993 – Material Specification for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic tile and Dimension Stone Installations
- C. Tile Council of North America, Inc. (TCNA) – Handbook for Ceramic Tile Installation, latest edition.
- D. ASTM C-33 – Standard Specification for Concrete Aggregates

1.03 SUBMITTALS

- A. Samples:
1. Submit for approval of color, pattern and finish. Samples are required for each type, color and/or pattern selected and shall be submitted in sufficient size and quantity to portray overall range.
 2. Where colored grouts are required, submit (with respective tiles) for approval of color.

1.04 WARRANTY

- A. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion in addition to the manufacturer's standard warranty.
- B. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

1.05 EXTRA STOCK

- A. 1 group of the following per each room: 1 box floor tile, 1 box wall tile, 4-6 cove & corners.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Materials shall be as noted in Room Finish Schedule on the Drawings.
- B. To establish price and color range products shall be based on American Olean DaTile, or approved equal, Group 1 for wall tile, Group 2 for floor tile.

2.02 MATERIALS

- A. General Requirements: Tile shall be Standard Grade and comply with requirements of ANSI 137.1 with modifications as specified herein. Containers shall be grade sealed in accordance with minimum grade specifications described in ANSI A 137.1 latest edition.
- B. Tile:
1. Toilet Room Wall Tile: Glazed, dust pressed, machine made, white body, square edge, standard quality 4.25 inch by 4.25 inch tile to match existing tile. Color to match existing or as selected by District from manufacturer's standard running line.
 2. Toilet Room Floor Tile: Glazed ceramic tile or 2 inch square ceramic mosaic tile to match existing conditions. Color to match existing or as selected by District from manufacturer's standard running line.
 3. Trim Shapes and Bases: Trim units and shapes shall be of same type as the tile with which they are used. Include bases, bullnoses, caps, coves, stops, angles, returns, trimmers and other shapes indicated or required to produce a completely finished installation. Trim shapes shall match tile in color and finish unless otherwise indicated. Use surface type trim for thin-set installations. Unless otherwise shown, base for areas with floor and wall tile shall match the wall.
- C. Setting and Grouting Materials:
1. Setting and grouting materials must be the products of one manufacturer.
 2. Thin Set Bond Coat: Ultra Flex II polymer-modified thin set mortar by MAPEI complying to ANSI A118.4.
 3. Grout: KER 200 polymer-modified sanded grout by MAPEI complying with ANSI A118.7 at floors. KER 800 polymer-modified non-sanded grout by MAPEI complying with ANSI A118.7 at walls.
 4. Latex-Portland Cement Mortar: Commercially formulated, latex modified, thin-set Portland cement mortar conforming to American National Standard Specification A-118.4 for "Latex-Portland Cement Mortar".
- D. Prepared Grouts:
1. Commercial Cement Grout: Commercially prepared, waterproof grout, color as selected (grout may be either pre-colored or with grout color added to suit). Grout shall be premixed requiring addition of water (and color, if required) only and shall be certified by manufacturer as suitable for intended use.
 2. Dry-Set Grout: Commercially prepared cement grout with additives providing water retention, color as selected (as specified for commercial cement grout), requiring addition of water only.
 3. Epoxy Grout: Commercially prepared, color as selected.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Prior to commencing ceramic tilework, inspect surfaces to receive tile and accessories. Notify the architect or IOR in writing of visually obvious defects or conditions that will prevent a satisfactory tile installation. Installation work shall not proceed until satisfactory conditions are provided. Beginning tile installation implies acceptance of surfaces.

3.02 PREPARATION

- A. Surfaces shall be structurally sound, clean, dry, and free of oily or waxy films and foreign matter. Concrete surfaces shall be free of form oil, curing compounds, and laitance.
 - 1. Concrete floors shall be screed-finished for application of bonded portland cement mortar bed, but steel-trowel finished if a cleavage membrane is used under the mortar bed.
 - 2. If tile is to be bonded directly to concrete floor with one of the thin-set methods, the slab shall have a steel trowel and fine broom finish, wood float finish, or mechanical scarification.
 - 3. Grounds, anchors, plugs, hangers, door frames, electrical, mechanical, and other work in or behind tile shall be installed before tile work is started.
 - 4. Surfaces to receive tile shall be plumb, level, and true with square corners. Floors in wet areas shall be sloped with cementitious fill under membrane. Maximum variation from required plane shall be:

3.02 INSTALLATION

- A. Installation Methods: Conform to installation methods
 - 1. Install floor tile in accordance with TCNA Handbook for the installation of Ceramic Tile, 2018 Edition, no. F113, ANSI 108.5 and 108.10 in accordance with manufacturer's directions, and Reference Standard. Install tile using thin set bond coat over waterproof membrane over mortar bed. Turn waterproof membrane up the wall 6 inches.
 - 2. Install wall tile over backerboard. Adhesive as per manufacturer's directions and Reference Standard. Bond ceramic tile to backerboard with latex-modified Portland Cement Mortar applied with a proper square notched trowel to provide a 1/8 inch thickness of mortar after the tiles are beat and twisted into the mortar. First apply mortar as a skim coat with the trowel's flat edge to force the mortar into the openings on the backerboard surface, creating a good mechanical bond. Then trowel the mortar with the tool's notched edge.
 - a. Install using dry set or latex method, TCNA W 244C-latest edition.
- B. Prior to setting tile, caulk around pipe and conduit penetrating tile surface using specified sealant (concealed).
- C. Grouting:
 - 1. Wall Tile (Not Otherwise Specified): "Dry-set" prepared grout.
 - 2. Ceramic Mosaic Floor Tile: Commercial cement grout.
 - 3. Toilet rooms use Latex-epoxy mortar and grout.
- D. Use no grout or mortar once initial set has begun, do not retemper mixes.
- E. Set tile with joints continuous in both directions.
- F. Lay out tile with fields centered; avoid use of tile less than 1/2 size except at irregularly shaped areas. When cutting is required, grind edges smooth. Accurately cut tile around work of other trades so that coverings will completely cover cut edges. Firmly embed tile in setting material with finished surfaces brought to true planes.

- G. Cove bases to floor; no "topset" base permitted.
- H. Clean tile and adjacent surfaces of mortar and grout as work progresses.
- I. Provide proper temperature and humidity conditions for curing the work. Damp cure cement grouts for not less than 72 hours. Add dampness as required and cover with a non-staining membrane.

3.03 CLEANING

- A. When work is otherwise complete, clean entire tile installation. Mild acid cleaners may be used only where so recommended by manufacturer.

3.04 PROTECTION

- A. Protect finished installation from damage until final acceptance of entire project.

END OF SECTION

SECTION 09 5113**ACOUSTICAL PANEL CEILINGS****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes:
 - 1. Acoustical ceiling panels in exposed grid suspension system.
 - 2. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
- B. Related Sections:
 - 1. Section 09 2900, Gypsum Board.
 - 2. Division 22, Plumbing
 - 3. Division 23, Heating, Ventilating, and Air Conditioning.
 - 4. Division 26, Electrical.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 - 4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - 6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 - 7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
 - 9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
 - 10. ASTM E 1264 Classification for Acoustical Ceiling Products.
 - 11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
 - 12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
- B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

- C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
- D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

1.04 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - 1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
 - a. Flame Spread: 25 or less
 - b. Smoke Developed: 50 or less
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units.

1.06 PROJECT CONDITIONS

- A. Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

1.07 WARRANTY

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
 - 1. Acoustical Panels: Sagging and warping
 - 2. Grid System: Rusting and manufacturer's defects
- B. Warranty Period:
 - 1. Standard Acoustical panels: Ten years from date of substantial completion.
 - 2. Grid: 10 years from date of substantial completion.
 - 3. Moisture Resistant Acoustical panels: Fifteen years from date of substantial completion.
- C. The Warranty shall not deprive the District of other rights the District may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

- D. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion in addition to the manufacturer's standard warranty.
- E. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

1.08 MAINTENANCE

- A. Extra Materials: Deliver extra materials to District's Representative. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - 1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
 - 2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide products of one of the following Manufacturers, or equal as approved by Architect with products in conformance with specification requirements:
 - 1. Armstrong World Industries
 - 2. Chicago Metallic Corporation (for suspension system)
 - 3. USG Interiors, Inc.
 - 4. Celotex Building Products Division

2.02 ACOUSTICAL CEILING PANELS

- A. Standard Acoustical Panels: School Zone FINE FISSURED as manufactured by Armstrong World Industries.
 - 1. Surface Texture: Fine
 - 2. Composition: Mineral Fiber (plant based binder)
 - 3. Color: White
 - 4. Size: 24 inch by 48 inch by 5/8 inch
 - 5. NRC: 0.55
 - 6. CAC: 35
 - 7. Flame Spread: Class A, ASTM E 1264
 - 8. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.90.
 - 9. Dimensional Stability: Standard.

2.03 SUSPENSION SYSTEMS

- A. Components:
 - 1. Main Beams and Cross Tees: Commercial quality hot-dipped galvanized steel, as per ASTM A 653. Double-web steel construction with rotary stitching and exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in flat white baked enamel finish.
 - a. Structural Classification: ASTM C 635 Heavy Duty.
 - b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 - c. Acceptable Product: Match existing.
 - 2. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

- B. Grid to be installed per DSA IR 25-2.13
- C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three times design load, but not less than 12 gauge.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not proceed with installation until wet work such as plastering and painting has been completed and thoroughly dried, unless expressly permitted by manufacturer's printed recommendations.

3.02 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
- B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
 - 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.03 INSTALLATION

- A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636.
- B. Suspend main beam from overhead construction with hanger wires spaced 48 inches on center along the length of the main runner. Install hanger wires plumb and straight.
- C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
- D. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.04 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 6500

RESILIENT FLOORING

PART 1 - GENERAL

1.01 SUMMARY

- A. Work Included: Resilient flooring work as shown on the Drawings or specified herein including required installation accessories.
- B. Related Sections:
 - 1. Section 09 6513, Resilient Base and Accessories.
 - 2. Section 09 6813, Tile Carpeting.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM F1303 Standard Specification for Sheet Vinyl Floor Covering with Backing.
 - 2. ASTM F1913 Standard Specification for Vinyl Sheet Floor Covering Without Backing.
 - 3. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
 - 4. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

1.03 SUBMITTALS

- A. Shop Drawings: Provide seaming plan for sheet flooring.
- B. Product Data: Submit data on specific products, describing physical and performance characteristics, patterns and colors available.
- C. Samples: Submit 2 samples of each material specified for selection and/or approval of color, pattern, and finish, with samples of matching welding rod seams, and transition material proposed for installation.
- D. Maintenance Data: Submit maintenance procedures and recommended maintenance materials.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to project site in original, unopened containers bearing manufacturer's brand name.
- B. Store all materials at the job site at a minimum temperature of 70 degrees F. for not less than 48 hours before installation.

1.05 PROJECT CONDITIONS

- A. Environmental Conditions: Maintain rooms and areas to receive flooring at a minimum temperature of 70 degrees Fahrenheit for not less than 48 hours before, during, and 48 hours after installation. Thereafter, temperatures shall be maintained at not less than 55 degrees Fahrenheit.

- B. Moisture content and bondability of concrete sub-floors shall be determined by field testing method recommended by flooring manufacturer.

1.06 WARRANTY

- A. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion in addition to a five (5) year manufacturer's warranty.
- B. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

1.07 COMMISSIONING

- A. Require an informal commissioning requirement that provides ample site staff training sessions for the cleaning and care of product, including post occupancy reviews prior to expiration of warranty.

1.08. QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Require installer to be factory trained and certified. Forbo installers to be "Master Mechanic" certified.
 - 2. Proof of Certification; provide proof of certification as Forbo "Master Mechanic" before start of work.
 - 3. Master Mechanic must be present on job site daily.
 - 4. Require mock-up to establish workmanship quality of seams, welds and cove.
- B. Pre-Floor Covering Installation Meeting: Require a meeting to review subfloor preparation, verification of readiness for floor covering installation and use of correct products, verification of the acclamation of correct finish materials and review installation requirements.

1.09. EXTRA STOCK

- A. Specify extra materials, for each color, between 2-10 percent (depending on project size).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Vinyl Sheet Flooring: Furnish products of one of the specified Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements.
 - 1. Armstrong World Industries www.armstrong.com
 - 2. Forbo, "Marmoleum"
 - 3. No other known equal.

2.02 MATERIALS

- A. Linoleum Sheet Flooring: Meeting or exceeding Federal Specification SS-T-312B, and ASTM F1700, Static Load Limit 450 pounds per square inch, 2.5mm gauge, unless otherwise indicated. ASTM E682/NFPA 258—450 or less. ASTM E-648/NFPA 253—Class 1. Homogeneous linoleum of primarily natural materials consisting of linseed oil, wood flour, rosin binders and pigments mixed and calendared onto natural jute backing.

- B. Rubber Stairtreads: Norament Satura Stairtreads, color to be selected by Architect from manufacturer's standard colors.
- C. Rubber Flooring: Norament Satura rubber flooring. Color as selected by Architect from manufacturer's standard colors.

2.03 ACCESSORIES

- A. Adhesives and Primers: Low VOC adhesives and seam sealers.
- B. Leveling and Patching: Portland Cement types as recommended by flooring manufacturer.
- C. Underlayment: Specify "FiberFlor – Supreme" as manufactured by MacMillan Bloedel Building Materials or approved equal.
- D. Johnson Diversey Sealer, finish and cleaner, or approved equal.
- E. Transition strips, mill finish aluminum, 1-3/8" x 1/8" National Guard 408, or approved equal.
- F. Seam Welding: Fully heat-welded seams. Use hot-air seam-welding tool and welding rods as recommended by the Flooring Manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not commence installation until work of other trades within the area has been substantially completed.
- B. Inspect the sub-floor to receive resilient flooring in accordance with ASTM F710. Do not lay floor covering until sub-floors are in proper condition to receive same. Sub-floors shall be broom clean, free of foreign matter and thoroughly clean before installation.
- C. Commencing installation implies acceptance of surfaces.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Grind protrusions flush and smooth.
- B. Fill cracks, minor holes, crevices, and depressions with crack filler.
- C. Prohibit traffic from area until filler is cured.
- D. Vacuum clean substrate.
- E. Apply primer to floor surfaces as recommended by Flooring Manufacturer.

3.03 MOISTURE TESTS

- A. After the structure is enclosed and acclimated, test for dryness of subfloor using adequate tests recommended by the flooring manufacturer to assure moisture levels do not exceed the levels allowed by the manufacturer and assure bonding is not hindered.

- B. Additional tests and alternate methods shall be employed as required to compliance with the manufactures' recommendations.
- C. Schedule tests in advance of installation with enough time to allow for re-testing if initial moisture tests fail. Installation shall not begin until strict compliance to the manufacturers' requirements is met.

3.04 INSTALLATION

- A. Install in accordance with Manufacturers' instructions and in accordance with "Recommended Work Procedures for Resilient Floor Coverings" of the Resilient Floor Covering Institute.
- B. Adhesive: Spread adhesive uniformly and at coverage rate recommended by flooring manufacturer. Use notched steel trowel or other devices as may be specified by manufacturers of adhesive and flooring. Apply adhesive to areas only to the extent which can be covered with flooring within the recommended "tack" time of the adhesive.
- C. Flooring:
 - 1. Neatly trim material abutting other work to form a true, clean joint. Where flooring edges are covered by other materials, make cuts sufficiently accurate so that edges are completely concealed.
 - 2. Thoroughly bond resilient flooring to backing surfaces. Roll with a 3-section, 150-lb. roller. Blisters and fishmouths are not acceptable.
 - 3. Resilient flooring is not required under fixed, floor mounted casework, and equipment having integral bottoms.
 - 4. Provide transition strips from tile to adjacent surfaces.
- D. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
- E. Install edge strips at unprotected or exposed edges, and where flooring terminates.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- G. Installation of resilient sheet flooring over the Vapor Reduction Floor Coating. Install using flooring manufacturer's recommended adhesive for the vapor reduction system.

3.05 INSTALLATION – SHEET FLOORING

- A. Install sheet flooring in maximum possible sizes consistent with installation. Apply adhesive to substrate per Manufacturer's recommendations.
- B. Lay sheet flooring with seams parallel to building lines to produce minimum number of seams.
- C. Seam Welding: Seam weld floor covering joints in accordance with Manufacturer's directions. Trim welded seams flat after seams have cooled, inspect for voids between welds and adjacent flooring.

3.06 POLISH COATING

- A. Clean and perform initial maintenance immediately after installation per the manufacturers' recommendation.

- B. At high traffic areas, including but not limited to corridors and aisles, apply one coat of sealer beneath the floor polish.
- C. Apply two coats of floor polish.

3.07 CLEANING

- A. Prior to acceptance but not less than 5 days after installation, thoroughly clean all surfaces free of adhesive, soil, and construction stains. Surfaces soiled prior to acceptance of project shall be recleaned at no added expense to the Owner. Expenses arising from recleaning shall be borne by those responsible for the soil.

3.08 PROTECTION

- A. Provide such protection as is required to protect the installation from damage until acceptance of the project. Paper protection, where used, shall be undyed and untreated. Remove such protection immediately prior to acceptance. Close off traffic to prevent damage to newly installed flooring per manufactures' recommended period of time

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 09 6513

RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Resilient base as shown on the Drawings and specified herein.
- B. Related Sections:
 - 1. Section 09 6500, Resilient Flooring.
 - 2. Section 09 6813, Tile Carpeting.
 - 3. Section 09 9100, Painting.

1.02 SUBMITTALS

- A. Samples: Submit for selection and/or approval of color of base.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver material to project site in original, unopened containers bearing Manufacturer's brand name.
- B. Base material in one room or area shall be from one manufacturer's run. Cartons shall be clearly marked with run number.

PART 2 PRODUCTS

2.01 MATERIALS

- A. 4 inch top set or carpet rubber base by Burke, or equal, color as selected by the Architect.
- B. Adhesives and Primers: As recommended by approved base manufacturer for use on the substrate material.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Condition of Surfaces: Do not commence installation until work of other trades within the area has been substantially completed.
- B. Verify that backing surfaces are clean, smooth, plane and free of grease, oil construction films, or other coatings or stains.
- C. Commencing installation is acceptance of substrate surfaces.

3.02 INSTALLATION

- A. Follow manufacturer's specifications and recommendations for installations.

- B. Thoroughly bond base to wall with bottom edge in uniform contact with floor surface. Make joints tight and surfaces aligned. In general, use no pieces of base less than 12 inches in length. Use pre-molded shapes for external corners. Cope internal corners. Scribe base to abutting materials.

3.03 CLEANING

- A. Prior to acceptance, thoroughly clean surfaces free of adhesive, soil and construction stains. Reclean surfaces soiled prior to acceptance of project at no added expense to the Owner. Expenses arising from recleaning shall be borne by the Contractor.

END OF SECTION

SECTION 09 6813

TILE CARPETING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Modular carpet tile.

1.02 SUBMITTALS

- A. Product Data: Literature describing products, installation methods, and certificate of conformance with required Radiant Panel Test.
- B. Shop Drawings: Show layout of each area to be covered for approval of pattern, and any pertinent installation details.
- C. Samples:
 - 1. Manufacturer's standard size in specified range for color and pattern selections.
 - 2. Two full size tiles of each color and pattern selected.
 - 3. One foot long sample of carpet accessories.
- D. Maintenance Manuals: Printed copies of manufacturer's recommendations for care, cleaning, and maintenance of specified carpet tiles. Manufacturers' representative shall demonstrate on the job the recommended system of maintenance.
- E. Submit manufacturer's Certification of Fire Rating.
- F. Maintenance Materials:
 - 1. Furnish the Owner with a minimum of 5% of each different material and color used in this project from same lot or production run for compatibility with the installed materials
 - 2. Provide materials in securely wrapped packages or factory sealed packing with the manufacturer's standard labels and the material and color designation used in these specifications.
 - 3. Deliver material to the Owner's on site designated storage place, unloaded and positioned in place per Owner's instructions.
 - 4. Provide the Owner with a signed receipt indicating materials and quantities upon delivery.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
 - 1. Installer shall be factory trained
 - 2. Provide proof of certification
 - 3. Provide mock-up to establish workmanship quality of seams, welds and cove

- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Pre-Floor Covering Installation Meeting: Require a meeting to review subfloor preparation, verification of readiness for floor covering installation and use of correct products, verification of the acclimation of correct finish materials and review installation requirements.
- D. Carpet Tile Low-VOC Emissions: Provide carpet and cushion materials that have been tested and certified to indicate carpet, carpet backings, cushions, and adhesives emit no or low VOCs (volatile organic compounds). Provide products carrying the following certifications:
 - 1. CRI Green Label.
- E. Static electricity generation of installed carpet shall not exceed 3.5 KV at 70° F and 20% R.H. for life of carpet tile.
- F. Visually perceptible deviations in color at sides and end seams will not be acceptable.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."
- B. Deliver and store packaged materials in original containers labels intact until time for use, with seals unbroken and store rolls in a flat position. Protect from damage, dirt, stains and moisture.

1.05 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Sequencing Schedule: Do not install carpet tiles until building is entirely closed in, wet work and painting is completed, and heating system is in operation.

1.06 WARRANTY

- A. Manufacturer's Warranty: Twenty (20) year manufacturer warranty commencing on recordation date of the Notice of Completion.
 - 1. Should carpet, tend to creep or bulge, be defective in manufacturing or show a substantial amount of wear, carpet shall be replaced with new carpeting at no cost to the Owner. Manufacturer to submit written warranty covering the following:

2. 20 Year, non-prorated Guarantee shall also include:
3. No resiliency loss of backing.
4. No zippering
5. Static protection (will not lose static property)
6. Edge ravel
7. Delamination
8. Surface wear

- B. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

1.07 COMMISSIONING

- A. Require an informal commissioning requirement that provides ample site staff training sessions to learn proper care and maintenance of flooring including post occupancy reviews prior to expiration of warranty

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 4 sq. yd. (8.3 sq. m).

PART 2 - PRODUCTS

2.01 CARPET TILE

- A. Carpet Tile: Tandus (formally Collins & Aikman) carpet tiles, no known equal.
1. Infinity series, Color to be selected from District stock colors.
- B. Tandus "Triad Geo Tile" walk-off system at exterior doors and sink cabinets in carpeted rooms.
1. Color to be coordinated with carpet.
- C. General:
1. Pile Height: 1/2 inch maximum.
 2. Exposed edges: Fasten to floor and have trim on the entire exposed edge.

2.02 ACCESSORIES

- A. Adhesive Tape: Minimum 2 inch wide, double sided, vinyl compatible adhesive tape.
1. Specify low VOC adhesives and seam sealers
- B. Resilient Edging Strips:
1. Reducing strip: Vinyl, Profile as shown, color as selected by Architect; Burke/Mercer or Roppe.
 2. Resilient Tile/Carpet Transition: Vinyl, profile as shown; color as selected by the Architect; Burke/Mercer.
- C. Crack Filler: Latex base type.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Examine areas to receive carpet tiles and verify that surfaces are suitable for installation.
- B. Test concrete floors for moisture with suitable moisture meter. Moisture shall not exceed adhesive manufacturer's recommendations.
- C. Do not begin installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Subfloor:
 - 1. Prior to installation, repair minor floor irregularities and thoroughly clean floor, leaving no dirt or grit.
 - 2. Fill cracks exceeding 1/16 inch in width with crack filler and sand smooth.
- B. Preparation:
 - 1. Concrete Floors: All surfaces which are to receive the floor covering materials specified herein shall have been properly cured and dried, a minimum of 28 days, with moisture content not to exceed 16%. Substrate surfaces shall be cleaned of all traces of oils, grease, dust, or foreign matter which will be detrimental to the application or appearance of the installed material by means of a "dustless" mechanical grinding or bead blasting process. Cleaning shall be performed a minimum of 14 days prior to beginning floor covering work.
 - a. Moisture Testing of Concrete Slabs on Grade: After the mechanical cleaning of the floor, and prior to the start of any work on the concrete floor surface, perform calcium chloride testing at the rate of 1 test per 1000 sq. ft., using commercially available calcium chloride test kits. Calcium chloride testing shall be performed, and readings shall be analyzed by an independent testing laboratory employed by the installer of the work of this Section. Readings must be less than 3.0 pounds per 24 hours per 1000 sq. ft. before installation of the floor covering begins. Readings of more than 3.0 pounds will be noted and those areas treated with a water vapor membrane recommended and installed by the installer of the floor covering, and retested.

3.03 INSTALLATION - GENERAL

- A. Apply carpet tiles in strict accordance with manufacturer's current printed instructions.
- B. Cut evenly along walls, cut and fit evenly around projections, corners, pipes, electrical outlets, floor air or heating elements, and trim strips.
- C. Securely fasten carpet edging strips to floor wherever carpet tiles meet different floor material and no threshold or other divider is noted.
- D. Extend carpet tile materials under all open-bottomed and raised bottom obstructions, and under removable flanges of obstructions. Extend carpet tiles into closets and

alcoves of rooms indicated to receive carpeting, unless another material is specifically identified to be used in that space. Carpet tile shall be installed under all movable furniture and equipment.

- E. Finish installation shall be free from visual defects.
- F. The Owner may review carpet tile scraps and retain any he chooses. Remove remainder of scraps from site.
- G. Leave carpet base and walls clean and free from stains, blemishes and other foreign material. Remove loose threads and vacuum clean.
- H. Installation shall not receive furniture or heavy traffic for 48 hours after installation.

3.04 INSTALLATION - "NO GLUE"

- A. Snap chalk lines on floor and apply a strip of double sided adhesive tape along side of the chalk line and lay first tiles along snapped chalk line. Additional tile units shall then be installed in a stair step manner, taking care to not entrap pile fibers in joints. Tiles shall be laid with pile all in the same direction.
- B. In areas where a tile field will exceed 15 feet in length or width, apply manufacturer's pressure sensitive adhesive to prevent the tiles from "migrating" within the overall field of carpet tile.

3.05 CLEANING

- A. Construction Waste Management: Manage construction waste in accordance with provisions of Division 00, Article 3, Section 3.12 Construction Waste Management. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.
- B. After completion of the carpet tile installation, remove all waste and excess materials, tools and equipment. The complete installation shall be thoroughly vacuumed, using an upright, commercial grade, beater type cleaner, and left in a clean condition. Provide all necessary temporary protection required.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 09 9100**PAINTING****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Surface preparation, paint and finish the exterior and interior exposed surfaces listed on the Painting Schedule in Part 3 of this Section. Provide high grade materials as recommended by the paint manufacturer for unlisted surfaces, as specified herein and as needed for a complete and proper installation. Exposed interior and exterior surfaces that do not have a factory finish shall be painted unless noted otherwise. For the purposes of this Section, a galvanized coating is not considered a factory finish.
- B. Related Sections:
 - 1. Section 07 6200, Sheet Metal Flashing and Trim.
 - 2. Section 09 2900, Gypsum Board.
 - 3. Section 09 2423, Portland Cement Stucco.
- C. Priming or priming and finishing of certain surfaces may be specified to be factory performed or installer-performed under other pertinent Sections.
- D. Painting is required throughout the project except for the following:
 - 1. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces, and duct shafts.
 - 2. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section except as may be so specified. Galvanized metals shall be painted unless noted otherwise.
 - 3. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts, unless otherwise indicated.
 - 4. Do not paint over required labels or equipment identification, performance rating, name or nomenclature plates.
 - 5. Do not paint concrete, which has been sandblasted unless noted otherwise.

1.02 REFERENCES

- A. ANSI/ASTM D16, Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
- B. ASTM D2016, Test Method for Moisture Content of Wood.
- C. State of California Department of Transportation Standard Specifications, Latest Edition.
- D. Regulation 8, Rule 3, of Bay Area Air Quality Management District as it pertains to organic compounds and Architectural coatings.

1.03 DEFINITIONS

- A. Conform to ANSI/ASTM D16 for interpretation of terms used in this Section.

1.04 SUBMITTALS

- A. Submit product data for the following items for review and approval:
 - 1. List of materials to be used:
 - a. Surface Cleaning Materials.
 - b. Surface Patching and Caulking Materials.
 - c. Painting Materials.
 - 2. Manufacturer's technical specifications, data sheets and additional information if requested for each painting material listed.
 - 3. Color and Finish Samples: Samples of each color and finish required. Such approved samples will constitute standards for color and finish for acceptance or rejection of completed work. Make samples 8 by 10 inches in size. Furnish 6 samples of each color and finish. Resubmit additional samples if necessary. Samples are to be labeled on the back side with the name of the project, contractor's name, color name, type of paint, and name of paint manufacturer.
 - 4. Provide M.S.D.S. to the Contractor's field office only. Do not send to Architect's office for review.
- B. On actual wood surfaces, provide two 4 by 8 inch samples of natural and stained wood finish. Label and identify each as to location and application.
- C. Manufacturer's application instructions.
- D. Copy of surface moisture and Ph test results to the District.
- E. Certification of factory mixed colors from paint manufacturer.

1.05 QUALITY ASSURANCE

- A. Product Manufacturer: Company specializing in manufacturing quality paints and finish products with 10 years experience.
- B. Applicator: Company specializing in commercial painting and finishing with 5 years documented experience approved by product manufacturer.
- C. Workmanship shall be of highest quality.
- D. Regulatory Requirements:
 - 1. Conform to applicable code for flame/fuel/smoke rating requirements for finishes.
 - 2. Interior finishes shall comply with CBC Chapter 8 and Table 8-B.
- E. Field Samples: On actual wall surfaces and other exterior building components, duplicate painted finishes of prepared samples. Provide full-coat finish samples on at least 100 square feet of surface, as directed. Provide additional samples if necessary to demonstrate the specified sheen, color and texture. Simulate finished lighting conditions for review of in-place work.
 - 1. Final acceptance of colors will be made from these in place samples.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver paint materials to site in manufacturer's original unopened containers with product designation, batch numbers and date of manufacture clearly visible. District Inspector to verify.
- B. Store paint materials and equipment in well-ventilated storage container provided by the contractor and in a location approved by the Owner. Receiving and opening paint materials will be performed in this room. Keep storage space neat, clean and accessible. Oily or paint filled rags must be removed and disposed of each day. Leave no paint materials unsecured.

- C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.
- D. Store paint materials in minimum ambient temperature of 45 degrees Fahrenheit, and a maximum of 90 degrees Fahrenheit, in well ventilated area; unless required otherwise by manufacturer's instructions.
- E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Environmental Conditions: Paint surfaces only when free from moisture. Perform no painting when temperature is below 50 degrees Fahrenheit, except when specifically directed otherwise in writing by the Owner.
- B. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees Fahrenheit for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- C. Do not apply exterior coatings during rain, or when relative humidity is above 80 percent.
- D. Provide the District with M.S.D.S. data for products being used, a copy of which is to be posted at the project site.
- E. Minimum Applications Temperatures for Latex Paints: 45 degrees Fahrenheit for interiors, 50 degrees Fahrenheit for exterior unless required otherwise by manufacturer's instructions.
- F. Minimum Application Temperature for Varnish and transparent finishes: 65 degrees Fahrenheit for interior or exterior unless required otherwise by manufacturer's instructions.

1.08 WARRANTY

- A. Warranty shall state that the Contractor will refinish without charge to the Owner any portion of the work, including adjacent surfaces if necessary, which evidences blistering, peeling, chalking, change of color, or other noticeable defects within this period.
 - 1. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion in addition to the manufacturer's standard warranty.
 - 2. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

1.09 MAINTENANCE

- A. Extra Materials: Provide one gallon of each paint used on this project, labeled with manufacturer name, paint color and area of use.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer's catalog names and number of paint types in this Section herein are based on products of PPG Industries, Inc, and is the standard of quality against which the District will judge equivalency.
 - 1. Other acceptable manufactures include:
 - a. Kelly Moore
 - b. Dunn Edwards

2.02 MATERIALS

- A. Coatings: Factory mixed colors. Pigments shall be fully ground; maintaining a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating.
- B. Coatings: Good flow and brushing properties, capable of drying or curing free of streaks or sags.
- C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, shall be of commercial quality and approved by paint manufacturer.
- D. Paint materials shall conform to BAAQMD Regulation 8, Rule 3.

2.03 FINISHES

- A. Refer to schedule at end of Section for surface finish schedule. Color selection packages will identify colors and application locations for each individual site as issued by the District.

PART 3 EXECUTION**3.01 INSPECTION**

- A. Verify the substrate conditions are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report condition to the Architect and Construction Manager that may potentially affect proper application.
 - 1. Portland cement plaster: After the required curing period is complete, perform Ph tests in the presences of the project Inspector and in sufficient quantities to satisfy the paint manufacturer requirements. Use a test method acceptable to the manufacturer. Surfaces alkali levels must be within the allowed limits set by the manufacturer prior to painting, follow the manufacturer recommendations to prepare and the substrates with tests results not within the prescribed limits.
- C. Measure moisture content of surfaces using electronic moisture meter. A maximum of two tests per Elementary School and five tests per High School will be required. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016.
 - 3. Exterior Located Wood: 15 percent, measured in accordance with ASTM D2016.
- D. Project Inspector must review and accept substrate prior to contractor beginning installation.

3.02 PREPARATION

- A. Prior to the start of surface preparation, the following items will be completed to the satisfaction of the District Inspector:
 - 1. Provide protective coverings for items that are not to be painted.
 - 2. Remove metal mesh grills where installed in front of windows and store for future painting and reinstallation. Waterblast for cleaning, then remove window louvers or shades that obstruct the painting of surfaces behind and reinstall.

3. Surfaces not to be painted: Chain link fence, galvanized handrails, except as noted, concrete steps and paving, aluminum windows, hardware, unpainted benches and fences, and other items not presently painted. Items in question are to be brought to the attention of the Project Manager for clarification prior to bidding.
- B. Methods for installation and protection of work: Provide and maintain lifts, scaffolding, ladders and drop cloths required for this work. Painted and finished surfaces subject to damage or defacement due to other work on the building must be properly protected and covered. Contractor will be responsible for any and all damages to painted work and to that of other areas caused by his operation.
- C. Protection: Protect concrete walks, landscaping, floors and pre-finished materials. Building fixtures and other items are not to be painted.
 1. Repair damage to other surfaces caused by work of this Section.
 2. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
 3. Remove empty paint containers from site at end of each day.
- D. Do not begin painting or finishing until the surfaces to be painted or finished are in proper condition in every respect, and approved by the District Inspector.
- E. Surfaces to be painted must be clean, dry, sound and free of dirt, rust, grease, traffic scum, dust, loosely adhering paint, surface chalk, staples, tacks, and other substances which might interfere with the functioning of the painting or coating system.
- F. Remove electrical plates, hardware, light fixture trim, acrylic guards and fittings prior to preparing surfaces or finishing.
- G. Correct defects and clean surfaces that affect work of this Section. Where wood is loose or missing, repair and paint.
- H. Seal marks such as felt-tipped marking pens, etc. with Rustoleum B-I-N Shellac Primer. Insure that these marks do not bleed through surface finishes.
- I. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- J. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high-pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning. Care must be taken to avoid etching glass. Replace damaged glass at not cost to Owner.
- K. Insulated Coverings: Remove dirt, grease and oil from canvas and cotton.
- L. Gypsum Board Surfaces: Latex fill minor defects with 3M Patch Plus Primer Spackling compound or equal. Spot prime defects after repair with Moorcraft Primer Underbody #284.
- M. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- N. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting and clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts and nuts are similarly cleaned. Spot prime after repairs.

- O. Shop Primed Steel Surfaces: Scrape, grind, and sand to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items. Areas where rust cannot be removed, use Advanced Protective Products Rust Destroyer.
- P. Window Glazing: Replace window glazing where glazing or putty is loose, missing, or in need of repair.
- Q. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior Top Gun 200 Caulking after prime coat has been applied.
- R. Exterior Plaster: Allow plaster to cure for 30 days prior to painting.
- S. Metal Frames Scheduled for Painting: Paint exterior face, sides and top, and bottom edges.
- T. Remove loose nails, screws or staples, and patch accordingly.
- U. Spot prime epairs, patching and bare substrate prior to application of finish coat.
- V. Metal Panels: Spot prime bare metal with Ironclad Retard-X Rust Inhibitive Latex Primer, fill dents and gouges with Bondo, spot prime patches and repairs, and apply specified coats.

3.03 APPLICATION AND WORKMANSHIP

- A. Painting is to be performed by skilled and experienced mechanics, working under the supervision of a capable foreman. Workmanship shall be of the highest quality and to the complete satisfaction of the District Inspector. Apply materials in accordance with the manufacturer's directions and in compliance with the manufacturer's specifications. Spray and backroll material, evenly brush or smoothly roll on without runs or sagging, free from drips, ridges, laps and brush marks. Ensure that coats are thoroughly dry before applying succeeding coats. Sand surfaces and dust clean between coats as necessary to produce a smooth finish.
- B. Apply paint materials in accordance with manufacturers specifications and recommendations.
- C. Do not apply prime coat until cleaned and District Inspector has approved prepared surfaces. Do not apply finish coat of paint until prime coat and patching have been inspected and approved by District Inspector. Prime coat to be tinted lighter than the finish coat.
- D. Apply putty or caulking after surface is primed and primer is dry.
- E. Concrete, stucco and plaster surfaces will not be painted until the surface is dry and contains minimum moisture.
- F. Completed painted surfaces must be free of blistering, running, peeling, scaling, streaks and stains, and the colors of the surfaces will remain free from fading.
- G. The finish surface for doors will be smooth. A stipple or texture surface from rolling will not be accepted. Open doors to paint door stiles and casings. Paint tops, bottom and edges of doors to match exterior paint schedule. Prepare doors and doorframe so as to insure proper operation after completion of painting.
- H. Size graphic lettering as indicated on drawings and paint in a solid style.
- I. Refer to Schedules at end of this section for the schedule of color-coding and identification banding of equipment, ductwork, piping, and conduit.

- J. Paint shop primed equipment. Paint shop prefinished items to colors selected by School District.
- K. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- L. Replace identification markings on mechanical or electrical equipment when painted accidentally.
- M. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports.
- N. Paint exposed conduit and electrical equipment occurring in finished areas.
- O. Reinstall electrical plates, hardware, light fixture trim, and fittings removed prior to finishing. Replace cracked or broken items.
- P. Paint area behind soffit vents and similar conditions. Do not paint over insect screens except as needed to match colors.
- Q. Provide a total dry film thickness not less than the specified amount in the finish schedule.
- R. Factory Primed Acoustical Metal Decking. Obtain approval of painted sample from Architect prior to painting.
- S. Do not paint over existing transparent finishes. Existing transparent finishes shall be refinished to match existing. Specify finish compatible with existing.
- T. All existing surfaces to be repaired and prepared prior to painting.
- U. Three coat system over existing paint or new primed finishes to consist of one prime coat and two finish coats.
- V. All shop-primed items are to be fully re-primed in the field.
- W. Color-tint sealers and undercoats within general color range of finish color. Vary color of successive coats sufficiently to distinguish between coats.
- X. Protect planting adjacent to buildings.
- Y. Acid wash all galvanized materials. Etch and prime prior to finish painting and rinse thoroughly.

3.04 CLEANING AND TOUCH UP

- A. As work proceeds, promptly remove paint where spilled, splashed or splattered.
- B. During progress of work, maintain premises free of accumulation of tools, equipment, surplus materials, and debris.
- C. Collect cotton waste, cloths, and material that may constitute a fire hazard. Place in closed metal containers, and remove daily from site.
- D. When cleaning airless or electro-static spray equipment, properly dispose of cleaning material. No material is to be poured down drains or into the ground.
- E. Upon completion of the painting work, remove from the premises and dispose of properly

scaffolding and equipment, surplus material, empty containers, and other debris resulting from construction operations. The building and surrounding areas must be left clean and neat. Do not use school debris boxes for disposal.

- F. Runs, sags, misses, holidays, stains, and other defects in the painted surfaces, including inadequate coverage and mil thickness, must be satisfactorily touched up, refinished or repainted as necessary.
- G. Leave glass areas, stucco surfaces, floors and walls, hardware, and other surfaces clean and free from paint, stain, spattering, smears or smudges which are the result of construction operations. Replace glass damaged by construction operations. This includes all glass areas of the buildings. Special cleaning solution must be used on plastic glazing areas. Do not scrape plastic glazing.

3.05 SCHEDULE – INTERIOR PAINT TYPES AND SHEENS

- A. Interior Gypsum Board:
 - 1. Primer: PPG Pure Performance Interior Latex Primer 9-2.
 - 2. Corridors: Semi-Gloss: PPG Pure Performance Semi-Gloss Interior Latex 9-510 Series.
 - 3. Classrooms: Satin. PPG Pure Performance Semi-Gloss Interior Latex 9-510 Series.
 - 4. Offices: Satin: PPG Pure Performance Eggshell Interior Latex 9-411 Series.
 - 5. Toilet Rooms: Semi-Gloss: PPG Pure Performance SemiGlossInterior Latex 9-510 Series.
 - 6. Service Areas: Satin: PPG Pure Performance Eggshell Interior Latex 9-411 Series.
 - 7. Kitchens: Semi-Gloss Enamel: PPG Pure Performance SemiGlossInterior Latex 9-510 Series.
- B. Interior Wood:
 - 1. Primer: PPG Speedhide Interior Latex Enamel Undercoater 6855.
 - 2. Opaque Finish: PPG Pure Performance Semi-Gloss Interior Latex 9-510 Series.
 - 3. Transparent Finish: Refinish to match existing. Specify product compatible with existing finish and, if possible, low VOC.
- C. Interior Metal Doors and Frames:
 - 1. Primer: PPG Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel 90-712 Series.
 - 2. PPG Pure Performance Semi-Gloss Interior Latex 9-510 Series.
- D. Interior Miscellaneous Metals:
 - 1. Sheen to fit circumstance.

3.06 SCHEDULE – EXTERIOR PAINT TYPES AND SHEENS

- A. Exterior Stucco:
 - 1. Primer: PPG Speedhide Exterior Latex Wood Primer 6-609.
 - 2. Semi-gloss, 100% Acrylic Latex: PPG Speedhide Exterior Semi-Gloss Acrylic Latex 6-900 Series.
- B. Wood (opaque):
 - 1. Primer: PPG Speedhide Exterior Latex Wood Primer 6-609.
 - 2. Gloss, 100% Acrylic Latex: PPG Speedhide Gloss Acrylic Latex Enamel 6-8534 Series.
- C. Misc. Ferrous Metals:
 - 1. Primer: PPG Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel 90-712 Series.
 - 2. PPG Pitt-Tech Int/Ext Satin DTM Industrial Enamel 90-474 Series.
- D. Ferrous metal gutters, downspouts, doors, flashing, etc.:
 - 1. Primer: PPG Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel 90-712 Series.

2. PPG Pitt-Tech Int/Ext Satin DTM Industrial Enamel 90-474 Series.
- E. Exterior Guardrails and Handrails:
1. Primer: PPG Pitt-Guard All Weather D-T-R Epoxy Coating 97946/949 Series.
 2. PPG Pitthane Ultra Gloss Urethane Enamel 95-812 Series.
- F. Aluminum:
1. Primer: PPG Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel 90-712 Series.
 2. PPG Pitt-Tech Int/Ext High Gloss DTM Industrial Enamel 90374 Series or PPG Pitt-Tech Int/Ext Satin DTM Industrial Enamel 90-474 Series.
- G. Metal Ramp – Anti-Slip Coating:
1. Wooster Products – LOW VOC Safe-Stride Acrylic coating.
 2. Install per manufacture's recommendations
 3. Color: Gray
 4. Product Rep: Leo Costa, Ebbert Pacific, 1444 Factor Ave., San Leandro, CA 94577
Phone: 510-357-7850; email: leo_costa@sbcglobal.net

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 10 1400

SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: The signs system required for this work may or may not be indicated on the Drawings and includes but is not limited to, door signs and support members.
- B. Related Sections:
 - 1. Section 08 7100, Door Hardware.

1.02 SUBMITTALS

- A. Materials List: Within 35 days after award of Contract, submit to the Architect a complete list of materials proposed to be furnished and installed under this Section.
- B. Shop Drawings: Accompanying the materials list, submit complete Shop Drawings showing details of the fabrication and installation, including proper and adequate provision for installation and completely describing necessary hardware. Show lettering proposed; room names and numbers to be provided by the Architect. Room and building designations need to be approved by designated District representative.
- C. Samples: Accompanying the materials list, submit a Sample of the system material illustrating the actual finish obtained in the specified finish.

1.03 QUALITY ASSURANCE

- A. For the actual fabrication and installation of the architectural signage system, use only mechanics who are thoroughly trained and experienced in the skills required and who are completely familiar with the manufacturer's recommended methods of installation plus the requirements of this work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Protection: Use such means necessary to protect system materials before, during, and after installation and to protect the installed work and materials of other trades.
- B. Replacements: In the event of damage, immediately make repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.05 WARRANTY

- A. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion in addition to the 10yearmanufacturer's standard warranty.
- B. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

PART 2 PRODUCTS**2.01 ARCHITECTURAL GRAPHIC SYSTEM**

- A. The Architectural graphic system shall be Vomar Plaque series 100 as manufactured by Vomar Products, Inc., 7800 Deering Avenue, Canoga Park, CA 91304, (818) 610-5115.

2.02 MATERIALS

- A. Signs shall be .25 inch thick solid acrylic plastic with permanent integral color and satin matte finish face. Type image shall be fused to the plastic under heat and pressure to .005 inch depth. The signs shall be unframed and meet State and Federal Handicap laws.
- B. Signs shall consist of:
1. Raised Characters: Section 11B-703.2
 - a. Letter Type: Section 11B-703.2.1; Raise characters on signs 1/32 inch minimum. Characters shall be sans serif uppercase characters accompanied by Grade 2 Braille.
 - b. Character Size: Section 11B-703.2.5; Raised characters shall be a minimum of 5/8 inch and a maximum of 2 inches high.
 - c. Proportions of Letters and Numbers: Section 11B-703.2.4; Characters on signs shall have a width-to-height ratio of between 3:5 and 1:1 and a stroke width-to-height ratio of between 1:5 and 1:10.
 - d. Letters measured must be uppercase. After choosing a typestyle to test, begin by printing the letters I, X, and O at 1 inch high. Place the template's 1:1 square over the X or O, whichever is narrower. If the character is not wider than 1 inch, nor narrower than the 3:5 rectangle, the proportions are correct. Use the 1:5 rectangle to determine if the stroke of the I is too broad, and the 1:10 rectangle to see if it is too narrow. If the tests are passed, the typestyle is compliant with proportion code.
 2. Braille Symbols: Section 11B-703.3; California Contracted Grade 2 Braille shall be used wherever Braille is required in other portions of these standards. Space dots 1/10 inch on center in each cell with 2/10 inch space between cells, measured from the second column of dots in the first cell to the first column of dots in the second cell. Raise dots a minimum of 1/40 inch above the background.
 - a. Recommended Rounded or domed California Braille dots, each distinct and separate. Dots with straight sides and flat tops are not readable for many Braille users.
 - b. Installation Height: 11B-703.4.
 3. Pictograms: Section 11B-703.6.
 - a. Field: 6" high. Characters and Braille shall not be located in the pictogram field, 11B-703.6.1.
 - b. Text Descriptors: Locate text descriptors directly below the pictogram field.
 4. International Symbol of Accessibility: Section 11B-703.7.2.1 and figure 11B-703.7.2.1.
 5. Contrast and Finish of Symbols: Section 11B-703.6.2; Contrast between character, symbols and their background must be 70 percent minimum and have a non-glare finish.
 6. Mounting Height and Location: Signs with tactile characters shall comply with Section 11B-703.4.
 7. Doorways Leading to Men's and Women's Sanitary Facilities: Provide Signs that Comply with Applicable Requirements of Sections 11B-703.7.2.6.
 8. Grade Level Exterior Exit Doors: Provide tactile exit signage to comply with 1011.1 and 11B-703.4.2.
- C. Parking lot signage to be .125" aluminum panel with baked porcelain enamel finish mounted to 3" galvanized steel post set in 36" x 12" concrete footing.

1. Reference District security phone number on tow sign.
- D. All room identification signage to be integral color with fussed raised lettering and California Braille.
 1. ASI, "Incast" or approved equal.
- E. Other Materials not specifically described but required for a complete and proper installation of identifying devices, shall be new, first quality of their respective kinds, and subject to approval of the Architect.

2.03 FABRICATION

- A. Workmanship: Fabricate in strict accordance with the approved Shop Drawings and the manufacturer's published recommendations.
 1. No discoloration on the face after lettering will be acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prior to installation of the work of this section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
- B. Verify that signage system may be installed in complete accordance with the original design and the approved Shop Drawings.

3.02 INSTALLATION

- A. Sign Locations: Where possible, locate signs on the door. See location details and Door Schedule on drawings.
- B. Install with vandal resistant fasteners. No double-sided tape.
- C. Anchoring: Firmly anchor all members, using all anchoring devices required to ensure positive attachment of the members for long life under hard use.

3.03 CLEANING

- A. Immediately prior to acceptance of the Work, remove protective materials from the signage system and clean exposed members.
- B. Do not use abrasives or harmful cleaning agents.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 10 2113
TOILET PARTITIONS

PART 1– GENERAL

1.01 SUMMARY

- A. Section Includes: Toilet Compartments and Urinal Screens.
- B. Related Sections:
 - 1. Section 06 1000, Rough Carpentry. Wall backing required to secure mounting brackets.
 - 2. Support for floor-anchored compartments.
 - 3. Section 10 2813, Toilet Accessories.

1.02 REFERENCES

- A. ANSI A117.1-1998 Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
- B. Title 24, California Code of Regulations, Parts 2, 3, and 5.
- C. ADA, Accessibility Guidelines for Buildings and Facilities, Federal Register Volume 56, Number 144, Rules and Regulations.
- D. US Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Program, Version 2.1
- E. CBC-California Building Code, 2022 Edition.
- F. American Society for Testing and Materials Standards:
 - 1. ASTM E84-01 Standard Test Method for Surface Burning Characteristics of Building Material.
 - 2. ASTM D2794-93(1999)e1 Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
 - 3. ASTM D2197-98(2002) Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion.
 - 4. ASTM D6578-00 Standard Practice for Determination of Graffiti Resistance.

1.03 PERFORMANCE REQUIREMENTS

- A. Graffiti Resistance: Partition material shall have the following graffiti removal characteristics when tested in accordance with ASTM D6578-00 Standard Practice for Determination of Graffiti Resistance in accordance with Section 9, "Graffiti Removal Procedure Using Manual Solvent Rubs":
 - 1. Cleanability: Five (5) required staining agents shall be cleaned off material.

- B. Scratch Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2197-98(2002) Standard Test Method for Adhesion of Organic Coating by Scrape Adhesion, using Gardner Stock #PA-2197/ST pointed stylus attachment on scrape tester:
 - 1. Scratch Resistance: Maximum Load Value shall exceed 10 kilograms.
- C. Impact Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2794-93(1999)e1 Standard Test Method for Resistance of Organic Coating to the Effects of Rapid Deformation (Impact), using .625" hemispherical indenter with 2-lb impact weight:
 - 1. Impact Resistance: Maximum Impact Force value shall exceed 30 inch-lbs.
- D. Fire Resistance: Partition material shall comply with the following requirements, when tested in accordance with ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials:
 - 1. Smoke Developed Index: Not to exceed 450.
 - 2. Flame Spread Index: Not to exceed 75.
 - 3. Material Fire Ratings:
 - a. National Fire Protection Association (NFPA): Class B.
 - b. International Code Council (ICC): Class B.

1.04 SUBMITTALS

- A. Comply with requirements of Section regarding submittals.
- B. Manufacturer's Data
 - 1. Provide required number copies of:
 - a. Product data sheets.
 - b. Installation instructions.
 - c. Cleaning and maintenance instructions.
 - d. Replacement parts information.
- C. Shop Drawings
 - 1. Provide required number of copies of all shop drawings.
 - 2. Show fabrication and erection of compartment assemblies, to extent not fully described by manufacturer's data sheets.
 - 3. Show anchorage, accessory items and finishes.
 - 4. Provide location drawings for bolt hole locations in supporting members for attachment of compartments.
- D. Samples
 - 1. Furnish scale model of compartments, including stile, shoe, door, door hardware, divider panel, and mounting brackets.
 - 2. Furnish sections showing stile anchoring and leveling devices, concealed threaded inserts, panel, stile, and edge construction.
 - 3. Provide sample of each item.
- E. Provide maintenance data to owner.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver items in manufacturer's original unopened protective packaging.
- B. Store materials in original protective packaging to prevent physical damage or wetting.
- C. Handle so as to prevent damage to finished surfaces.

1.06 WARRANTY

- A. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion in addition to the manufacturer's standard warranties.
- B. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.
- C. Furnish twenty-five year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship.
- D. Furnish one-year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2– PRODUCTS**2.01 MANUFACTURERS**

- A. Manufactured by Scranton Products, Hinny Hiders, NFPA 286 class, or approved equal.
- B. Product: Hinny Hiders, NFPA 286 class, high density polyethylene or poly propylene.
- C. Toilet partitions shall be the product(s) of a single manufacturer.

2.02 MOUNTING CONFIGURATIONS

- A. All toilet partitions to be solid plastic with metal bottom edge.
- B. All Hinges shall be 8 inches and fabricated from heavy-duty extruded aluminum with a bright dip anodized finish with wrap-around flanges, surface mounted and through bolted to doors and pilasters with stainless steel, torx head sexbolts. Hinges operate and field with adjustable nylon cams. Cams can be field set in 30-degree increments or hinges shall be integral, fabricated from the door and pilaster with no exposed metal parts.
- C. Partitions to utilize head-rail brace mount system and continuous wall brackets.

2.03 COMPONENTS/MATERIALS

- A. Stiles, Panels, Doors, and Screens
 - 1. Stiles, Panels, Doors, and Screens shall be manufactured from Solid Color Reinforced Composite material.

- B. Finish Thickness
 - 1. Stiles and doors shall be 3/4" (19 mm).
 - 2. Panels and benches shall be 1/2" (13 mm).
- C. Hardware shall be vandal resistant.
 - 1. All hardware to be 18-8, type-304 stainless steel with satin finish.
 - 2. Hardware of chrome-plated "Zamak", aluminum, or extruded plastic is unacceptable.
- D. Latch and Pulls: Provide door pull on both sides of accessible compartment doors.
 - 1. Sliding door latch shall be 14 gauge (2 mm) and shall slide on nylon track.
 - 2. Sliding door latch shall require less than 5-lb force to operate. Twisting latch operation will not be acceptable.
 - 3. Latch track shall be attached to door by machine screws into factory-installed threaded brass inserts.
 - 4. Threaded brass inserts shall be factory installed for door hinge and latch connections and shall withstand a direct pull exceeding 1,500 lbs. per insert.
 - 5. Through bolted, stainless steel, pin-in-head Torx sex bolt fasteners shall be used at latch keeper-to-stile connections and shall withstand direct pull force exceeding 1,500 lbs. per fastener.
- E. Hinges:
 - 1. Hinge shall be standard barrel hinges, adjustable in the field for closing angle to show non-occupancy.
 - 2. All doors shall be equipped with self-closing hinge.
 - 3. Fasteners secured directly into the core are not acceptable.
 - 4. Optional --Door shall be furnished with two 11-gauge (3-mm) stainless steel door stop plates with attached rubber bumpers to resist door from being kicked in/out beyond stile.
 - 5. Hinges shall be secured with stainless steel, pin-in-head Torx machine screws into threaded brass inserts.
 - 6. Threaded brass inserts shall withstand a direct pull force exceeding 1,500 lbs per insert.
- F. Mounting Bracket
 - 1. Mounting brackets shall be 18-gauge (1.2- mm) stainless steel and extend full height of panel.
 - 2. U-channels shall be furnished to secure panels to stiles.
 - 3. Angle brackets shall be furnished to secure stiles to walls and panels to walls.
 - 4. Fasteners at locations connecting panels-to-stiles shall utilize through bolted, stainless steel, pin-in-head Torx sex bolt fasteners. Through-bolted fasteners shall withstand direct pull force exceeding 1,500 lbs. per fastener.
 - 5. Wall mounted urinal screen brackets shall be 11 gauge (3 mm) double thickness.
- G. Leveling Device shall be 7-gauge, 3/16" (5-mm) hot rolled steel bar; chromate-treated and zinc-plated; through-bolted to base of solid color reinforced composite stile.
- H. Stile Shoe shall be one-piece, 4" (102-mm) high, type-304, 22-gauge (0.8-mm) stainless steel with satin finish. Top shall have 90° return to stile. Shoe will be composed of one-piece of stainless steel and capable of being fastened (by clip) to stiles starting at wall line.
- I. Headrail (Overhead Braced) shall be satin finish, extruded anodized aluminum (.125" / 3-mm thick) with anti-grip profile.

J. Coat Hook

1. Coat Hook shall be constructed of stainless steel and shall project no more than 1-1/8" (29 mm) from face of door.
2. Coat hook shall be secured by to door by through-bolted, theft-resistant, pin-in-head Torx stainless steel screws. Through-bolted fasteners shall withstand a direct pull force exceeding 1,500 lbs. per fastener.

2.04 FABRICATION

- A. Vandal-Resistant Hardware Option: for Institutional Hardware option add suffix .67 to 1092 Series. Install with vandal resistant one-way screws

PART 3– EXECUTION

3.01 INSPECTION

- A. Check areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
- B. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.
- C. Do not begin installation of compartments until conditions are satisfactory.

3.02 ERECTION

- A. Install compartments rigidly, straight, plumb, and level and in accordance with manufacturer's installation instructions.
- B. Installation methods shall conform to manufacturer's recommendation for backing and proper support.
- C. Conceal evidence of drilling, cutting, and fitting to room finish.
- D. Maintain uniform clearance at vertical edge of doors.

3.03 ADJUSTMENT AND CLEANING

- A. Adjust hardware for proper operation after installation.
- B. Set hinge cam on in-swinging doors to hold doors open when unlatched.
- C. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.
- D. Clean exposed surfaces of compartments, hardware, and fittings.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 10 2813

TOILET ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes toilet and janitor accessories complete with attachment hardware as shown on the Drawings and as specified.
- B. Related Sections:
 - 1. Section 06 1000, Rough Carpentry.

1.02 SYSTEM DESCRIPTION

- A. Accessories shall be the product of a single manufacturer unless otherwise specified.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's catalog cuts and data sheets, complete parts list, and installation requirements for each accessory item specified.
- B. Schedule of accessories showing locations and types of anchorage and required backing.
- C. Maintenance data, operating instructions, and keys required for each type of equipment and lock.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
 - 1. Public Law 101-336 "The Americans with Disabilities Act of 2010 (ADA).
 - 2. ADA Accessibility Guidelines (ADAAG).

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver items in manufacturer's original unopened protective packaging.
- B. Store materials in original protective packaging to prevent soiling, physical damage, or wetting.
- C. Handle so as to prevent damage to finished surfaces.
- D. Protection:
 - 1. Maintain protective covers on units until installation is complete.
 - 2. Remove protective covers at final cleanup of installation.

1.06 PROJECT CONDITIONS

- A. Coordinate submission of installation instructions so that backing, blocking, framing, and formwork can be properly installed and work of other trades will not be delayed.

1.07 WARRANTY

- A. Warrant mirrors for 5 years against silver spoilage.
- B. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion in addition to the manufacturer's standard warranties.
- C. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. All toilet room accessories shall be Contractor Furnished and Contractor Installed (CFCI) unless otherwise indicated.

2.02 MATERIALS

- A. Stainless Steel Sheet: ASTM A167, commercial grade, Type 302/304, gage as standard with manufacturer of specified items. Unless specified otherwise, the use of other stainless steel alloys shall not be allowed.
- B. Stainless Steel Tubing: ASTM A269, commercial grade, seamless welded.
- C. Sheet Steel: ASTM A366, cold rolled stretcher leveled; with G90 galvanized coating.
- D. Mirror Glass: FS DD-G-451, Type I, Class 1, Quality 1, 1/4 inch thick, with silver coating, copper protective coating, and non-metallic paint covering.
 - 1. Protect edges with vinyl tape or other protective coating.
- E. Adhesive: Epoxy type contact cement.
- F. Fasteners, Screws, and Bolts: Stainless steel when available otherwise corrosion resistant such as hot dip galvanized; as recommended by accessory manufacturer for component and substrate.
 - 1. Fastening shall be concealed and theft/tamper-proof where exposed when available.
- G. Locks: Tumbler type, keyed alike unless specified otherwise. Provide locks and furnish keys for standard lockable items. Provide 2 keys for each lock.

2.03 FINISHES

- A. Provide manufacturer's finish for each item indicated in accessory schedule, stainless steel where available.
 - 1. Where there are choices of available finishes, not including satin stainless steel, provide chart for Architect's selection.
- B. Exposed Finishes: Unless otherwise noted, Stainless steel, No. 4, satin finish; satin chrome finish acceptable where stainless steel not available for accessory item scheduled.
- C. Concealed Surfaces: Pretreat and clean. Spray apply one coat primer and baked enamel finish.

2.04 MANUFACTURED UNITS

- A. Catalog numbers listed are given to establish minimum appearance, function and quality standards acceptable. Where required to be semi-recessed, furnish matching stainless steel skirt to suit partition or wall condition.
 - 1. Accessories are to comply with requirements of CBC 11B-307.2.
- B. Paper Towel Dispensers: Owner Furnished, Contractor Installed (OFCI).
 - 1. Bay West Roll #89500, or approved equal.
- C. Toilet Paper Dispensers: Owner Furnished, Contractor Installed (OFCI).
 - 1. Non-Handicapped Stalls: Bay West Wagon Wheel #884, or approved equal.
 - 2. Handicapped Recessed Stall: For Interior wall, Bobrick B-4388, B3888or approved equal; if block wall, B-2890, or approved equal.
 - 3. Handicapped Surface Mounted: Bobrick B-3888, or approved equal.
- D. Handicapped: Recessed: Owner Furnished, Contractor Installed (OFCI).
 - 1. Bobrick B-386; Standard: Bobrick B-3888, or approved equal.
- E. Grab Bars: Heavy Duty, 18 gauge, 304 stainless steel tubing, welded 11 gauge flanges, concealed mounting. Safety grip finish, no peening, Bobrick B6806, or approved equal.
 - 1. Configurations and sizes indicated on drawings.
 - 2. No flange covers.
- F. Sanitary Napkin Disposal:
 - 1. Floor Stand Alone: Hospitality Specialties #250
 - 2. Surface-Mounted: Bobrick B-5270
 - 3. Recessed: Bobrick B-353 or B-35303
 - 4. Or approved equal.
- G. Soap dispenser: Provide at each classroom sink.
 - 1. GOJO 800 Series Bag-in-Box Dispenser 800 ml bag-in-box system.
 - a. Portion controlled.
 - b. ADA compliant for push force.
- H. Student toilet room mirrors: 22 gauge, high polished stainless steel with backing plates; Bobrick B-1556, or approved equal.
 - 1. Size as indicated on drawings.
- I. Trash receptacles:
 - 1. Owner Furnished, Owner Installed (OFOI).
 - 2. Bradley Model 356, surface mounted, stainless steel.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Check openings scheduled to receive recessed units for correct dimensions, plumbness of blocking or frames, and preparation that would affect installation of accessories.
- B. Check areas to receive surface-mounted units for conditions that would affect quality and execution of Work.
- C. Do not begin installation until conditions are satisfactory.

3.02 INSTALLATION

- A. Install fixtures and accessories in accordance with manufacturer's printed instructions.
- B. Install true, plumb and level, securely and rigidly anchored to substrate.
- C. Attach grab bars to backing installed in wall to withstand loads prescribed by California Code of Regulation (CCR), Title 24, Section 11B-609.8.

3.03 ADJUSTING AND CLEANING

- A. Adjust accessories for proper operation.
- B. After completion of installation, clean and polish exposed surfaces.
- C. Deliver keys and instruction sheets to Owner.

END OF SECTION

SECTION 10 4400

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Surface mounted fire extinguisher. One at each classroom.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Submittal Procedures:
 - 1. Action Submittals shall be submitted in accordance with Section 01 3300, "Submittal Procedures."
 - 2. Closeout Submittals shall be submitted in accordance with Section 01 7700, "Closeout Procedures," and Section 01 7836, "Warranties."

1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's specifications and installation instructions for fire extinguishers to be used.

1.4 CLOSEOUT SUBMITTALS

- A. Specified warranty.

1.5 QUALITY ASSURANCE

- A. Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- B. Fire extinguishers shall be listed and labeled for type, rating, and classification by Factory Mutual (FM) or another independent testing agency acceptable to authorities having jurisdiction and to Owner's insurance company.

1.6 WARRANTY

- A. Manufacturer: Furnish District with manufacturer's 2-year written warranty in which manufacturer agrees to repair or replace fire extinguishers that fails in materials or workmanship within specified warranty period. Failure includes, but is not limited to, the following:
 - 1. Failure of hydrostatic test according to NFPA 10.
 - 2. Faulty operation of valves or release levers.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

- A. Fire extinguishers shall be UL listed, conforming with ANSI/UL 711, and bear UL "Listing Mark" for type, rating, and classification of extinguisher.

- B. Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

2.2 EQUIPMENT

- A. Fire Extinguishers:
 - 1. Typical: Multipurpose dry chemical type, 5-pound capacity, UL Rating 2A-10B:C; Larsen's MP5.
 - 2. Mounting: Standard Bracket-Larsen model 817

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fire extinguisher shall be located where shown.
- B. Securely fasten to structure, square and plumb, in accordance with manufacturer's instructions.
- C. Provide fire extinguisher in each Classroom.

END OF SECTION

SECTION 12 3624

PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Counter tops with high pressure plastic laminate finish.
- B. Related Sections:
 - 1. Section 06 1000, Rough Carpentry.
 - 2. Section 06 4116, Plastic Laminated Clad Cabinets
 - 3. Division 22, Plumbing.
 - 4. Division 26, Electrical.

1.02 REFERENCES

- A. The following references and standards are hereby made a part of this Section. Laminated plastic items shall conform to applicable requirements therein except as otherwise specified herein or shown on the Drawings.
 - 1. Manual of Millwork, latest edition. Woodwork Institute (WI).

1.03 SUBMITTALS

- A. Shop Drawings: Submit in accord with "Millwork Shop Drawings", Section 1, Manual of Millwork and the above.
- B. Samples: Submit for selection and/or approval of plastic laminates upon request of Architect.
- C. Furnish a WI certified compliance label on the first page of Shop Drawing and on each countertop.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Comply with Section 1, Manual of Millwork, "Recommended Care and Storage of Architectural Woodwork".

1.05 WARRANTY

- A. Require unconditional two (2) year installation warranty commencing on recordation date of the Notice of Completion in addition to the manufacturer's standard warranties.
- B. Require a site review with the designated District representative prior to expiration of warranty as a condition to end installation warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Plastic laminate shall be as manufactured by one of the following manufacturer's, or equal, as approved by Architect and of owner approved pre-selected color, with products in conformance with specification requirements:
 - 1. Formica
 - 2. Wilsonart

2.02 MATERIALS

- A. Core Material: Minimum 3/4 inch thick particleboard, medium density, conforming to C.S. 236, Type 1-B-2.
- B. Laminated Plastic Veneers:
 - 1. Material: High pressure, thermo-setting, laminated plastic surfacing material, conforming to NEMA Publication LD-3 Latest Conditions.
 - 2. Thickness and Type: .043" post forming grade.
 - 3. Colors: As selected by Architect from manufacturer's standard range. Assume selection from plain colors excluding pure white.
 - 4. Finish: "Suede", "Velvet", or equivalent.
 - 5. Backing Sheets: Fabricator's option of one of the methods allowed by the Manual of Millwork for the specified construction grade.
 - 6. Adhesive: Type II adhesive except use Type 1 where sinks occur.
- C. Specify formaldehyde-free, environmentally preferable materials and low VOC adhesives.
- D. All shelving to be 3/4" plywood core.
- E. Specify 5-knuckle hinges.
- F. Specify heavy-duty, ball bearing, full-extension drawer glides.
- G. Drawer bottoms to be fully let-in, glued and blocked.

2.03 FABRICATION

- A. Shop fabricate items. Where possible Make counters and splashes a single length for each run without transverse joints. Where runs exceed fabrication limits, provide the least number of joints possible. Indicate transverse joints on shop drawings.
- B. Make intersection of top and splash integrally coved with a 1/4" radius continuous sheet of plastic.
- C. Front edge shall be full round edge.
- D. Top of splash shall be waterfall top.
- E. Splashes shall be returned at wall or closed end with square butt joint.
- F. Provide backing sheets securely glued to opposite face of all laminated tops and splashes.
- G. Make all cutouts required for sinks, equipment and accessories mounted in tops or splashes. Seal all edges of cutout per Manual of Millwork.
- H. Sink cutouts: Shall not occur within 18" of a discretionary field joints.

2.04 SOURCE QUALITY CONTROL

- A. Construct to WI Specifications for "Custom Grade".
- B. Drawings indicate general appearance standards only and are not intended to lessen or reduce compliance with specified grades. Where Drawings apparently require such a departure from standard specifications, secure directions or confirmations before proceeding.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect surfaces to receive laminated plastic items and report all defects. Proceeding with installation implies acceptance of surfaces as satisfactory.

3.02 PREPARATION

- A. Coordinate work under this Section with other trades whose work adjoins, combines or aligns with same. Take such field measurements as may be required. Report any major discrepancy between Drawings and field dimensions to the Architect and secure directions before proceeding.

3.03 INSTALLATION

- A. Set in place, scribe square and level and secure with concealed fastenings.
- B. Install the work of this Section at the locations on the Drawings, and in accordance with the approved Shop Drawings and Part 3 of Section 16 of the Manual of Millwork.
 - 1. Install work in this section as specified in the WI Manual of Millwork, and provide a WI Certified Compliance Certificate for Installation at the completion of project installation.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 12 9300

SITE FURNISHINGS

PART 1 - GENERAL

1.01 SCOPE

- A. Provide pre-cast concrete benches complete, as shown and as specified.

1.02 SUBMITTALS

- A. Shop drawings: To indicate fabrication, dimensions, assembly, finishes, layout and attachments for the components to be installed.
- B. Color chips: To indicate range of color and finish for each type and color of material used.
- C. Samples: as requested by Owner's Representative.

1.03 PRODUCT HANDLING

- A. Deliver fabricated units and component parts to project site identified per shop drawings. Protect surfaces from damage during shipping and installation. No damaged work will be acceptable.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Pre-cast concrete benches shall be as manufactured by Wausau Tile Inc, Wausau, WI 800-388-8728, wausautile.com or approved equal.

2.02 MATERIALS

- A. Pre-cast Concrete Bench: Model No TF5116, curved concrete bench without back.
 - 1. Size: 74 inches long by 18 inches wide by 16 inches tall.
 - 2. Weight: 1,000 pounds.
 - 3. Material: Concrete with 3/8 inch steel reinforcing.
 - 4. Anchoring: Four 1/2 inch diameter threaded inserts.
 - 5. Color: To be selected from manufacturers standard acid wash or weatherstone colors.

2.03 NON SHRINK GROUT

- A. Premixed, factory packaged, non-shrink, nonmetallic, non-staining, noncorrosive, nongaseous grout. Compressive strength 5,000 psi/7 days. 0.00% shrinkage, 0.04% expansion after set.

PART 3 - EXECUTION

3.01 CONDITION OF SURFACES

- A. Before starting work, examine adjoining work on which installation is dependent for workmanship and fit. Correct deficiencies before proceeding with work.

3.02 INSTALLATION

- A. Install items per manufacturer's recommendations or as shown and as specified. Set work plumb, level, true and in proper alignment in relation to work of other trades. Work with marred surfaces, chipped edges, discoloration or other defects will be rejected.
- B. Fastenings: Conceal unless otherwise shown; make up threaded fastenings tight so that threads are concealed by fittings. Finish exposed fastenings to match adjacent finish.

3.03 TOUCH-UP AND CLEANING

- A. Touch-up minor scratches and blemishes with manufacturer's recommended product and system; match original finish for color and gloss. Repair finish imperfections. Replace damaged work. Clean surfaces and leave free from smears.

END OF SECTION

SECTION 22 05 10
PLUMBING GENERAL PROVISIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. References.
- B. Description of Work.
- C. Drawings and Specifications.
- D. Industry Standards and Codes.
- E. Site Examination.
- F. Permits, Fees and Utility Connections.
- G. Coordination of Work.
- H. Progress of Work.
- I. Submittals
- J. Operation and Maintenance Manuals.
- K. Project Record Documents.
- L. Warranty.
- M. Quality and Care
- N. Access Doors.
- O. Starting Equipment and Systems.

1.2 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

1.3 REFERENCES

- A. ANSI - American National Standards Institute.
- B. ASTM - American Society for Testing Materials.
- C. CEC - California Electric Code.
- D. NEMA - National Electric Manufacturers' Association.
- E. NFPA - National Fire Protection Association.
- F. OSHA - Occupational Safety and Health Act.
- G. UL - Underwriters' Laboratories.
- H. See detailed References that are listed in individual sections.

1.4 DESCRIPTION OF WORK

- A. The work included in this division of the specifications consists of furnishing labor, tools, equipment, supplies and materials, unless otherwise specified, and in performing operations necessary for the installation of the complete Plumbing System as required by these specifications or shown on the Drawings, subject to the terms and conditions of the Contract Agreement.
- B. The work shall also include the completion of details of plumbing work not mentioned or shown which are necessary for the successful operation of mechanical systems described on the drawings or required by these specifications. Furnish and install any incidental work not shown or specified which is required to provide a complete and operational system.

1.5 DRAWINGS AND SPECIFICATIONS

- A. Drawings are schematic and diagrammatic. Drawings indicate the general arrangement of equipment, piping, and other plumbing work. Use judgement and care to install mechanical work to fit the job conditions within the building construction and finishes, and to function properly.
- B. The Contractor shall investigate the building conditions affecting the Work and shall arrange his work accordingly providing offsets, fittings, valves and accessories to fit the actual job conditions. The Contractor shall be responsible to field measure and confirm new and existing mechanical systems locations with respect to other architectural, structural, and electrical work, existing and new. Do not scale distances off of the mechanical drawings. Use actual building dimensions.
- C. The drawings and specifications are complimentary each to the other. What is required by one shall be as binding as if called for by both.
- D. Examine all drawings and specifications prior to bidding the Work. Report any discrepancies to the Engineer.

1.6 INDUSTRY STANDARDS AND CODES

- A. The Mechanical Contractor shall comply with provisions of all codes, regulations, laws and ordinances applicable to the work involved. This does not relieve the Contractor

from furnishing and installing work shown or specified which may exceed the requirements of such codes, regulations laws and ordinances.

- B. All materials, products, devices, fixtures forms or types of construction included in this project shall meet or exceed the published requirements of the publications listed below. These publications form a part of this specification.

1. California Building Code, 2022.
2. California Mechanical Code, 2022.
3. California Plumbing Code, 2022.
4. California Electrical Code, 2022.
5. National Fire Protection Association.
6. California Fire Code, 2022.
7. California State Fire Marshal.
8. Occupational Safety and Health Administration, including CAL-OSHA.
9. California Energy Code, 2022.
10. California Green Building Standards Code, 2022.
11. State of California Code of Regulations, Title 24.
12. Other applicable state laws.

- C. Nothing in the Drawings or Specifications shall be construed to permit work that does not conform these codes. When Contract Documents differ from governing codes, furnish and install to the higher standard required at no extra charge. The Contract Documents are not intended to repeat the code requirements except where necessary for clarity.

- D. No material or product installed as a part of the Work shall contain asbestos in any form.

- E. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.

1.7 SITE EXAMINATION

- A. Contractor shall examine the site, verify dimensions and locations with Drawings, check utility connection locations, and familiarize himself with the existing conditions and limitations. No extras will be allowed because of the Contractor's misunderstanding of the amount of work involved or his lack of knowledge of any site condition which may affect his work. Any apparent variance of the drawings or specifications from the existing conditions at the site shall be called to the attention of the Engineer immediately.

1.8 PERMITS, FEES AND UTILITY SERVICES

- A. Contractor shall pay for and obtain all permits and service required in the installation of this work.
- B. Contractor shall arrange for all required inspections and will secure approvals from authorities having jurisdiction.

1.9 COORDINATION OF WORK

- A. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work and that such establishment is the exclusive responsibility of the contractor.
- B. The Contractor shall give careful consideration to the work of the General, Electrical and other contractors on the job and shall organize his work so that it will not interfere with the work of other trades. He shall consult the drawings and specifications for work of other trades for correcting information, and the pertinent drawings for details and dimensions.
- C. Arrange plumbing work in a neat, well-organized manner with the piping and similar services running parallel and/or perpendicular to primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.
- D. Verify the location of all equipment, plumbing devices, etc. and if interference develops, the Owner/Engineer's decision will be final and no additional compensation will be allowed for the moving of misplaced air devices or equipment.

1.10 PROGRESS OF WORK

- A. This Contractor shall organize his work so that the progress of the mechanical work will conform to the progress of the other trades, and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from defective or ill timed work performed under this section shall be borne by this Contractor.

1.11 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS

- A. Plumbing systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.
- B. Plumbing systems and equipment shall include, but are not limited to, all piping, water heaters, expansion tanks, air compressors, vacuum pumps, electrical and control panels, conduits and other components.
- C. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the state in which the Work is performed.

1.12 SUBMITTALS

- A. See Section 013300 - Submittals, for additional submittal procedures.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project. C. Shop Drawing Submittals: Prepared specifically for this Project.
- D. Organize submittals in sequence according to Specification Section. Submit in bound document with tabs identifying each Specification Section. Provide a Table of Contents identifying the Specifications Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package at one time. Do not submit individual Sections piecemeal.
- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- F. Furnish, upon request, installation instructions for all equipment and materials to Inspector of Record prior to installation.
- G. Maintain a copy of the fire penetration installation instructions on site for use by the Inspector of Record.

1.13 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. LP Consulting Engineers, Inc. will consider requests for substitutions only within 7 days after date of Agreement.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the .

- D. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.
- E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- F. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Center Joint Unified School District.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Center Joint Unified School District and LP Consulting Engineers, Inc. for review or redesign services associated with reapproval by authorities including obtaining reapproval by authorities.
- G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- H. If excessive review, as judged by the Engineer, is required caused by complicated, numerous or repetitive requests, Contractor shall reimburse Engineer and its Consultants for such review at their standard billing rates. I. Substitution Submittal Procedure:
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 3. The LP Consulting Engineers, Inc. will notify in writing of decision to accept or reject request.
 - 4. Present each substitution individually. If a proposed substitute is not found to be acceptable, then the specified item shall be supplied.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01700 Closeout Submittals for Operation and Maintenance Manual requirements.

- B. Provide operating and maintenance instructions, diagrams and parts lists for all components of all mechanical systems and each piece of equipment furnished under these specifications.
- C. Operating and maintenance instructions shall be furnished for the following equipment and systems:
 - 1. Plumbing Systems.
 - 2. Medical Gas Equipment, Piping and Alarm Systems.
 - 3. Piping Systems.
 - 4. Temperature Controls Systems.
 - 5. Testing, Adjusting, and Balancing Reports.
- D. Provide manufacturer's model number, design data, capacities, etc. for each piece of plumbing equipment furnished as a part of the Work.
- E. The operating instructions shall include procedures for starting, stopping and emergency manual operation for all equipment and systems.
- F. Provide maintenance instructions of each item of individual equipment including applicable maintenance data as recommended by the manufacturer, including frequency of lubrication, lubricants, inspections required, adjustment procedures, belt and pulley sizes, etc.
- G. Provide manufacturer's parts bulletins with part numbers for each item of equipment included in the Work. Parts bulletins shall be specific to the equipment provided. Extraneous information that does not apply to the equipment provided shall be eliminated from the literature.
- H. Include copies of test reports (startup, check, etc.) and inspections performed for each piece of equipment provided in the Work.
- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Center Joint Unified School District's name and registered with manufacturer.
- J. Provide supplier and manufacturer contacts, telephone numbers and addresses in the front portion of the operation and maintenance manual.

1.15 PROJECT RECORD DOCUMENTS

- A. See Section 017700 - Closeout Procedures.
- B. Provide red-lined drawings accurately showing location of equipment and devices and size and routing of piping. Include notes explaining installed condition for complete understanding.

1.16 QUALITY ASSURANCE

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from LP Consulting Engineers, Inc. before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

1.17 PROJECT CONDITIONS

- A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.18 WARRANTY

- A. See Section 01700 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 QUALITY AND CARE

- A. All materials shall be new and in perfect condition when installed unless specifically indicated otherwise. Materials shall be tested within the Continental United States by an independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements. When not otherwise specified, all material shall conform to applicable National Standards (ANSI).
- B. All capacities, sizes and efficiency ratings shown on the drawing are minimum. Gas meter and gas pressure reducing valve capacities are maximum allowable.
- C. Each category of material or equipment shall be of the same brand or manufacturer throughout the Work wherever possible.
- D. The quality of materials and equipment to be provided is defined by the brand names, manufacturers, model and catalog numbers listed on the Drawings and in the Specifications. Contractor shall provide each item listed, of the quality specified, or equal.

- E. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.
- F. Inspect and report concealed damage to carrier within their required time period.
- G. Store materials in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect from dirt, water, construction debris, and traffic.
- H. Equipment which has been damaged, exposed to weather or is, in the opinion of the Engineer or Owner, otherwise unsuitable because of improper fabrication, storage or installation shall be removed and replaced by this Contractor at his expense.

2.2 ACCESS DOORS

- A. Coordinate access door requirements with Section 08305. The more stringent requirements shall govern.
- B. Provide access doors where access through floors, walls or ceilings is required to access plumbing equipment and plumbing devices or other systems requiring access for maintenance, test or observation.
 - 1. Access doors requiring hand access or access for observation only shall be 14"x14" minimum usable opening.
 - 2. Access doors where entrance of a service person may be required shall be 24"x30" minimum usable opening.
- C. Established standard: Milcor of types listed below. Other acceptable manufacturers: CESCO, J.L. Industries, Karp, Larsen's, or equal. Comply with the following:
 - 1. Form doors and frames of welded, ground smooth steel construction, 14 gauge for doors, 16 gauge for frames. Provide prime coat finish except for stainless steel type.
 - 2. Concealed hinges to allow 175 degree opening.
 - 3. Locks: flush, screw driver operated cam lock(s).
 - 4. Provide anchoring devices suitable for the construction into which the doors are framed.
- D. Application (as applicable):
 - 1. In gypsum drywall walls and ceilings: Type DW.
 - 2. In ceramic tile walls: Type MS (stainless steel).
 - 3. In fire rated walls: Type Fire Rated (rating as required for wall or ceiling), self closing, 250 F in 30 min. temperature rating.

PART 3 EXECUTION

3.1 INSTALLATION

A. Access Doors

1. Coordinate the exact location of access doors to provide proper access to the item concealed. Obtain written approval for access door locations from Architect.
2. Coordinate installation of access doors with the trades performing the construction assemblies into which the access doors are placed.
3. Install all access doors neatly and securely, to open and close completely, and to operate freely and without binding. Install rated doors in accordance with their listing requirements.
4. Test operate all doors and make all adjustments required for satisfactory operation. Replace all damaged materials.
5. Install in accordance with manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with the requirements within this section.
- B. Test all piping with no leak or loss in pressure in accordance with the requirements within this section.

3.3 GENERAL TESTING REQUIREMENTS FOR MECHANICAL AND PLUMBING SYSTEMS

- A. Contractor shall assign a responsible person to be an independent representative to witness testing and to sign as witness of times, pressure and losses of testing media for all hydronic, duct and gas piping testing.
 1. Test all piping as noted below with no leak or loss of pressure. Repair or replace defective piping until tests are accomplished successfully.
 2. Submit to the Engineer for review a log of all tests made which shall include time, temperature, pressure, water makeup and other applicable readings, necessary to indicate the systems have been operated and tested in the manner outlined in the construction documents.
 3. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period, repair leaky piping and retest. Repeat the procedure until the entire system is proven tight.
- B. Test the following systems with the medium listed to the pressure indicated for the time period listed:

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe markers.
- B. Valve Tags

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 09 91 23 - Interior Painting: Identification painting.
- C. Section 22 60 05 - Medical Air, Gas, and Vacuum Systems: Supply of pipe labels for placement under this section.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.
- B. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

1.04 SUBMITTALS

- A. See Section 013300 - Submittals, for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.
- C. Shop Drawing: Indicate locations and text for proposed labels and proposed diagrams posted at Kitchens, mechanical equipment rooms, and other areas where there are complex plumbing systems.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- E. Maintenance and operation requirements

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Piping: Pipe markers.
- B. Valves: Tags.

2.02 MANUFACTURERS

- A. Brady Corp.

- B. Seton Identification Products.

2.03 TAGS

- A. Metal Tags: Brass, minimum 0.032-inch thickness with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 PIPE MARKERS

- A. Comply with ASME A13.1.
- B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Secure to pipe using two (2) stainless steel straps. Install securing bands completely around pipe and overlapped.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 91 23 for stencil painting.

3.02 INSTALLATION

- A. Equipment Label Installation: Install or permanently fasten labels on each valve and piece of mechanical equipment. Locate equipment labels where accessible and visible.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
- C. Kitchens, mechanical equipment rooms, and other areas where there are complex systems, the Contractor is to provide an annotated diagram of plumbing layout including valves. The diagram is to be laminated and wall mounted.
- D. Install tags with corrosion resistant chain.
- E. Install plastic pipe markers in accordance with manufacturer's instructions.
- F. Identify valves in main and branch piping with tags.

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 07270 - Firestopping.
- C. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.
- D. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2010.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- H. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013300 - Submittals, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. Knauf Insulation: www.knaufusa.com.
 - 2. Johns Manville Corporation: www.jm.com.
 - 3. Owens Corning Corp: www.owenscorning.com.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. 'K' value: ASTM C 177, 0.22 to 0.28 at 100 degrees F.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D. Vapor Barrier Lap Adhesive: Compatible with insulation.
 - 1. Compatible with insulation.

2.03 JACKETS

- A. PVC Plastic.
 - 1. Manufacturers:
 - a. Proto Corporation, Proto-Wrap 30 LoSmoke.
 - b. Johns Manville Corporation: www.jm.com.
 - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

- a. Minimum Service Temperature: 0 degrees F.
- b. Maximum Service Temperature: 150 degrees F.
- c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
- d. Thickness: 10 mil.
- e. Connections: Brush on welding adhesive.
- 3. Covering Adhesive Mastic: Compatible with insulation.
 - a. Compatible with insulation.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Embossed.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with molded PVC fitting covers.
- D. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with vapor barrier, factory-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with molded PVC fitting covers.
- E. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert Location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

- F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, use a UL rated fire penetration assembly, 3M or equal.
- G. Pipe in Supply Air Plenum or Finished Spaces: Finish with PVC jacket and fitting covers.
- H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.
- I. Exterior Applications (exposed to the weather): Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Hot and Tempered Water Supply:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: 1 inch and larger.
 - (a) Thickness: 1.5 inch.
 - 2) Pipe Size Range: 3/4 inch and smaller.
 - (a) Thickness: 1 inch.
 - 2. Domestic Cold Water Located in Unheated Areas:
 - a. Glass Fiber Insulation:
 - 1) Pipe size range: Up to and including 2": Insulation thickness 1".
 - 2) Pipe size range: Over 2": Insulation thickness 1.5".

END OF SECTION

SECTION 22 10 05

PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Drains.
 - 3. Domestic water.
 - 4. Flanges, unions, and couplings.
 - 5. Pipe hangers and supports.
 - 6. Valves.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 078446 - Fire-Resistive Joint Systems.
- C. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- D. Section 22 07 19 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- C. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 2011.
- D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012.
- E. ASME B31.1 - Power Piping; 2014.
- F. ASME B31.9 - Building Services Piping; 2014.
- G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- H. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.
- I. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.
- J. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- K. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2015a.

- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
- M. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.
- N. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.
- O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).
- P. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2014.
- Q. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2014.
- R. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).
- S. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
- T. AWWA C651 - Disinfecting Water Mains; 2005.
- U. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009.
- V. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011.
- W. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- X. MSS SP-67 - Butterfly Valves; 2011.
- Y. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- Z. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.
- AA. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- AB. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- AC. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- AD. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- AE. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.04 SUBMITTALS

- A. See Section 013300 - Submittal Procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

- C. Project Record Documents: Record actual locations of valves.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with State of California, standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME BPVC-IX and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

1.06 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with State of California plumbing code.
- B. Include certification that water piping meets the lead-free requirements of California HSC section 116875 and to comply with NSF 61.
- C. Conform to applicable code for installation of backflow prevention devices.
- D. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED

- A. Cast Iron Pipe (acceptable alternate): CISPI 301, hubless.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310 with MG couplings.
 - 3. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies. Heavy duty, Husky SD4000, .015 inch thick 304 stainless steel shield, 4-band coupling.

2.03 DRAIN PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

- B. Copper Tube: ASTM B 306, DWV or ASTM B 88 (ASTM B 88M), Type M (C), Drawn (H).
 1. Application: Condensate drains.
 2. Fittings: ASME B16.29, wrought copper, or ASME B16.23, solvent.
 3. Joints: ASTM B32, alloy Sn50 solder.

2.04 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn, Type K.
 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2.05 WATER PIPING, BURIED

- A. Copper Pipe: ASTM B 42, hard drawn, Type K.
 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2.06 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 1. Fittings: ASME B16.18, cast copper alloy.
 2. Joints: For sizes 1-1/2" and smaller, ASTM B 32, alloy Sn95 solder.
 3. Joints: For sizes 2" and larger, AWS A5.8, BCuP5 silver braze.
- B. Provide full solder cup for all fittings.
- C. Schedule 40 Screwed Brass: Capped or plugged outlets.

2.07 NATURAL GAS PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. Polyethylene Pipe: ASTM D2513, SDR 11.
 1. Fittings: ASTM D2683 or ASTM D2513 socket type.
 2. Joints: Fusion welded.

2.08 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 1. Fittings: ASTM A234/A234M, wrought steel welding type.
 2. Joints: ASME B31.1, welded.
 3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.09 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 2 Inches and Under:
 1. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.10 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Conform to MSS SP-58.
 2. Steel hanger rods and clevis shall be cadmium or zinc plated.
 3. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
 4. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 7. Vertical Support: Steel riser clamp.
 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
1. Conform to MSS SP-58.
 2. Steel hanger rods and clevis shall be cadmium or zinc plated.
 3. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
 4. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 6. Vertical Support: Steel riser clamp.
 7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.11 GATE VALVES

- A. Manufacturers:
1. Nibco, Inc: www.nibco.com.
 2. Crane Co. Valve Division
 3. Milwaukee Valve Company: www.milwaukeevalve.com.
 4. Hammond.
 5. Stockham.
- B. Up To and Including 2 Inches:
1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, threaded ends with union.

2.12 BALL VALVES

- A. Manufacturers:
1. Nibco, Inc: www.nibco.com.
 2. Crane Co., Valve Division
 3. Milwaukee Valve Company: www.milwaukeevalve.com.
 4. Stockham.
- B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, stainless steel ball, full port, teflon seats and stuffing box ring, stainless steel blow-out proof stem, lever handle with balancing stops, threaded ends with union.

- C. Gas Service: Construction, 2" and Smaller: PE2406, PE3408 Polyethylene, minimum 80 psi operating pressure, full port, butt or socket fusion, with square operator nut. ASTM D2513, ASME B16.40.

2.13 PLUG VALVES

- A. Manufacturers:
 - 1. DeZurik.
 - 2. Milwaukee Valve Company.
- B. Construction 2-1/2 Inches and Larger: 1, 175 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- J. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 05 23.
- K. Install water piping to ASME B31.9.

- L. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- M. Sleeve pipes passing through partitions, walls and floors.
- N. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Provide copper plated hangers and supports for copper piping.
 - 7. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - 8. Support cast iron drainage piping at every joint.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inches to 1-1/4 inches:
 - 1) Maximum Hanger Spacing: 6.5 ft.
 - 2) Hanger Rod Diameter: 3/8 inches.
 - b. Pipe Size: 1-1/2 inches to 2 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.
 - c. Pipe Size: 2-1/2 inches to 3 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 1/2 inch.
 - d. Pipe Size: 4 inches to 6 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 5/8 inch.

END OF SECTION

SECTION 22 10 06

PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floor drains.
- B. Cleanouts.
- C. Water hammer arrestors.
- D. Trap primers.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 22 10 05 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011.
- B. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- C. NSF 372 - Drinking Water System Components - Lead Content; 2011.
- D. PDI-WH 201 - Water Hammer Arresters; 2010.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. See Section 013300 - Submittals, for submittal procedures.
- C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- D. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- E. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- F. Project Record Documents: Record actual locations of equipment, cleanouts, water hammer arrestors.
- G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with State of California plumbing code.
- B. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.
- C. Conform to applicable code for installation of backflow prevention devices.
- D. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 REFER TO PLUMBING SCHEDULE FOR PLUMBING PIPING SPECIALTIES NOT LISTED HEREIN.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface as indicated on plans. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Install cleanouts in waste drops from each urinal and sink.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to and water closets and as shown on plans.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flush valve water closets.
- B. Wall hung urinals.
- C. Lavatories.
- D. Sinks.
- E. Indoor drinking fountains.
- F. Service sinks.

1.2 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 22 10 05 - Plumbing Piping.
- C. Section 22 10 06 - Plumbing Piping Specialties.

1.3 REFERENCE STANDARDS

- A. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration 2008 (Reaffirmed 2013).
- B. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).
- C. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.
- D. ASME A112.19.2 - Ceramic Plumbing Fixtures 2018, with Errata.
- E. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2022.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.
- G. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.
- H. NSF 372 - Drinking Water System Components - Lead Content 2022.

1.4 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Center Joint Unified School District's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with State of California plumbing code.
- B. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.
- C. Conform to applicable code for installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.8 WARRANTY

- A. See Section 01700 - Contract Closeout, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 GENERAL REQUIREMENTS:

- A. Refer to Architectural drawings for exact locations, fixture mounting heights and ADA accessibility requirements.

- B. Insulate domestic hot water, tempered water and waste piping below handicapped plumbing fixtures with molded single piece removable insulation covers, foam, fire resistant, Truebro, or equal. Install insulation covers in accordance with ADA requirements.
- C. Provide 85% IPS red brass pipe for each connection to faucets, stops, hose bibs, and other fixtures/trim. Securely anchor brass pipe to structure. Install stop valves on water supply lines for each fixture, except hose bibbs.
- D. Provide compression shutoff control stop valves with IPS inlets and threaded brass nipples at pipe connection on water supplies to each fixture. Provide stops with lock shield loose key and key handle for each stop. For combination fixtures, provide with compression stop and IPS inlet on each water supply fitting.
- E. Provide cast brass escutcheons, except escutcheons exposed to view shall have chrome plated finish.
- F. Provide chromium-plated finish on fittings and accessories exposed to view.
- G. Fixture fittings and trim: Conform to ASME A112.18.1M and ASME A112.19.5, as applicable.
- H. Centerset faucets: Top-mounted with inlets on not greater than 4 inch centers, unless specified otherwise below.
- I. Separate faucets and combination supply fittings: Provide inlets on 8 inch centers.
- J. Zinc-alloy or plastic handles are not permitted for faucets and valves.
- K. Provide special roughing-in for wheelchair fixtures.
- L. Lavatory flow rates not to exceed 0.5 GPM.
- M. Water closet flush flow rates not to exceed 1.28 GPF.
- N. Urinal flush flow rates not to exceed 0.125 GPF.
- O. Provide water hammer arrestors at end of pipe runs to two or more fixtures, properly sized with sufficient displacement volume to dissipate calculated energy in the piping systems. Locate in accessible location or provide access panel with location approved by Architect.
- P. Fixture dimensions specified are nominal.

2.3 SEE PLUMBING SCHEDULE FOR FIXTURE REQUIREMENTS.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.4 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.5 CLEANING

- A. Clean plumbing fixtures and equipment.

END OF SECTION

SECTION 23 05 10
MECHANICAL GENERAL PROVISIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. References.
- B. Description of Work.
- C. Drawings and Specifications.
- D. Industry Standards and Codes.
- E. Site Examination.
- F. Permits, Fees and Utility Connections.
- G. Coordination of Work.
- H. Progress of Work.
- I. Submittals
- J. Operation and Maintenance Manuals.
- K. Project Record Documents.
- L. Warranty.
- M. Quality and Care
- N. Access Doors.
- O. Starting Equipment and Systems.

1.2 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.
- D. Section 013300 - Submittals.
- E. Section 017700 - Closeout Procedures.

1.3 REFERENCES

- A. ANSI - American National Standards Institute.
- B. ASTM - American Society for Testing Materials.
- C. CEC - California Electric Code.
- D. NEMA - National Electric Manufacturers' Association.
- E. NFPA - National Fire Protection Association.
- F. OSHA - Occupational Safety and Health Act.
- G. UL - Underwriters' Laboratories.
- H. See detailed References that are listed in individual sections.

1.4 DESCRIPTION OF WORK

- A. The work included in this division of the specifications consists of furnishing labor, tools, equipment, supplies and materials, unless otherwise specified, and in performing operations necessary for the installation of the complete Mechanical System as required by these specifications or shown on the Drawings, subject to the terms and conditions of the Contract Agreement.
- B. The work shall also include the completion of details of mechanical work not mentioned or shown which are necessary for the successful operation of mechanical systems described on the drawings or required by these specifications. Furnish and install any incidental work not shown or specified which is required to provide a complete and operational system.

1.5 DRAWINGS AND SPECIFICATIONS

- A. Drawings are schematic and diagrammatic. Drawings indicate the general arrangement of equipment, piping, ductwork and other mechanical work. Use judgement and care to install mechanical work to fit the job conditions within the building construction and finishes, and to function properly.
- B. The Contractor shall investigate the building conditions affecting the Work and shall arrange his work accordingly providing offsets, fittings, valves and accessories to fit the actual job conditions. The Contractor shall be responsible to field measure and confirm new and existing mechanical systems locations with respect to other architectural, structural, and electrical work, existing and new. Do not scale distances off of the mechanical drawings. Use actual building dimensions.
- C. The drawings and specifications are complimentary each to the other. What is required by one shall be as binding as if called for by both.
- D. Examine all drawings and specifications prior to bidding the Work. Report any discrepancies to the Engineer.

1.6 INDUSTRY STANDARDS AND CODES

- A. The Mechanical Contractor shall comply with provisions of all codes, regulations, laws and ordinances applicable to the work involved. This does not relieve the Contractor from furnishing and installing work shown or specified which may exceed the requirements of such codes, regulations laws and ordinances.
- B. All materials, products, devices, fixtures forms or types of construction included in this project shall meet or exceed the published requirements of the publications listed below. These publications form a part of this specification.
 - 1. California Building Code, 2022.
 - 2. California Mechanical Code, 2022.
 - 3. California Plumbing Code, 2022.
 - 4. California Electrical Code, 2022.
 - 5. National Fire Protection Association.
 - 6. California Fire Code, 2022.
 - 7. California State Fire Marshal.
 - 8. Occupational Safety and Health Administration, including CAL-OSHA.
 - 9. State of California Energy Conservation Standards.
 - 10. State of California Code of Regulations, Title 24.
 - 11. Other applicable state laws.
- C. Nothing in the Drawings or Specifications shall be construed to permit work that does not conform these codes. When Contract Documents differ from governing codes, furnish and install to the higher standard required at no extra charge. The Contract Documents are not intended to repeat the code requirements except where necessary for clarity.
- D. No material or product installed as a part of the Work shall contain asbestos in any form.

1.7 SITE EXAMINATION

- A. Contractor shall examine the site, verify dimensions and locations with Drawings, check utility connection locations, and familiarize himself with the existing conditions and limitations. No extras will be allowed because of the Contractor's misunderstanding of the amount of work involved or his lack of knowledge of any site condition which may affect his work. Any apparent variance of the drawings or specifications from the existing conditions at the site shall be called to the attention of the Engineer immediately.

1.8 PERMITS, FEES AND UTILITY SERVICES

- A. Contractor shall pay for and obtain all permits and service required in the installation of this work.
- B. Contractor shall arrange for all required inspections and will secure approvals from authorities having jurisdiction.

1.9 COORDINATION OF WORK

- A. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work and that such establishment is the exclusive responsibility of the contractor.
- B. The Contractor shall give careful consideration to the work of the General, Electrical and other contractors on the job and shall organize his work so that it will not interfere with the work of other trades. He shall consult the drawings and specifications for work of other trades for correcting information, and the pertinent drawings for details and dimensions.
- C. Arrange mechanical work in a neat, well-organized manner with the piping, conduit, and similar services running parallel and/or perpendicular to primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.
- D. Verify the location of all equipment, and devices, etc. and if interference develops, the Owner/Engineer's decision will be final and no additional compensation will be allowed for the moving of misplaced air devices or equipment.

1.10 PROGRESS OF WORK

- A. This Contractor shall organize his work so that the progress of the mechanical work will conform to the progress of the other trades, and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from defective or ill timed work performed under this section shall be borne by this Contractor.

1.11 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS

- A. Mechanical systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.
- B. Mechanical systems and equipment shall include, but are not limited to, all piping, heating and ventilating equipment, electrical and control panels, conduits and other components.
- C. Supports, anchorage and restraints, including attachments to building structure, for all piping and ductwork for standard installation details that comply with the latest edition of the Mason Industries "Seismic Restraint Guidelines", the latest edition of the SMACNA "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing

Piping Systems", or equal, shall be used wherever possible. The Contractor shall provide all supporting documentation required for the Engineer and the reviewing authorities. If compliance with one of these standards is demonstrated, separate structural calculations are not required.

- D. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the state in which the Work is performed.

1.12 SUBMITTALS

- A. See Section 013300 - Submittal Procedures, for additional submittal procedures.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project.
- D. Organize submittals in sequence according to Specification Section. Submit in bound document with tabs identifying each Specification Section. Provide a Table of Contents identifying the Specifications Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package at one time. Do not submit individual Sections piecemeal.
- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- F. Furnish, upon request, installation instructions for all equipment and materials to Inspector of Record prior to installation.
- G. Maintain a copy of the fire and smoke damper installation instructions on site for use by the Inspector of Record.

1.13 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. LP Consulting Engineers, Inc. will consider requests for substitutions only within 7 days after date of Agreement.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the .
- D. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.

- E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- F. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Center Joint Unified School District.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Center Joint Unified School District and LP Consulting Engineers, Inc. for review or redesign services associated with reapproval by authorities including obtaining reapproval by authorities.
- G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- H. If excessive review, as judged by the Engineer, is required caused by complicated, numerous or repetitive requests, Contractor shall reimburse Engineer and its Consultants for such review at their standard billing rates.
- I. Substitution Submittal Procedure:
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 3. The LP Consulting Engineers, Inc. will notify in writing of decision to accept or reject request.
 - 4. Present each substitution individually. If a proposed substitute is not found to be acceptable, then the specified item shall be supplied.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01700 Closeout Submittals for Operation and Maintenance Manual requirements.
- B. Provide operating and maintenance instructions, diagrams and parts lists for all components of all mechanical systems and each piece of equipment furnished under these specifications.

- C. Operating and maintenance instructions shall be furnished for the following equipment and systems:
 - 1. Air Conditioning Systems.
 - 2. Piping Systems.
 - 3. Temperature Controls Systems.
 - 4. Motors.
 - 5. Hydronic Balance and Test Reports.
- D. Provide manufacturer's model number, design data, capacities, etc. for each piece of mechanical equipment furnished as a part of the Work.
- E. The operating instructions shall include procedures for starting, stopping and emergency manual operation for all equipment and systems.
- F. Provide maintenance instructions of each item of individual equipment including applicable maintenance data as recommended by the manufacturer, including frequency of lubrication, lubricants, inspections required, adjustment procedures, belt and pulley sizes, etc.
- G. Provide manufacturer's parts bulletins with part numbers for each item of equipment included in the Work. Parts bulletins shall be specific to the equipment provided. Extraneous information that does not apply to the equipment provided shall be eliminated from the literature.
- H. Include copies of test reports (startup, check, etc.) and inspections performed for each piece of equipment provided in the Work.
- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Center Joint Unified School District's name and registered with manufacturer.
- J. Provide supplier and manufacturer contacts, telephone numbers and addresses in the front portion of the operation and maintenance manual.

1.15 PROJECT RECORD DOCUMENTS

- A. See Section 017700 - Closeout Procedures.
- B. Provide red-lined drawings accurately showing location of equipment and devices and size and routing of ductwork. Include notes explaining installed condition for complete understanding.

1.16 QUALITY ASSURANCE

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.

- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from LP Consulting Engineers, Inc. before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

1.17 WARRANTY

- A. See Section 017700 - Closeout Procedures, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 QUALITY AND CARE

- A. All materials shall be new and in perfect condition when installed unless specifically indicated otherwise. Materials shall be tested within the Continental United States by an independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements. When not otherwise specified, all material shall conform to applicable National Standards (ANSI).
- B. All capacities, sizes and efficiency ratings shown on the drawing are minimum.
- C. Each category of material or equipment shall be of the same brand or manufacturer throughout the Work wherever possible.
- D. The quality of materials and equipment to be provided is defined by the brand names, manufacturers, model and catalog numbers listed on the Drawings and in the Specifications. Contractor shall provide each item listed, of the quality specified, or equal.
- E. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.
- F. Inspect and report concealed damage to carrier within their required time period.
- G. Store materials in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect from dirt, water, construction debris, and traffic.

- H. Equipment which has been damaged, exposed to weather or is, in the opinion of the Engineer or Owner, otherwise unsuitable because of improper fabrication, storage or installation shall be removed and replaced by this Contractor at his expense.

2.2 ACCESS DOORS

- A. Provide access doors where access through floors, walls or ceilings is required to access mechanical, plumbing, control system components, fire dampers and fire alarm system components (such as smoke detectors, fire/smoke dampers, etc.) or other systems requiring access for maintenance, test or observation.
1. Access doors requiring hand access or access for observation only shall be 14"x14" minimum usable opening.
 2. Access doors where entrance of a service person may be required shall be 24"x30" minimum usable opening.
- B. Established standard: Milcor of types listed below. Other acceptable manufacturers: Cesco, J.L. Industries, Karp, Larsen's, or equal. Comply with the following:
1. Form doors and frames of welded, ground smooth steel construction, 14 gauge for doors, 16 gauge for frames. Provide prime coat finish except for stainless steel type.
 2. Concealed hinges to allow 175 degree opening.
 3. Locks: flush, screw driver operated cam lock(s).
 4. Provide anchoring devices suitable for the construction into which the doors are framed.
- C. Application (as applicable):
1. In gypsum drywall walls and ceilings: Type DW.
 2. In ceramic tile walls: Type MS (stainless steel).
 3. In fire rated walls: Type Fire Rated (rating as required for wall or ceiling), self closing, 250 F in 30 min. temperature rating.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Access Doors
1. Coordinate the exact location of access doors to provide proper access to the item concealed. Obtain written approval for access door locations from Architect.
 2. Coordinate installation of access doors with the trades performing the construction assemblies into which the access doors are placed.

3. Install all access doors neatly and securely, to open and close completely, and to operate freely and without binding. Install rated doors in accordance with their listing requirements.
4. Test operate all doors and make all adjustments required for satisfactory operation. Replace all damaged materials.
5. Install in accordance with manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with the requirements within this section.
- B. Test all piping with no leak or loss in pressure in accordance with the requirements within this section.

3.3 GENERAL TESTING REQUIREMENTS FOR MECHANICAL AND PLUMBING SYSTEMS

- A. Contractor shall assign a responsible person to be an independent representative to witness testing and to sign as witness of times, pressure and losses of testing media for all hydronic piping and duct testing.
 1. Test all piping as noted below with no leak or loss of pressure. Repair or replace defective piping until tests are accomplished successfully.
 2. Submit to the Engineer for review a log of all tests made which shall include time, temperature, pressure, water makeup and other applicable readings, necessary to indicate the systems have been operated and tested in the manner outlined in the construction documents.
 3. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period, repair leaky piping and retest. Repeat the procedure until the entire system is proven tight.
- B. Test the following systems with the medium listed to the pressure indicated for the time period listed:
 1. Hydronic Piping: Pressure=125 Psig / Medium= Water / Duration=4 Hours.

3.4 CUTTING AND PATCHING

- A. Submit written request in advance of cutting or alteration which affects:
 1. Structural integrity of any element of Project.
 2. Efficiency, maintenance, or safety of any operational element.
 3. Visual qualities of sight exposed elements.

4. Work of Center Joint Unified School District or separate Contractor.

- B. Execute cutting and patching to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.
- C. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Code requirements, to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.5 PRIMING AND PAINTING

- A. Apply primer to all exposed ferrous metals that are not factory primed, factory finished, galvanized, stainless steel or anodized. Exposed black steel piping shall be primed and finish painted to match Architectural finish requirements.
 - 1. Primer shall be as recommended by the paint manufacturer for each specific application.
 - 2. Acceptable Products include: Fuller O'Brien Blox-Rust Metal All Purpose Primer, equivalent Rust-Oleum product, or equal. See Section 092216 for other acceptable products.
- B. Apply two coats of primer to metal surfaces of items to be insulated or jacketed, except ductwork and piping, or factory primed or finished.
- C. Preparation:
 - 1. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.
 - 2. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; seal stains and marks which cannot be completely removed using Devco KILSTAIN primers, shellac, or other coating

acceptable to paint manufacturer any marks or defects that might bleed through paint finishes.

3. Remove mildew from impervious surfaces by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow substrate to thoroughly dry.
4. Galvanized Surfaces:
 - a. Remove surface contamination and oils by solvent cleaning in accordance with SSPC-SP 1 and allow to dry.
 - b. Apply Devoe MIRROLAC Galvanized Metal Primer in accordance with manufacturer instructions.
5. Uncoated Steel And Iron Surfaces:
 - a. Remove grease, rust, scale, and dust from steel and iron surfaces using solvent in accordance with SSPC-SP 1.
 - b. Where heavy coatings of scale or contaminants are evident, hand tool clean in accordance with SSPC-SP 2 or use other approved SSPC SP method as needed.
6. Shop Primed Steel Surfaces: Remove loose primer and dust. Sand and feather edges to smooth surface. Clean areas with solvent and spot prime bare metal surfaces with appropriate Devoe MIRROLAC metal primer or primer recommended by manufacturer.

D. Application:

1. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.
2. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.
3. Remove dust and other foreign materials from substrate immediately prior to applying each coat.

E. Finish Painting: See Section 092216.

3.6 STARTING EQUIPMENT AND SYSTEMS/COMMISSIONING

- A. Provide training of the District's Maintenance and Operations staff for operating and maintaining the systems prior to occupancy.
- B. The District will not accept the project as complete until the commissioning is completed. This includes training of the District's Maintenance and Operations staff for operating and maintaining the systems prior to occupancy.

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

1.03 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.
- D. Division 00 - Submittals.

1.04 SUBMITTALS

- A. See Division 00 - Submittal Procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Heat Transfer Equipment: Nameplates.
- C. Major Control Components: Nameplates.

2.02 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Seton Identification Products: www.seton.com/aec.

2.03 NAMEPLATES

- A. Description: Stainless steel with engraved letters.
 - 1. Letter Height: 1/4 inch.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Equipment Label Installation: Install or permanently fasten labels on each major item of mechanical equipment. Locate equipment labels where accessible and visible. Labels shall indicate room served by item of mechanical equipment.
- B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- C. Identify air handling units, pumps, heat transfer equipment, tanks, fire/smoke damper access doors, and water treatment devices with nameplates. Small devices, such as terminal units, in-line pumps, may be identified with tags.
- D. Identify thermostats/sensors relating to terminal boxes or valves with tags.
- E. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 23 0719

HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8456 - Firesafing.
- B. Section 23 2213 - Steam and Condensate Heating Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- C. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.
- D. Division 00 - Submittals.
- E. Division 00 - Closeout Procedures.
- F. Division 00 - General Commissioning Requirements.

1.05 SUBMITTALS

- A. See Division 00 for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.08 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturer:
 - 1. Armacell LLC; AP Armaflex: www.armacell.us/#sle.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. Minimum Service Temperature: Minus 40 degrees F.
 - 2. Maximum Service Temperature: 180 degrees F.
 - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.03 JACKETS

- A. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Embossed.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Pipe saddle.
- C. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

3.03 SCHEDULE

- A. Cooling Systems:
 - 1. Refrigerant Piping:
 - a. Flexible Elastic Cellular Insulation:
 - 1) Pipe Size Range: 1 inch and smaller.
 - (a) Thickness: 1 inch.
 - 2) Pipe Size Range: 1.25 inch and larger.
 - (a) Thickness: 1.5 inch.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 23 8126.13

SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air cooled condensing units.
- B. Indoor ductless fan & coil units.
- C. Controls.

1.02 RELATED REQUIREMENTS

- A. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.
- B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- C. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; 2010.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.
- F. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Division 00 for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- D. Design Data: Indicate refrigerant pipe sizing.
- E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- F. Project Record Documents: Record actual locations of components and connections.
- G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

- H. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Center Joint Unified School District's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 WARRANTY

- A. See Division 00 - Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Mitsubishi Electric.
- B. District Approved Equal.

2.02 SYSTEM DESIGN

- A. Split-System Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Cooling: Air-source direct expansion located in outdoor unit with evaporator.
 - 2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.

2.03 INDOOR UNITS FOR DUCTLESS SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
- B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 - 2. Manufacturer: System manufacturer.
- C. Remote Actuators:

2.04 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Comply with AHRI 210/240.
 - 2. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.
- B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

- C. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion valves.
 - 2. Provide heat pump reversing valves.
- D. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.
 - 2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 26 01 10**ELECTRICAL GENERAL REQUIREMENTS****PART 1 - GENERAL****1.01 CONTRACT PROVISIONS**

- A. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.02 SUMMARY

- A. This section describes the requirements for the electrical work includes, among others, the furnishing and installation of the following:
1. Grounding system.
 2. Wiring systems including power wiring to plumbing and HVAC and other misc. appliances and equipment.
 3. Communications management system (voice/video/media/clock)
 4. Computer data systems, outlets, raceway, and cabling.
 5. Intrusion alarm and video security systems.
 6. Assistive Listening system
 7. Fire alarm system.
 8. Testing and commissioning.
- B. Furnish and install all electrical equipment and systems as shown on the Drawings and as described in this Division of the Specifications to provide a complete and functional electrical installation. This work includes but is not limited to all material and labor required for installation of electrical and special systems complete as described herein this specification and drawings; and connections (and installation where not otherwise provided for) of electrical equipment furnished by others. Provide and install all items of equipment, devices, supports, etc., which are incidental to the major components shown on the Drawings or described in these Specifications.

1.03 RELATED WORK INCLUDED IN OTHER DIVISIONS

- A. Finish painting except factory applied finishes and repair of factory finishes shall be provided in accordance with appropriate sections of this Specification. Coordinate "painting" requirements of this Division with other trades as required to assure timely and satisfactory completion of required work. In finished areas, all exposed raceway, boxes, galvanized steel box covers (where allowed), and other electrical "structure" shall be finished to match adjacent structures. Verify that all raceway openings are closed and box covers are in place prior to finishing work done by others.
- B. Examine the drawings and specification for mechanical equipment and provide electrical installation for heating, ventilation and air conditioning equipment, motors, pumps and associated motor starters and controls as described in Division 23.
- C. Examine the Architectural drawings and specification for electrical appliances and equipment which may not be shown on the plans to include and provide electrical installations as described in the architectural division of work.
- D. Examine the Architectural drawings and provide all construction necessary to maintain the integrity of the fire rated barriers.

- E. Examine the Architectural drawings and coordinate with the Architect to provide access doors, whether shown on drawings or not, where floors, walls, or ceiling must be penetrated for access to electrical equipment, outlet boxes, devices, etc., and as specified in this specification.
- F. Provide and install, as part of the work described in this Division, all power and control wiring fed from a source of 30 Volts or more (i.e. all wiring except temperature control wiring) for mechanical equipment described in Division 23.
- G. Examine the fire sprinkler system drawings and specifications for electrical work which may not be shown on the electrical and/or fire detection and alarm plans to be included in the electrical work as necessary as described in the Division 21 fire sprinkler system.

1.04 APPLICATION OF OTHER DIVISIONS

- A. Where carpentry, masonry, concrete work, painting, etc., is required in the installation of equipment specified under this Division, the work shall be done in accordance with the applicable Division of these Specifications. This work could include for example: work associated with panelboard installation, equipment pads or bases, support structures, etc.

1.05 DRAWINGS AND SPECIFICATIONS

- A. The information presented in these Specifications and on the Drawings is intended to describe the utilitarian and physical aspects of the systems shown as well as the quality of the entire installation. All information is as complete and thorough as possible, but every condition or situation cannot be anticipated. Exact locations, dimensions, elevations, etc. must be determined "on the job" with careful attention to the "intent" of the Drawings and Specifications.
- B. The above paragraph shall not be construed as to allow significant deviation from either the Drawings or Specifications without prior approval of the Architect, but minor changes in conduit routing or equipment locations may be required or desired due to specific conditions encountered. This work shall be accomplished in accordance with these Specifications and no "extra charges" are to be created for any unanticipated labor or material.
- C. Any error or omissions of detail in either the drawings or the specifications shall not relieve the Contractor from correctly installing all materials necessary for complete and operating electrical systems.
- D. Contractor shall inspect the site and verify all measurements and conditions. No extra compensation will be allowed because of differences between work shown on the drawings and measurements at the site.
 - 1. The Drawings are diagrammatic in nature, but the locations of devices, equipment, outlets, and lighting fixtures are shown approximately where installations are intended. Architectural, structural, mechanical, audio/video, theatrical lighting and other drawings shall be examined, noting all conditions that may affect this work. Report conflicting conditions to the Architect/Engineer for adjustment before proceeding with the work. Should the Contractor proceed with work without reporting the matter, he does so on his own responsibility and shall alter work if directed by the Architect/Engineer at his own expense.
- E. Examine the architectural, structural, mechanical, fire sprinkler and manufacturer's drawings for various equipment in order to determine exact routing and final terminations

for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.

- F. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of outlets or equipment, prior to rough in without incurring any additional cost or changes.
- G. If significant departures from the Drawings or Specifications are considered necessary by the Contractor, details of the changes and the reasons therefore shall be submitted to the Architect as within thirty days after award of contract. Prior written acceptance of the Architect is required for these departures.
- H. Clarification of plans and specifications for the purpose of facilitating construction, but not involving additional labor and materials, may be prepared during construction by the Architect/Engineer. Said revised plans and specifications shall become a part of the contract. The Contractor shall conform to the revised plans and specifications at no additional cost to the District.

1.06 CODES, STANDARDS, RULES AND REGULATIONS

- A. All work and materials shall be in full accordance with the latest rules, codes, and/or regulations and not limited to the following:
- B. California Electrical Code (CEC) – 2022 Edition
- C. NFPA 101 - Life Safety Code
- D. NFPA 72 - Fire Alarm Code
- E. Title 24 - State of California Administrative Code
- F. Uniform Building Code (UBC) OR California Building Code (CBC)
- G. City or County Electrical Code as applicable.
- H. Utility rules and regulations.
- I. Any applicable additional codes and regulatory documents effective at the project site.
- J. Nothing on the Drawings or in the Specifications shall be construed to allow work not in conformance with these rules, codes, and regulations.
 - 1. The Drawings and/or Specifications shall take precedence where work and material described therein exceeds that required by rules, codes, or regulations.

1.07 MANUFACTURER'S INSTRUCTIONS

- A. Follow the manufacturer's instructions when specific installation or connection details are not indicated or specified on the contract documents.
- B. Notify the Architect/Engineer of conflicts between the manufacturer's instructions and installation or connection details prior to the installation of materials.

1.08 WORKMANSHIP

- A. High quality workmanship shall be evidenced in the installation of all electrical equipment

and materials. Use the National Electrical Contractors Association's "Standard of Installation" as a guide to the workmanship required. Be prepared to replace or repair any material or equipment damaged by or installed in a manner exhibiting evidence of poor workmanship.

1.09 COORDINATION WITH OTHER TRADES

- A. Examine the Electrical Drawings and refer to the Drawings and Specifications describing other work to be accomplished. Verify and coordinate prior to bid. Continue to coordinate work planning and all work in the field to avoid conflicts, errors, and/or delays. No compensation will be allowed for extra work necessitated by lack of coordination.

1.10 AUTHORITY OF THE ARCHITECT

- A. As used in this paragraph only, the word "Architect" shall mean the Architect of record or his designated representative.
- B. The authority of the Architect shall be absolute with respect to all performance under this Specification. In case of dispute, the decision of the Architect shall be final.
- C. Where optional materials, methods, or installation techniques are allowed under the provisions of this Specification, they may be used at the discretion of the Architect. The Architect may require specific materials, methods, or techniques to be used in specific situations where use of other materials, methods, or techniques might in his judgment result in loss of aesthetics, accidental damage, life safety hazard, or loss of utility over the system design lifetime.
- D. No additional charges will be allowed for work or material require to be supplied under the conditions of this paragraph unless the need for such material or work could not have been anticipated by thorough study of the site, Drawings, and Specifications and knowledge of all applicable codes, laws, and ordinances.

1.11 EXAMINATION OF THE SITE

- A. The contractor is required to visit the site of construction prior to bid to determine existing conditions and their effect upon the work he will be required to perform. No additional compensation will be allowed for any extra expenses incurred by failure to detect and evaluate all existing conditions that will affect his work to be included in the bid to accomplish this contract document's goal.

1.12 STRUCTURAL REQUIREMENTS:

- A. Secure all anchors for electrical equipment in a manner, which will not decrease the structural value of any structure to an unsafe level. Install all equipment, fixtures, and etc. to resist seismic movements. Inform the Architect in advance and provide drawings of any proposed modifications to the structure that involves cutting or patching of concrete, masonry, steel, or wood in this project.

1.13 PERMITS, FEES, AND, INSPECTIONS

- A. Obtain all permits and licenses as required and pay all fees incidental to construction.
- B. Inspections required by prevailing Local Authorities, and/or ordinances, shall be coordinated and arranged by the contractor. Provide the Architect with a schedule of inspections, where applicable, and submit all certificates of inspection to the Architect.

- C. The Contractor shall cooperate with the Architect and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate equipment, or perform any reasonable work, which, in the opinion of the Architect, will be necessary to determine the quality or adequacy of the work. Work shall not be closed in or covered before inspection and approval by the Architect. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor. If any material does not conform with these specifications the Contractor shall, within three days after being notified by the Architect, remove the materials from the premises.

1.14 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable to District. Secure material from weather or accidental damage.

1.15 OPERATING INSTRUCTIONS

- A. Instruct the District as to function, operation, maintenance, and adjustment of each system and piece of equipment provided.

1.16 RECORD DRAWING

- A. The Contractor shall keep a separate set of Electrical Drawings at the job site to be used as RECORD Drawings. These Drawings are to be kept current and in a neat and clean condition at all times. They are to be available for inspection by the Architect or Engineer at any time during site visitations. These Drawings shall be "red lined" to indicate all changes in equipment, device, and outlet locations; and to indicate the true locations of all concealed or underground work where different from that shown on the Drawings. Each sheet of this set shall be clearly and permanently marked "RECORD DRAWINGS".
- B. Upon completion of the project and prior to final payment, transfer all RECORD DRAWINGS information to the provided original drawings. All information shall be clearly drawn with "RED" ink. The drawings shall be scanned, 100% edited, and converted into an AutoCAD ".dwg" version 2002 (or higher) electronic file. Deliver the original, final sets, and electronic files (CD) to the Architect for review and delivery to the District/Owner.

1.17 GUARANTEE

- A. All electrical work, material, and equipment shall be guaranteed to be free from defects in workmanship or material for a period of two (2) year from the date of final acceptance. Repair or replace all such defects in a timely manner and any damage to the owner's property resulting from such defect or repair thereof. All equipment and material provided and all work accomplished under the requirements of this section shall be at no expense to the District.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Unless specifically indicated otherwise, all material shall be new and free from defects; it shall be listed by Underwriters' Laboratories where applicable. Like items shall be of the same manufacturer (except lighting fixtures - which shall be as specified).

- B. Except as noted otherwise, where material of a particular manufacturer is specified, the intent is to describe the quality and function of the item. The term "...or acceptable equal" is implied. A substitution of any of these items will require that the item be presented in a submittal whether specifically listed in the "Submittals" paragraph below or not.

2.02 SUBMITTALS

- A. Material submittals shall be complete and submitted all at the same time. The individual groups of submittal types (e.g.: lighting fixtures, wiring devices, distribution equipment, etc.) MUST be prefaced with a list of contents identifying each item by its project name or symbol, manufacturer, and complete catalog number. Each copy of each submittal group shall have the list of contents attached. These lists will be used to report submittal comments. The Contractor is responsible for submitting this information in a timely manner so that material may be ordered early enough to meet the construction schedule. If material is not ordered in time for whatever reason, pay such premium prices and special handling charges as are required to meet the construction schedule. No substitution of an "accepted" item will be allowed due to failure to plan for adequate material procurement lead time.
- B. Shop drawings shall be drawn to scale or completely dimensioned and shall give all information required to completely describe the item. The Contractor shall carefully check all the shop drawings for compliance with these specifications and the Plans.
- C. If the shop drawings show variations from the Contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in order that if (acceptable) suitable action may be taken for proper adjustment of the Contract. The Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract, even though the shop drawings have been reviewed.
- D. Work requiring shop drawings shall not be started before receipt of the Architect's review and acceptance.
- E. The Architect's/Engineer's review of the submitted materials, items and shop drawings are for general compliance with the plans and specifications and general design and arrangement only. Therefore, it shall not relieve the Contractor from responsibility for errors of any sort in the materials, items, shop drawings or schedules. The Contractor shall verify all dimensions and job site conditions affecting the work, and shall be responsible for furnishing and installing the proper materials required by the Contract, whether or not indicated on the drawings and specifications.
- F. As a minimum, submittals are required for the following items:
1. RACEWAY COMPONENTS
 2. WIRE AND CABLE
 3. WIRING DEVICES
 4. PULL BOXES
 5. SAFETY SWITCHES, DISCONNECTS AND CIRCUIT BREAKERS
 6. FIBER OPTICS CABLING
 7. ASSISTIVE LISTENING
 8. STRUCTURED CABLING
 9. COMMUNICATIONS SYSTEM
 10. INTRUSION AND VIDEO SECURITY SYSTEM
 11. DATA DISTRIBUTION SYSTEM
 12. TERMINAL CABINETS
 13. FIRE ALARM SYSTEM

2.03 SUBSTITUTIONS

- A. Specific brand names and catalog numbers are used to describe materials in order to establish of performance and quality.
- B. Only one substitution will be considered for any item. Substitute materials must be equal in quality and function to that specified. Allowance of a substitution does not permit any reduction of system performance or utility, and the Contractor is responsible for additional costs incurred due to use of a substituted item. If the proposed substitute item is "rejected", the specified item shall be provided (re-submittal required) without further discussions or delay.
- C. Any Contractor's proposed substitution of material, article, or method in the opinion of the Architect/Engineer are equal to that specified will be accepted, provided the Contractor submits a single written request, in triplicate, to the Architect, with the following information for each item:
 - D. Name of Manufacturer or supplier.
 - E. Trade or brand names.
 - F. Type, model, style, and/or catalog number.
 - 1. Size or capacity rating.
- G. After receipt of a written request from the contractor, the engineer of record will review product substitutions fourteen (14) days prior to the bid date. If system substitutions are submitted after the award of the project contract, the analysis for the whole system substitution will be charged to the contractor at senior engineer hourly rates.
- H. The decision of the Architect/Engineer shall govern as to what is equal to the item specified in the plans and specifications. Equality will be judge on the basis of the following:
 - 1. Conformance with description or performance required.
 - 2. Equal in quality.
 - 3. Comparable in appearance and artistic effect where these are in considerations.
 - 4. Comparable operation, maintenance and performance.
 - 5. Equal in longevity and service under conditions of climate and usage.
 - 6. Conformance with space allocations and requirements for operations from in details and construction of related work.
 - 7. Conformance with all applicable codes and regulations.
- I. If the Architect/Engineer considers it necessary, tests to determine the quality of the proposed materials shall be made, at the expense of the Contractor, by an unbiased laboratory, satisfactory to the Architect.

2.04 ENCLOSURES

- A. Provide enclosures suitable for the specific type of location in which they are installed.
 - 1. Provide NEMA 1 or NEMA 12 boxes and enclosures for dry locations. Dry locations are all indoor areas that do not fall within the definitions below for wet or damp locations.
 - 2. Provide NEMA 3R boxes and enclosures for wet locations. Wet locations are all locations exposed to weather, whether under a roof or not.
 - 3. Provide NEMA 4 boxes and enclosures for damp locations. Damp locations are all indoor spaces wholly or partially underground or any area subject to water

spray.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All equipment shall be set square and plumb, securely mounted, adequately supported, and permanent. Provide workspace around items of electrical equipment as required by California Electrical Code (CEC). In general, equipment is to be installed in accordance with manufacturer's instructions; but the requirements of these specifications shall take precedence where conflicts exist.
- B. **WIRING METHODS:** The cables and conductors of all systems specified in the Specification are required to be installed in raceway.

3.02 ELECTRICAL WORK FOR EQUIPMENT PROVIDED UNDER OTHER SECTIONS

- A. Install power conductors and terminate on equipment provided under other specification sections. Verify specific requirements.
- B. Install and terminate electrical controls as described on the Electrical Drawings (For mechanical equipment specified in Division 23).
- C. Line voltage control wiring of exhaust fans is to be accomplished under this Division. The controlling device may be specified elsewhere.
- D. Provide and install all disconnect/safety switches and motor starters except those devices specified to be furnished with equipment specified elsewhere.
- E. Unless provided for in another Division, install all items of electrical equipment provided by others.
- F. Assist others in equipment testing to verify that wiring and connections made under this Division are correct.

3.03 EQUIPMENT IDENTIFICATION

- A. Nameplates shall be installed on all items of electrical equipment as follows: switchboard(s) and switchboard circuit breakers, panelboards, terminal cabinets, time switches, contactors, motor control switches, wall switches (where noted on the Drawings), motor starters provided under this Division where the function is not immediately obvious, and safety switches.
- B. The nameplate shall identify the item by Drawing name where applicable and describe its use or function in this installation.
- C. Permanently mark all utility outlets to show source of power panel and circuit breaker number.

3.04 SEALING PENETRATIONS

- A. Flash and counter flash roof and wall penetrations with equipment manufactured for the purpose and as described in other Divisions of these Specifications or as Directed by the Architect. Apply mastic as required to seal absolutely watertight.
- B. Conduits penetrating floor slabs or block or concrete walls shall be grouted and sealed watertight.

3.05 CUTTING AND PATCHING

- A. Obtain the Architect's acceptance prior to cutting existing surfaces or surfaces under construction. All such surfaces must be repaired or patched to the satisfaction of the

Architect.

3.06 EQUIPMENT ANCHORING

- A. Seismic Withstand Requirements: Freestanding or wall-hung equipment shall be anchored in place by methods, which will meet the requirements of the Uniform Building code for seismic loads. The CONTRACTOR shall submit calculations in accordance with "Contractor Submittals", for the design of the anchoring systems for all equipment, including panels, transformers, etc. in excess of 250 pounds. Calculations shall be performed, signed and stamped by a Structural Engineer or a Civil Engineer experienced in structural design and licensed in the State of California. The calculation shall provide an analysis of lateral and overturning forces and shall include a factor of safety against overturning equal to 1.5. The calculation shall also provide an analysis of both the anchoring system and the foundation or wall system to receive the anchor loads and shall show that the foundation is capable of resisting all anchor loads. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria.
- B. Seismic bracing for light fixtures cable or pendant suspended from ceiling or roof structure shall be seismically braced to prevent fixture from swaying 45 degree in either direction of suspension point. Contractor shall use same cable used to suspend light fixture. Where pendants are use the contractor shall use air craft light fixture suspension cable. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria referred to in above paragraph.

3.07 PROTECTION CLEANING AND REPAIRS

- A. All electrical equipment shall be protected from damage or degradation during construction. Electrical equipment stored or installed shall be protected from dust, water, or damage from other sources.
- B. After all other work has been accomplished, such as plastering, painting, etc., and prior to final review by the Architect; all electrical equipment, especially equipment enclosures, panelboards, switchboards, and lighting fixtures shall be thoroughly cleaned (inside and out) of all dirt, water, grease, plaster, paint, or other construction debris. All surfaces shall be clean and in "new" condition. All scratches, dents, marks, cracks, etc., shall be repaired to the satisfaction of the Architect or the equipment shall be replaced at no additional cost.

3.08 ELECTRICAL EQUIPMENT DELIVERABLES

- A. Retain and safeguard all detachable and spare devices, equipment, and literature (O&M manuals, instruction books, wiring diagrams, test reports, keys, fixtures, etc.) until completion of work. At this time, all items will be delivered to the District as directed by the Architect.

3.09 TESTS

- A. Prior to energization of equipment, check the insulation resistance of listed circuits, with a 500 volt "Megger".
- B. Take precaution during the testing period to insure the safety of personnel and equipment.
- C. Test all wiring for continuity and grounds before any fixtures or equipment are connected. Where such tests indicate faulty installation or other defects, the fault(s) shall be located and repaired at the Contractor's expense. The repaired installation shall then be

retested.

- D. Verify rotation of all three phase motors and reconnect if necessary.
- E. Verify the resistance of the grounding electrode system(s).
- F. Balance all loads on each panelboard and all other types of distribution equipment as applicable.

END OF SECTION

SECTION 26 05 26**GROUNDING AND BONDING****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. This section describes general requirements, products and methods of execution relating to the furnishing and installation of a grounding system complete as required for this project.

1.02 MINIMUM REQUIREMENTS

- A. The minimum requirement for the system shall conform to Article 250 of the CEC.

1.03 SPECIAL REQUIREMENTS

- A. Unless specified elsewhere, the ohmic values for grounds and grounding systems shall be as follows:
1. For grounding metal enclosures and frames for electrical and electronically operated equipment--5 ohms maximum.
 2. For grounding systems which electrical utilization equipment and appliances are connected--5 ohms maximum.
 3. For grounding secondary distribution systems, neutrals, non-current carrying metal parts associated with distribution systems, and enclosures of electrical equipment not normally within reach of other than authorized and qualified electrical operating and maintenance personnel--10 ohms maximum.

PART 2 – PRODUCTS

- 2.01 All grounding conductors, ground rods, and equipment required for ground systems shall be in accordance with UL 467 and as follows:

- A. Grounding conductor for building service ground to be bare copper sized in accordance with CEC Article 250.

2.02 CONNECTIONS

- A. Joints in grounding conductors and mats below grades shall be made with solderless compression connections or with AMPACT TAP equipment. Terminations above grade shall be made with solderless lugs, securely bolted in place.

PART 3 – EXECUTION**3.01 SERVICE GROUND**

- A. Create an equipotential plane for the grounding system for this project at the distribution panel by connecting the following to the distribution panel ground bus:
1. The commercial system's grounded neutral conductor for transformer neutrals.
 2. All metallic water services to the buildings.
 3. All "man-made" grounds specified to be installed.
 4. The service equipment and all conduits entering and leaving the equipment.
 5. The metallic gas mains entering the buildings, if gas service is installed.
 6. Reinforcing steel in slab and/or footings.
 7. Structural steel columns (one, minimum).

8. Other items or equipment called for on the drawings.

B. Current carrying capacity of the grounding and bonding conductors shall be in conformity with table 250-94 of the CEC.

3.02 "MAN-MADE" GROUND

A. "Man-made" ground shall consist of a "Ufer Ground" as shown on the plans. The "man-made" ground shall be tested with an approved measuring device, such as "Vibroground", in order to verify that resistance does not exceed the specified level.

B. Furnish certified test results.

3.03 EQUIPMENT GROUND

A. The raceway system shall be bonded in conformity with CEC requirements to provide a continuous ground path. Where required by code or where called for on the plans, an additional grounding conductor shall be sized in conformity with table 250-95 of the CEC.

B. Provide separate grounding conductor securely bonded and effectively grounded to both ends of all conduits.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.02 REFERENCE STANDARDS

- A. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.
- B. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006
- C. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010
- D. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.
- E. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- F. 2022 California Electrical Code

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of California Electrical Code.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 – PRODUCTS

2.01 MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

- A. Thomas & Betts Corporation: www.tnb.com.

- B. Threaded Rod Company: www.threadedrod.com.
- C. Or Equal.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SUPPORTS

- A. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. The pipe ring shall be malleable iron, split and hinged, or shall be springable wrought steel. Rings shall be bolted to or interlocked with the suspension rod socket.
- B. Pipe racks for groups of parallel conduits shall be constructed of galvanized structural steel preformed channels of length as required, suspended on threaded rods and secured thereto with nuts above and below the cross bar.
- C. Factory made pipe straps shall be one hole malleable iron or two hole galvanized clamps.
- D. Supporting rods shall be at least 3/8" diameter and channel shall be at least 3/4" deep. Supporting hardware shall be galvanized steel.

2.03 MATERIALS

- A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of structural steel or formed steel members; galvanized.
- C. Anchors and Fasteners:
- D. Concrete Structural Elements: Use precast inserts, expansion anchors, powder-actuated anchors, or preset inserts.
- E. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
- F. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
- G. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
- H. Solid Masonry Walls: Use expansion anchors or preset inserts.
- I. Sheet Metal: Use sheet metal screws.
- J. Wood Elements: Use wood screws.
- K. Fastener Types:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 - 5. Other Types: As required.
 - 6. Manufacturers:

- a. Powers Fasteners, Inc: www.powers.com.
 - b. Or Equal.
- L. Formed Steel Channel:
- M. Substitutions: See Section 01 60 00 - Product Requirements.
- N. Powder-Actuated Anchors:
- O. Substitutions: See Section 01 60 00 - Product Requirements.
- P. Steel Spring Clips:
- Q. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
 - 1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
 - 2. Obtain permission from the Architect and the Structural Engineer before drilling or cutting structural members.
- B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- C. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
- E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 26 05 34

RACEWAYS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Conduit, fittings and conduit bodies.

1.02 RELATED REQUIREMENTS

- A. Section 33 71 19 - Electrical Underground Ducts and Manholes.
- B. Section 07 84 00 - Firestopping.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems.
- F. Section 26 05 37 - Boxes.
- G. The requirements of the kitchen equipment consultant plans and specifications.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.
- D. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- E. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.
- G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association; 2005.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association; 2003.
- I. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.
- J. 2022 California Electrical Code.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings, and conduit bodies.
- C. Project Record Documents: Accurately record actual routing of conduits larger than 1 1/4 inches.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of California Electrical Code.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept conduit on site. Inspect for damage.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

PART 2 – PRODUCTS**2.01 CONDUIT REQUIREMENTS**

- A. Conduit Size: Comply with NFPA 70.
 - 1. Minimum Size: 3/4 inch unless otherwise specified.
- B. Underground Installations:
 - 1. More than 5 Feet from Foundation Wall: Use plastic coated conduit or thickwall non-metallic conduit.
 - 2. Within 5 Feet from Foundation Wall: Use rigid steel conduit.
 - 3. In or Under Slab on Grade: Use plastic coated conduit or thickwall non-metallic conduit.
 - 4. Minimum Size: 1 inch.
- C. Outdoor Locations Above Grade: Use rigid steel conduit or intermediate metal conduit.
- D. In Slab Above Grade:
 - 1. Use intermediate metal conduit or thickwall nonmetallic conduit.
 - 2. Maximum Size Conduit in Slab: 3/4 inch; 1/2 inch for conduits crossing each other.
- E. Wet and Damp Locations: Use rigid steel conduit or intermediate metal conduit.
- F. Dry Locations:
 - 1. Concealed: Use electrical metallic tubing.
 - 2. Exposed: Use rigid steel conduit or intermediate metal conduit for installation up to 8 feet.

2.02 METAL CONDUIT

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedtube.com.
 - 2. Beck Manufacturing, Inc: www.beckmfg.com.
 - 3. Wheatland Tube Company: www.wheatland.com.
 - 4. Or Equal.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.03 PVC COATED METAL CONDUIT

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedtube.com.
 - 2. Thomas & Betts Corporation: www.tnb.com.
 - 3. Robroy Industries: www.robroy.com.
 - 4. Or Equal.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NEMA RN 1; rigid steel conduit with external PVC coating.
- C. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.04 FLEXIBLE METAL CONDUIT

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc: www.afcweb.com.
 - 2. Electri-Flex Company: www.electriflex.com.
 - 3. International Metal Hose: www.metalhose.com.
 - 4. Or Equal.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Interlocked steel construction.
- C. Fittings: NEMA FB 1.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc: www.afcweb.com.
 - 2. Electri-Flex Company: www.electriflex.com.
 - 3. International Metal Hose: www.metalhose.com.
 - 4. Or Equal.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Interlocked steel construction with PVC jacket.
- C. Fittings: NEMA FB 1.

2.06 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedtube.com.

2. Beck Manufacturing, Inc: www.beckmfg.com.
3. Wheatland Tube Company: www.wheatland.com.
4. Or Equal.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.07 NONMETALLIC TUBING SHALL NOT BE USED FOR THIS PROJECT, NO EXCEPTIONS.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

- A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install steel conduit as specified in NECA 101.
- C. All conduits shall be run concealed in walls and/or ceiling. Where conduits cannot be run concealed in wall and/or ceiling space, the Contractor shall coordinate with the architectural and structural plans and the Architect for installing and routing of exposed conduits.
- D. Arrange supports to prevent misalignment during wiring installation.
- E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- G. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.
- H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- I. Do not attach conduit to ceiling support wires.
- J. Arrange conduit to maintain headroom and present neat appearance.
- K. Route exposed conduit parallel and perpendicular to walls.
- L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- M. Route conduit in and under slab from point-to-point.
- N. Do not cross conduits in slab.

- O. Maintain adequate clearance between conduit and piping.
- P. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- S. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations.
- T. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.
- U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic.
- W. Provide suitable pull string in each empty conduit except sleeves and nipples.
- X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- Y. Ground and bond conduit under provisions of Section 26 05 26.
- Z. Identify conduit under provisions of Section 26 05 53.

3.03 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 26 05 37

BOXES

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Floor boxes.
- C. Pull and junction boxes.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 26 27 16 - Electrical Cabinets and Enclosures.
- C. Section 26 27 26 - Wiring Devices: Wall plates in finished areas.
- D. The requirements of the kitchen equipment consultant plans and specifications.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.
- C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
- E. 2022 California Electrical Code.

1.04 SUBMITTALS

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

1.05 QUALITY ASSURANCE

- A. Conform to requirements of California Electrical Code.
- B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Appleton Electric: www.appletonelec.com.
- B. Arc-Co./Division of Arcade Technology; www.arc-co.com.

- C. Unity Manufacturing: www.unitymfg.com.
- D. Or Equal.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- C. Wall Plates for Finished Areas: As specified in Section 26 27 26.

2.03 FLOOR BOXES

- A. Floor Boxes: NEMA OS 1, fully adjustable, 1-1/2 inches deep.
- B. Material: Cast metal.
- C. Shape: Round.
- D. Service Fittings: As specified in Section 26 27 26.

2.04 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 26 27 16.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- D. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
 - 3. Cover Legend: "ELECTRIC".

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify locations of floor boxes and outlets prior to rough-in.
- B. Verify locations of all boxes required for kitchen equipment with kitchen consultant plans and specifications.

3.02 INSTALLATION

- A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by California Electrical Code.
- C. Coordinate installation of outlet boxes for equipment connected under Section 26 27 17.
- D. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
 - 1. Adjust box locations up to 10 feet if required to accommodate intended purpose.
- F. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.
- G. Maintain headroom and present neat mechanical appearance.
- H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- J. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- K. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- L. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- M. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- N. Use flush mounting outlet box in finished areas.
- O. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- P. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in fire-rated and acoustic rated walls.
- Q. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- R. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- S. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- T. Use adjustable steel channel fasteners for hung ceiling outlet box.
- U. Do not fasten boxes to ceiling support wires.
- V. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- W. Use gang box where more than one device is mounted together. Do not use sectional box.

- X. Use gang box with plaster ring for single device outlets.
- Y. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- Z. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- AA. Set floor boxes level.
- AB. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.03 ADJUSTING

- A. Adjust floor boxes flush with finish flooring material.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

3.04 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.
- D. Field-painted identification of conduit.

1.02 RELATED REQUIREMENTS

- A. Section 09 90 00 - Painting and Coating.

1.03 REFERENCE STANDARDS

- A. 2022 California Electrical Code amendments.

1.04 SUBMITTALS

- A. See Section 01 30 00 – 2022 Administrative Requirements for submittals procedures.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of California Electrical Code amendments.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

PART 2 – PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Buried Electrical Lines: Underground warning tapes.
- B. Communication Cabinets: Nameplates.
- C. Conduit: Conduit markers.
- D. Control Device Station: Labels.
- E. Electrical Distribution and Control Equipment Enclosures: Nameplates.

2.02 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Seton Identification Products: www.seton.com/aec.
- C. HellermannTyton: www.hellermanntyton.com.

- D. Or equal.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 NAMEPLATES AND LABELS

- A. Manufacturers:
 - 1. Kolbi Pipe Marker Co.; www.kolbipipemarkers.com.
 - 2. Seton Identification Products; www.seton.com.
 - 3. Or Equal.
- B. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- C. Locations:
 - 1. Each electrical distribution and control equipment enclosure.
 - 2. Communication cabinets.
- D. Letter Size:
 - 1. Use 1/8 inch letters for identifying individual equipment and loads.
 - 2. Use 1/4 inch letters for identifying grouped equipment and loads.
- E. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations, and _____.

2.04 WIRE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation; www.bradycorp.com.
 - 2. Seton Identification Products; www.seton.com.
 - 3. HellermannTyton; www.hellermannntyton.com.
 - 4. Or Equal.
- B. Description: Vinyl cloth type self-adhesive wire markers.
- C. Description: Cloth type wire markers.
- D. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.
- E. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
 - 2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

2.05 CONDUIT MARKERS

- A. Manufacturers:
 - 1. Brady Corporation; www.bradycorp.com.
 - 2. Seton Identification Products; www.seton.com.
 - 3. HellermannTyton; www.hellermannntyton.com.
 - 4. Or Equal.
- B. Location: Furnish markers for each conduit longer than 6 feet.

- C. Spacing: 20 feet on center.
- D. Color:
 - 1. Fire Alarm System: Red.

2.06 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady Corporation; www.bradycorp.com.
 - 2. Seton Identification Products; www.seton.com.
 - 3. HellermannTyton; www.hellermanntyton.com.
 - 4. Or Equal.
- B. Description: 3 inch wide polyethylene tape, detectable type colored red with suitable warning legend describing buried electrical lines.
- C. Description: 4 inch wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

- A. Install nameplates and labels parallel to equipment lines.
- B. Secure nameplates to equipment front using screws.
- C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.
- D. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 26 27 16

ELECTRICAL CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hinged cover enclosures.
- B. Cabinets.
- C. Terminal blocks.
- D. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
- C. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks; National Electrical Manufacturers Association; 2005.
- D. 2022 California Electrical Code.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard data for enclosures and cabinets.
- C. Cabinet Keys: Deliver to District in accordance with Section 016000 for maintenance materials.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of California Electrical Code.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.01 ENCLOSURE MANUFACTURERS

- A. Cooper B-Line: www.bline.com.
- B. Qube Corporation: www.qubeinc.com.

- C. Robroy Industries: www.robroy.com.
- D. Or equal.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250, Type 1 steel enclosure.
- B. Covers: Continuous hinge, held closed by flush latch operable by screwdriver.
- C. Provide interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.
- D. Enclosure Finish: Manufacturer's standard enamel.

2.03 CABINETS

- A. Boxes: Galvanized steel.
- B. Backboard: Provide 3/4-inch-thick plywood backboard for mounting terminal blocks. Paint matte white.
- C. Fronts: Steel, flush type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.
- D. Provide metal barriers to form separate compartments wiring of different systems and voltages.
- E. Keys: Provide two of each different key.

2.04 TERMINAL BLOCKS

- A. Manufacturers:
 - 1. Allen-Bradley/Rockwell Automation: www.ab.com.
 - 2. Cooper Bussmann: www.bussmann.com.
 - 3. WECO Electrical Connectors Inc: www.weco.ca.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Terminal Blocks: NEMA ICS 4.
- C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
- D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
- E. Provide ground bus terminal block, with each connector bonded to enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at

each corner under the provisions of Section 26 05 29.

- C. Install cabinet fronts plumb.

3.02 CLEANING

- A. Clean electrical parts to remove conductive and harmful materials.
- B. Remove dirt and debris from enclosure.
- C. Clean finishes and touch up damage.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 26 27 26**WIRING DEVICES****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. This section describes general provisions, products and methods of execution relating to line voltage wiring devices approved for use on this project.

1.02 QUALITY ASSURANCE

- A. Manufacturers mentioned and catalog numbers specified are for establishment of type, configuration and quality. Other manufacturers and types may be submitted for approval.

PART 2 - PRODUCTS**2.01 DEVICES**

- A. Provide wiring devices indicated. Catalog numbers shown are Hubbell unless noted otherwise. Equal devices manufactured by Pass and Seymour, Leviton, Bryant, Slater and G.E. are acceptable. Provide all similar devices of same manufacturer. Provide devices and device plates of a color and finish specified as selected by Owner. Provide weatherproof where so noted on drawings.

2.02 SWITCHES

- A. Provide 20 Amp, 120-277V rated switches with UL listing for tungsten lamp loads or inductive loads without derating. Switches shall be as follows:

20A

Single Pole	CAT. NO. 1221-I
Three-Way	CAT. NO. 1223-I
Four-Way	CAT. NO. 1224-I
Key Operated	CAT. NO. 1221-L
Momentary Cont.	CAT. NO. 1557-I
Double Pole	CAT. NO. 1222-I
Pilot Switch	CAT.NO.1221-PL
3-Way Pilot Switch	CAT. NO. 1223-PL

- B. Other switch types shall be provided as called for on the drawings or as required by the application.

2.03 RECEPTACLES

- A. Provide grounding type receptacles as follows, or as required to match equipment furnished in this or other divisions.

Single phase, 3-wire devices

15A-125V	CAT. NO. 5262-I	NEMA #5-15R
15A-125V GFCI	CAT. NO. GF-5262-I	NEMA #5-15R

15A-125V Iso. Grnd.	CAT. NO. IG-5262	NEMA #5-15R
15A-250V	CAT. NO. 5662-I	NEMA #6-15R
Clock hanger 125V	CAT. NO. S-373-3SS	NEMA #5-15R
20A-125V	CAT. NO. 5362-I	NEMA #5-20
20A-125V GFCI	CAT. NO. GF-5362-I	NEMA #5-20R
20A-125V Iso. Grnd.	CAT. NO. IG-5362	NEMA #5-20R
20A-250V	CAT. NO. 5462-I	NEMA #6-20R

- B. Outlets requiring ratings color and configurations different from those listed above shall be provided as shown on the plans and/or required by the equipment served.

PART 3 - EXECUTION

3.01 COVER PLATES

- A. Install all wiring devices indicated complete with cover plates. Cover plates shall fit snugly against finished surfaces and line up true with adjacent building lines, and be symmetrical in location and appearance.

3.02 SWITCHES

- A. All switches shall be installed so their handles move in a vertical plane.
- B. Door swings shall be checked and, if necessary, switches shall be relocated to place them on the strike side of the door.

3.03 RECEPTACLES

- A. Receptacles shall not be placed back-to-back in adjacent rooms. They shall be offset at least 12".
- B. Unless otherwise noted on the drawings, receptacles shall be installed in the vertical position with the grounding pin down.

END OF SECTION

SECTION 27 05 00**COMMON WORK RESULTS FOR COMMUNICATIONS****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Communications equipment coordination and installation.
 - 2. Sleeves for pathways and cables.
 - 3. Sleeve seals.
 - 4. Grout.
 - 5. Common communications installation requirements.

1.03 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.04 SUBMITTALS

- A. Product Data: For sleeve seals.

1.05 COORDINATION

- A. Coordinate arrangement, mounting, and support of communications equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS**2.01 SLEEVES FOR PATHWAYS AND CABLES**

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.02 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - 3. Sealing Elements: [EPDM] [NBR] <Insert other> interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
 - 4. Pressure Plates: [Plastic] [Carbon steel] [Stainless steel]. Include two for each sealing element.
 - 5. Connecting Bolts and Nuts: [Carbon steel with corrosion-resistant coating] [Stainless steel] of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.03 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect

in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

- E. Right of Way: Give to piping systems installed at a required slope.

3.02 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors [2 inches] <Insert dimension> above finished floor level.
- G. Size pipe sleeves to provide [1/4-inch] <Insert dimension> annular clear space between sleeve and pathway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- L. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.03 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.04 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 27 05 26**COMMUNICATIONS GROUNDING AND BONDING****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. This section describes general requirements, products and methods of execution relating to the furnishing and installation of a grounding system complete as required for this project.

1.02 MINIMUM REQUIREMENTS

- A. The minimum requirement for the system shall conform to Article 250 of the CEC.

1.03 SPECIAL REQUIREMENTS

- A. Unless specified elsewhere, the ohmic values for grounds and grounding systems shall be as follows:
 - 1. For grounding metal enclosures and frames for electrical and electronically operated equipment--5 ohms maximum.
 - 2. For grounding systems which electrical utilization equipment and appliances are connected--5 ohms maximum.
 - 3. For grounding secondary distribution systems, neutrals, non-current carrying metal parts associated with distribution systems, and enclosures of electrical equipment not normally within reach of other than authorized and qualified electrical operating and maintenance personnel--10 ohms maximum.

PART 2 – PRODUCTS

- 2.01 All grounding conductors, ground rods, and equipment required for ground systems shall be in accordance with UL 467 and as follows:

- A. Grounding conductor for building service ground to be bare copper sized in accordance with CEC Article 250.

2.02 CONNECTIONS

- A. Joints in grounding conductors and mats below grades shall be made with solderless compression connections or with AMPACT TAP equipment. Terminations above grade shall be made with solderless lugs, securely bolted in place.

PART 3 – EXECUTION**3.01 SERVICE GROUND**

- A. Create an equipotential plane for the grounding system for this project at the distribution panel by connecting the following to the distribution panel ground bus:
 - 1. The commercial system's grounded neutral conductor for transformer neutrals.
 - 2. All metallic water services to the buildings.
 - 3. All "man-made" grounds specified to be installed.
 - 4. The service equipment and all conduits entering and leaving the equipment.
 - 5. The metallic gas mains entering the buildings, if gas service is installed.
 - 6. Reinforcing steel in slab and/or footings.
 - 7. Structural steel columns (one, minimum).
 - 8. Other items or equipment called for on the drawings.

- B. Current carrying capacity of the grounding and bonding conductors shall be in conformity with table 250-94 of the CEC.

3.02 "MAN-MADE" GROUND

- A. "Man-made" ground shall consist of a "Ufer Ground" as shown on the plans. The "man-made" ground shall be tested with an approved measuring device, such as "Vibroground", in order to verify that resistance does not exceed the specified level.
- B. Furnish certified test results.

3.03 EQUIPMENT GROUND

- A. The raceway system shall be bonded in conformity with CEC requirements to provide a continuous ground path. Where required by code or where called for on the plans, an additional grounding conductor shall be sized in conformity with table 250-95 of the CEC.
- B. Provide separate grounding conductor securely bonded and effectively grounded to both ends of all conduits.

END OF SECTION

SECTION 27 05 29

COMMUNICATIONS SUPPORTING DEVICES

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.02 REFERENCE STANDARDS

- A. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements
- B. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements
- C. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements
- D. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements
- E. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association
- F. 2022 California Electrical Code.

1.03 SUBMITTALS

- A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of California Electrical Code.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 – PRODUCTS

2.01 MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

- A. Thomas & Betts Corporation: www.tnb.com.
- B. Threaded Rod Company: www.threadedrod.com.

- C. Or Equal.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SUPPORTS

- A. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. The pipe ring shall be malleable iron, split and hinged, or shall be springable wrought steel. Rings shall be bolted to or interlocked with the suspension rod socket.
- B. Pipe racks for groups of parallel conduits shall be constructed of galvanized structural steel preformed channels of length as required, suspended on threaded rods and secured thereto with nuts above and below the cross bar.
- C. Factory made pipe straps shall be one hole malleable iron or two hole galvanized clamps.
- D. Supporting rods shall be at least 3/8" diameter and channel shall be at least 3/4" deep. Supporting hardware shall be galvanized steel.

2.03 MATERIALS

- A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of structural steel or formed steel members; galvanized.
- C. Anchors and Fasteners:
- D. Concrete Structural Elements: Use precast inserts, expansion anchors, powder-actuated anchors, or preset inserts.
- E. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
- F. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
- G. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
- H. Solid Masonry Walls: Use expansion anchors or preset inserts.
- I. Sheet Metal: Use sheet metal screws.
- J. Wood Elements: Use wood screws.
- K. Fastener Types:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 - 5. Other Types: As required.
 - 6. Manufacturers:

- a. Powers Fasteners, Inc:
www.powers.com.
- b. Or Equal. L. Formed

Steel Channel:

- M. Substitutions: See Section 01 60 00 - Product Requirements.
- N. Powder-Actuated Anchors:
- O. Substitutions: See Section 01 60 00 - Product Requirements.
- P. Steel Spring Clips:
- Q. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1. 1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
 - 2. Obtain permission from the Architect and the Structural Engineer before drilling or cutting structural members.
- B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- C. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
- E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 27 05 33**COMMUNICATIONS BACK BOXES****PART 1 – GENERAL****1.01 SECTION INCLUDES**

- A. Wall and ceiling outlet boxes.
- B. Floor boxes.
- C. Pull and junction boxes.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association
- B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association
- C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association
- E. 2022 California Electrical Code (CEC).

1.03 SUBMITTALS

- A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of California Electrical Code (CEC).
- B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 – PRODUCTS**2.01 MANUFACTURERS**

- A. Appleton Electric: www.appletonelec.com.
- B. Arc-Co./Division of Arcade Technology; www.arc-co.com.
- C. Unity Manufacturing: www.unitymfg.com.
- D. Or Equal.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment

- supported; include 1/2 inch male fixture studs where required.
- 2. Concrete Ceiling Boxes: Concrete type.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

C. Wall Plates for Finished Areas: As specified in Section 26 27 26.

2.03 FLOOR BOXES

A. Floor Boxes: NEMA OS 1, fully adjustable, 1-1/2 inches deep.

B. Material: Cast metal.

C. Shape: Round.

D. Service Fittings: As specified in Section 26 27 26.

2.04 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Hinged Enclosures: As specified in Section 26 27 16.

C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:

- 1. Material: Galvanized cast iron.
- 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

D. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:

- 1. Material: Galvanized cast iron.
- 2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
- 3. Cover Legend: "ELECTRIC".

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify locations of floor boxes and outlets prior to rough-in.

B. Verify locations of all boxes required for kitchen equipment with kitchen consultant plans and specifications.

3.02 INSTALLATION

A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by California Electrical Code (CEC).

D. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
1. Adjust box locations up to 10 feet if required to accommodate intended purpose.

G. Maintain headroom and present neat mechanical appearance.

- H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- J. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- K. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- L. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- M. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- N. Use flush mounting outlet box in finished areas.
- O. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- P. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in fire-rated and acoustic rated walls.
- Q. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- R. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- S. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- T. Use adjustable steel channel fasteners for hung ceiling outlet box.
- U. Do not fasten boxes to ceiling support wires.
- V. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- W. Use gang box where more than one device is mounted together. Do not use sectional box.
- X. Use gang box with plaster ring for single device outlets.
- Y. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- Z. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- AA. Set floor boxes level.
- AB. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.03 ADJUSTING

- A. Adjust floor boxes flush with finish flooring material.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

3.04 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 27 05 39**RACEWAYS FOR COMMUNICATIONS SYSTEMS****PART 1 – GENERAL****1.01 SECTION INCLUDES**

- A. Conduit, fittings and conduit bodies.

1.02 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC)
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT)
- C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC)
- D. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association
- E. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association
- G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association
- I. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association
- J. 2022 California Electrical Code (CEC).

1.03 SUBMITTALS

- A. See Section 01 33 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings, and conduit bodies.
- C. Project Record Documents: Accurately record actual routing of conduits larger than 1 1/4 inches.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of California Electrical Code (CEC).
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept conduit on site. Inspect for damage.

- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

PART 2 – PRODUCTS

2.01 CONDUIT REQUIREMENTS

- A. Conduit Size: Comply with California Electrical Code (CEC). 1. Minimum Size: 3/4 inch unless otherwise specified.
- B. Underground Installations:
 - 1. More than 5 Feet from Foundation Wall: Use plastic coated conduit or thickwall non-metallic conduit.
 - 2. Within 5 Feet from Foundation Wall: Use rigid steel conduit.
 - 3. In or Under Slab on Grade: Use plastic coated conduit or thickwall non-metallic conduit.
 - 4. Minimum Size: 1 inch.
- C. Outdoor Locations Above Grade: Use rigid steel conduit or intermediate metal conduit.
- D. In Slab Above Grade:
 - 1. Use intermediate metal conduit or thickwall nonmetallic conduit.
 - 2. Maximum Size Conduit in Slab: 3/4 inch; 1/2 inch for conduits crossing each other.
- E. Wet and Damp Locations: Use rigid steel conduit or intermediate metal conduit.
- F. Dry Locations:
 - 1. Concealed: Use electrical metallic tubing.
 - 2. Exposed: Use rigid steel conduit or intermediate metal conduit for installation up to 8 feet.

2.02 METAL CONDUIT

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedtube.com.
 - 2. Beck Manufacturing, Inc: www.beckmfg.com.
 - 3. Wheatland Tube Company: www.wheatland.com.
 - 4. Or Equal.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- Steel Conduit: ANSI C80.1.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.03 PVC COATED METAL CONDUIT

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedtube.com.
 - 2. Thomas & Betts Corporation: www.tnb.com.
 - 3. Robroy Industries: www.robroy.com.
 - 4. Or Equal.

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

B. Description: NEMA RN 1; rigid steel conduit with external PVC coating.

C. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.04 FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.
4. Or Equal.
5. Substitutions: See Section 01 60 00 - Product Requirements. B.

Description: Interlocked steel construction.

C. Fittings: NEMA FB 1.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.
4. Or Equal.
5. Substitutions: See Section 01 60 00 - Product Requirements. B.

Description: Interlocked steel construction with PVC jacket.

C. Fittings: NEMA FB 1.

2.06 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedtube.com.
2. Beck Manufacturing, Inc: www.beckmfg.com.
3. Wheatland Tube Company: www.wheatland.com.
4. Or Equal.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.07 NONMETALLIC TUBING SHALL NOT BE USED FOR THIS PROJECT, NO EXCEPTIONS.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

- C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

- A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install steel conduit as specified in NECA 101.
- C. All conduits shall be run concealed in walls and/or ceiling. Where conduits cannot be run concealed in wall and/or ceiling space, the Contractor shall coordinate with the architectural and structural plans and the Architect for installing and routing of exposed conduits. D. Arrange supports to prevent misalignment during wiring installation.
- E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- G. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.
- H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- I. Do not attach conduit to ceiling support wires.
- J. Arrange conduit to maintain headroom and present neat appearance.
- K. Route exposed conduit parallel and perpendicular to walls.
- L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- M. Route conduit in and under slab from point-to-point.
- N. Do not cross conduits in slab.
- O. Maintain adequate clearance between conduit and piping.
- P. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- S. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations.
- T. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.
- U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

- V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic.
- W. Provide suitable pull string in each empty conduit except sleeves and nipples.
- X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- Y. Ground and bond conduit under provisions of Section 27 05 26.

3.03 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 27 13 23**FIBER OPTICS CABLING****PART 1 - GENERAL****1.01 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. Backbone fiber optic cabling.
2. Fiber Optic Cable testing.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
1. Federal Communications Commission (FCC) Regulations:
 - FCC Part 15; Radio Frequency Devices & Radiation Limits.
 - FCC Part 68; Connection of Terminal Equipment to the Telephone Network.
 2. Electronics Industries Alliance (EIA):
 - EIA; Testing Standards.
 3. American National Standards Institute, Inc. (ANSI) / Telecommunications Industry Association (TIA) / Electronics Industries Alliance (EIA):
 - ANSI/TIA/EIA-568-C; Commercial Building Telecommunications Cabling Standards, including the following:
 - Part 3: Optical Fiber Cabling Components Standard.
 - ANSI/TIA/EIA-598-C; Optical Fiber Cable Color Coding.
 - ANSI/TIA/EIA-606-A; Administration Standard for Commercial Telecommunications Infrastructure.
 - ANSI/TIA/EIA-758; Customer-Owner Outside Plant Telecommunications Cabling Standard (TIA/EIA-758-1: Addendum No. 1).
 4. Building Industry Consulting Service International, Inc. (BICSI):
 - BICSI (TDMM); Telecommunication Distribution Methods Manual.
 - BICSI; Customer-Owner Outside Plant Design Manual.
 - ICEA S-83-596-1994; Fiber Optic Premises Distribution Cable.
 - ICEA S-87-640-1999; Fiber Optic Outside Plant Communications Cable.
 - ICEA S-104-696-2001; Standard for Indoor-Outdoor Optical Cable.

5. Underwriters Laboratories, Inc. (UL):

- UL 1651; Optical Fiber Cable.
- UL 2024A; Optical Fiber Cable Routing Assemblies.

1.04 DEFINITIONS

- A. Above finish floor (AFF) - Standard mounting height (e.g., 18 inch AFF) for a device using the center line of the device as the measurement point.
- B. Administration - The methodology defining the documentation requirements of a cabling system and its containment, the labeling of functional elements and the process by which moves, additions, and changes are recorded.
- C. ANSI/TIA/EIA - Associations involved in developing telecommunications industry standards.
- D. Attenuation - The decrease in magnitude of transmission signal strength between points, expressed in dB as the ratio of output to input signal level.
- E. Attenuation-to-crosstalk ratio (ACR) - The ratio obtained by subtracting insertion loss (attenuation [dB]) from near-end crosstalk (dB). ACR is normally stated at a give frequency.
- F. Auditory assistance device - An intentional radiator used to provide auditory assistance to a handicapped person or persons. Such a device may be used for auricular training in an educational institution, for auditory assistance at places of public gatherings, such as a church, theater, or auditorium, and for auditory assistance to handicapped individuals, only, in other locations.
- G. Backboard - Backboard generally refers to the 3/4" A-C grade plywood sheeting, lining the walls of the telecommunications room. Plywood shall be void-free, with two coats of fire retardant paint matching the painted interior walls covering both sides.
- H. Backbone - A facility (e.g., pathway, cable, or conductors) between any of the following spaces: telecommunications rooms, common telecommunications rooms, floor-serving terminals, entrance facilities, equipment rooms, and common equipment rooms.
- I. Basic link test configuration - Horizontal cable of up to 90m (295 ft) plus up to 2m (6.5 ft) of test equipment cord from the main unit of the tester to the local connection, and up to 2m (6.5 ft) of test equipment cord from the remote connection to the remote unit of the tester. Maximum length is 94 m (308 ft).
- J. Bonding Conductor (BC) - A conductor used specifically for the purpose of bonding.
- K. Cable Labeling System –
 - 1. The scheme employed when identifying cable or its associated hardware.
 - 2. Scheme adapted for labeling cables to identify them based on ANSI/TIA/ EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure. See administration.
- L. Cable Runway - Hardware designed and manufactured for horizontal pathway distribution of cable and inside wiring inside the BDF and IDF rooms.
- M. CAT - Category used when identifying the performance characteristics of twisted pair cabling.
- N. Ceiling Distribution System - A distribution system that utilizes the space between a suspended or false ceiling and the structural surface above.

- O. Closed-Circuit Television (CCTV) - A private television system, typically used for security purposes, in which the signal is transmitted to a limited number of receivers.
- P. Communications plenum cable (CMP) - Type CMP communications plenum cable shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics. (NEC) Cables must pass required test for fire and smoke characteristics of wires and cables, NFPA 262 or UL 910.
- Q. Communications Riser Cable (CMR) - Type CMR communications riser cable shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor. (NEC) Cables must pass requirements for flame propagation.
- R. Electromagnetic Interference (EMI) - Radiated or conducted electromagnetic energy that has an undesirable effect on electronic equipment or signal transmissions.
- S. Entrance Conduit - Conduit that connects the campus underground infrastructure with the building's Telecommunications Room.
- T. Fire Retardant - Any substance added to delay the start or ignition of fire or slow the spread of the flame of any material.
- U. Firestopping - The process of installing [specialty] listed fire-rated materials into penetrations of fire-rated barriers to reestablish the fire-resistance rating of the barrier.
- V. Firestopping Location. A penetration through a fire-rated wall with a sleeve.
- W. Firestop System - A specific installation consisting of the material(s) (firestop penetration seals) that fill the opening in the wall or floor assembly, and around and between any items that penetrate the wall or floor (e.g., cables, cable trays, conduit, ducts, pipes), and any termination devices (e.g., electrical outlet boxes) along with their means of support.
- X. Grounding Conductor - A conductor used to connect the grounding electrode to the building's main grounding busbar.
- Y. Grounding System - A system of hardware and wiring that provides an electrical path from a specified location to an earth ground point.
- Z. Horizontal Cabling - The part of the cabling system that extends from the work area telecommunications outlet to the horizontal cross-connect in the telecommunications room.
- AA. Hybrid Cable - An assembly of two or more cables, of the same or different types or categories, covered by one overall sheath.
- BB. Infrastructure (Telecommunications) - A collection of those telecommunications components, excluding equipment, that together provide the basic support for the distribution of all information within a building or campus.
- CC. Intermediate Cross-connect (IC) - the connection point between a backbone cable that extends from the main cross-connect and the backbone cable from the horizontal cross-connect.
- DD. Loose Tube - A type of optical fiber cable construction where one or more fibers are laid loosely in a tube. Also called loose tube fiber.
- EE. Main Cross-connect (MC) - The cross-connect normally located in the Telecommunications Equipment Room for cross-connection and interconnection of entrance cables, first-level backbone cables, and equipment cables.
- FF. Metropolitan Area Network (MAN) - A data communications network that covers an

area larger than a campus area and smaller than a wide area network. Typically interconnects two or more LANs and usually covers an entire metropolitan area.

- GG. MPOE - Minimum Point of Entry, Utility Partnerships/Alternate Carrier, usually located within the Telecommunications Room.
- HH. Multimode Fiber (MMF) - An optical fiber that carries many paths of light or an optical waveguide that allows many bound modes to propagate.
- II. Single-mode Fiber (SMF) - An optical fiber, usually step-index grade, which supports only one mode of light propagation. This does not necessarily imply single wavelength operation. The light source is normally a laser.
- JJ. Strand (STR) - A single unit of optical fiber within a cable (e.g., a 12-strand fiber cable has 12 individual optical fibers within the cable sheath).
- KK. Telecommunications Entrance Facility - Utility Partnerships/Alternate Carrier Minimum Point of Entry that is usually located within the Main Cross-connect Room (MC).
- LL. Telecommunications Equipment Room (TER) - A centralized space that provides space and maintains a suitable operating environment for the termination of backbone and campus cabling and house centralized communications and/or computer equipment (such as Core Switches and Servers). Note: An equipment room is considered distinct from a telecommunications closet because of the nature or complexity of the equipment housed by the equipment room.
- MM. Telecommunications Main Grounding Busbar (TMGB) - A grounding busbar, located in the MC, connected to the main building ground electrode by a continuous 2/0 - #4 AWG wire (Wire size is dependant on the distance between the busbar and the building main).
- NN. Telecommunications Room (TR) - A room dedicated to housing a group of telecommunications connectors (e.g., patch panel or punch-down block) that allows equipment and backbone cabling to be cross connected with patch cords or jumpers.
- OO. Underwriters Laboratories (UL) - A United States-based independent testing laboratory that sets safety tests and standards.
- PP. Uninterruptible Power Supply (UPS) - A device that is inserted between a primary power source (e.g., a commercial utility) and the primary power input of equipment to be protected (e.g., a computer system) to eliminate the effects of transient variances or temporary outages. Retain acronyms, abbreviations, and terms that remain after this Section has been edited.

1.05 SYSTEM DESCRIPTION

- A. Provide a complete telecommunication fiber optic cabling system installation as specified herein and as shown on the Drawings. In general, system shall include, but not be limited to, the following:
1. OSP backbone fiber optic cabling:
 - a. Data System backbone fiber optic cable shall route underground between the site main cross connect room (MDF) and each campus buildings IDF. The installed cable shall consist of one 12-strand singlemode and 12 strand MM OM4, Indoor/Outdoor, fiber optic hybrid cable.
 - b. OSP backbone fiber optic cables shall terminate on full height racks in the MDF and IDF wall racks. The cable ends will be fusion spliced to MMF and SMF pigtails with manufacturer terminated LC connectors and placed in LC connector plates.

- c. OSP Fiber optic cable connector standard shall be Type LC. Connectors shall be simplex type.
- 2. ISP backbone fiber optic cabling:
 - a. Backbone fiber optic cable shall route between the Main IDF and other IDF locations throughout building, and shall consist of one 6-strand singlemode, ISP, fiber optic cable(s). The IDF shall connect directly from the ER in a star topology without requiring an intermediate patch at any other point.
 - b. ISP backbone fiber optic cables shall terminate on same rack as OSP backbone fiber at the ER room, utilizing rack mounted, LC patch panels as required with patch cord management integrated into each panel. Locate the ISP backbone patch field just below the OSP patch field at the ER. At the IDF, locate rack mounted, 24 port patch panels at top of full height dedicated rack with patch cord management integrated into the patch panels.
 - c. Fiber optic backbone cables shall terminate on backside of fiber patch panels.
 - d. ISP backbone fiber optic patch panel field shall interface with routing/switching equipment, furnished by owner at the MDF, ER and IDF via fiber patch cords from modular connectors on patch panel front side.
 - e. ISP Fiber optic cable connector standard shall be Type LC. Connectors shall be simplex type.
- 3. Patch cords:
 - a. LC-LC duplex fiber patch cords shall be provided to patch between the OSP and ISP fiber cables.
 - b. Provide duplex patch cords as required to patch between Backbone (LC) and equipment(SC/LC/FC etc...) as required. Coordinate with owners IT Representative.
- B. Refer to Drawings for complete documentation of above requirements and all additional requirements.

1.06 SUBMITTALS

- A. Submit 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. Describe system operation, equipment, dimensions and indicate features of each component.
 - 3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 - 4. Furnish structural calculations for equipment anchorage.
 - 5. Complete bill of materials listing all components.
 - 6. Warranty.
- B. Record Drawings:
 - 1. Furnish Record Drawings utilizing Shop-Drawing submissions with updated field conditions. These Drawings shall include but not be limited to the following:
 - a. Plot plans and building floor plans, showing point-to-point wiring location of all devices.

- b. Block Diagram/Riser Diagram showing the system components and all conduit and wire type/sizes between each.
2. Drawings shall be incorporated into the Record Drawing submission.
3. Final acceptance will not be made until the owners representative has approved the Record Drawings.

1.07 OPERATION AND MAINTENANCE MANUAL

- A. Supply operation and maintenance manuals to include the following:
 1. A detailed explanation of the operation of the system.
 2. Pictorial parts list and part numbers.
 3. Schematic wiring diagrams.
 4. Telephone numbers for the authorized parts and service distributor.
 5. Final testing reports.

1.08 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. Manufacturer qualifications: Manufacturer must have a minimum 5 continuous years of experience in design and manufacturing of the materials and equipment specified herein.
- D. Installer's qualifications:
 1. Installer must have a minimum 5 continuous years of experience in satisfactory completion for Projects similar in scope and cost. Provide backup information on 5 such Projects.
 2. Installing contractor shall possess a current, active and valid C7 California State Contractors License.
 3. The installer shall be the Manufacturer's certified reseller/installer of the telecommunication equipment provided. Provide evidence of this certification.
 4. Conduit Contractor shall possess a current, active and valid C10 California State Contractors License.

1.09 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Telecommunication system 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 shipping shall be replaced and returned to Manufacturer at no cost to Owner.
- B. Storage: Store in 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.
- C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal components damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.10 WARRANTY

- A. OSP and ISP Fiber and components offered under this Section shall be covered by a minimum 10 year product and application warranty for malfunctions resulting from defects in materials, workmanship and performance as specified by the manufacturer. Warranty shall begin upon acceptance by the owner.

1.11 MAINTENANCE

A. Maintenance services:

1. Distributor of the major system components shall maintain a replacement parts department and provide testing equipment when needed. A complete parts department shall be located close enough to supply replacement parts within a 4 hour period.
2. Service must be rendered within 4 hours of system failure notification.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. The following Manufacturer shall be acceptable and in compliance with the project scope as specified herein and indicated on the Drawings.

1. Backbone fiber optic cable:
 - a. Corning Cable Systems.
 - b. BerkTek
 - c. Belden
 - d. Commscope
2. Fiber optic terminations:
 - a. Corning Cable Systems.
 - b. Leviton
 - c. Belden
 - d. Commscope
3. Indoor Fiber Splice Closure
 - a. Corning Cable Systems.
 - b. Leviton
 - c. Belden
4. Fiber Splice Trays
 - a. Corning Cable Systems.
 - b. Leviton
 - c. Belden
 - d. Commscope
5. Media Converter
 - a. Omnitron Systems
 - b. Fiber Tronics

- c. Or approved equal
- 6. Test equipment:
 - a. Corning Cable Systems
 - b. Fluke Networks.
 - c. Laser Precision.
 - d. Tektronix.

B. Substitutions: Substitutions will not be accepted.

2.02 BACKBONE FIBER OPTIC CABLING

A. The backbone cabling system is the portion of the telecommunications cabling system that extends from the Intermediate Distribution Frame (IDF) to the Main Distribution Frame (MDF).

B. Fiber Optic Backbone Cabling

1. Data System Backbone Cabling

- a. Cable shall be UL/cUL OFNR/OFN FTA rated and be Flame Resistant in accordance with the UL 1666.
- b. Cable shall be an OSP.
- c. Cable shall be constructed utilizing a loose tube design.
- d. Cable will be fully water blocked combining overall water blocking tape and a moisture blocking gel for each individual tube.
- e. Cable will maintain the following:
 - 1) Crush Resistance (EIA-455-41) = 2000 N/cm
 - 2) Impact Resistance (EIA-455-25) = 2000 Impacts w/1.6 N-m
 - 3) Min Bend Radius:
 - 4) Long Term - No Load = 15x Cable diameter Short Term - Load = 20x Cable diameter
 - 5) Operating Temp. = -40°C to +70°C
 - 6) Storage Temp. = -40°C to +80°C
 - 7) Cable shall be constructed of 50/125µ OM4 rated glass capable of:
 - a) 1 Gigabit Ethernet Link at 1000m/600m (@850nm/1300nm) 10 Gigabit Ethernet Link at 500m/300m (@850nm/1300nm)
- f. All fiber shall be fusion spliced
- g. The Fiber Optic Cable shall be as follows:
 - 1) Color: Fiber Optic cable jacket will be Black
 - 2) Quantity: See Drawing for quantity and installation details.
 - 3) Part#: note: hybrid cables are preferred over separate runs of each type of cable. Provide justification if you are not able to use the hybrid cable.
 - 4) Field Breakout Kits: To be used for all cables more than 6 strands. Provide two kits per buffer tube to be terminated.
 - 5) Hybrid 12 Strand Multi Mode, 12 Strand Single Mode Fiber (needs 4 breakout kits)

- a) Single Unit configuration
 - b) 12 strand SMF
 - c) 12 Strand MMF, OM4: 10G/550
 - d) OFNR Indoor|Outdoor
 - e) Nominal Diameter: .5 or less
- C. OSP backbone fiber optic cable:
- 1. Application:
 - a. Suitable for outdoors, in underground PVC conduit installations where protection against water and moisture entry is required.
 - b. Optical transmission performance is not significantly affected by environmental fluctuations, installation or aging.
 - c. Materials do not evolve hydrogen in quantities that will increase light attenuation.
 - d. The cable construction shall be Indoor/Outdoor Hybrid cable.
 - 2. Multimode 50/125µm fiber strands shall meet or exceed the following physical criteria:
 - a. Core diameter: 50µm, ±2.5µm.
 - b. Cladding diameter: 125µm, ±1.0µm.
 - c. Core/cladding offset: ≤1.5µm.
 - d. Coating diameter: 254µm, ±7.0µm.
 - e. Coating/cladding concentricity: 6.0µm.
 - f. Minimum tensile strength: 100,000psi.
 - 3. Multimode 50/125µm fiber strands shall meet or exceed the following performance criteria:
 - a. Attenuation: 3.0dB/km at 850nm and 1.0dB/km at 1300nm wavelengths, maximum.
 - b. Overfilled bandwidth: 3,000MHz•km at 850nm and 500MHz•km at 1300nm wavelengths, minimum.
 - c. Laser bandwidth: 4,000MHz•km at 850nm and 500MHz•km at 1300nm wavelengths, minimum.
 - 4. Singlemode fiber strands shall meet or exceed the following physical criteria:
 - a. Core diameter: 8.3µm.
 - b. Cladding diameter: 125µm, ±0.7µm.
 - c. Core/cladding offset: ≤0.5µm.
 - d. Coating diameter: 254µm, ±7.0µm.
 - e. Coating/cladding concentricity: 12.0µm.
 - f. Minimum tensile strength: 100,000psi.
 - 5. Singlemode fiber strands shall meet or exceed the following performance criteria:
 - a. Attenuation: 0.45dB/km at 1310nm and 0.25dB/km at 1550nm wavelengths, maximum.
 - b. Mode field diameter: 8.4µm ±0.6µm at 1310nm and 8.9µm ±0.6µm at 1550nm.
 - c. Cutoff wavelength: ≤1260nm.

- d. Dispersion: 8.0ps/nm•km at 1310nm and 2.6-6.0ps/nm•km at 1530-1565nm.
- 6. Buffering:
 - a. Fibers shall be loosely buffered, either in a core tube or in multiple tubes around central member.
 - b. Buffering tube(s) shall be filled with compound to protect against moisture penetration. Filling compound shall be non-hygroscopic and non-nutritive to fungus ("FLEXGEL," or equivalent). The compound shall be easily removed with conventional nontoxic solvents.
 - c. Fibers and buffer tube(s) shall be individually color-coded to meet the requirements of ANSI/TIA/EIA-598-A-1995 (also reference ANSI/ICEA S-83-596-1994 and EIA- 230).
- 7. Cable and sheath:
 - a. Central member: Dielectric rod (glass-reinforced plastic, GRP).
 - b. Fillers (where required to maintain circularity): Plastic rods matched to buffer tube diameter.
 - c. Water blocking tape: Applied longitudinally over the central member/buffer tube(s)/filler core.
 - d. Strength element: The cable shall have an internal strength element such as aramid yarn.
 - e. Rip cord: Nylon or similar (to aid splitting the outer jacket).
 - f. Outer jacket: The cable shall have a seamless outer jacket, high or medium density polyethylene or equal, applied to and completely covering the internal components (central member, buffer tube(s), fillers, strength element, etc.). The outer jacket shall contain UV inhibitors for stable performance in direct sunlight. The outer jacket shall be non-hygroscopic and non-nutritive to fungus.
 - g. Printing: The jacket shall be printed/permanently marked with the manufacturer, sequential length (feet), fiber type, month and year or quarter and year of manufacture.
- 8. Tensile strength: The cable shall have a 600 lb minimum rated load.
- 9. Operating temperature range: -40° to 158°F.
- D. ISP backbone fiber optic cable:
 - 1. Application:
 - a. Suitable for indoor installations, between floors exposed in equipment rooms as vertical risers, or above suspended ceilings and below raised floors exposed in cable trays, hangers or on deck. If space is used as an air plenum, cable shall either be plenum rated or installed in EMT conduit.
 - b. Exhibit stable performance in a building environment.
 - c. Optical transmission performance is not significantly affected by environmental fluctuations, installation or aging.
 - d. Materials do not evolve hydrogen in quantities that will increase light attenuation.
 - 2. Singlemode fiber strands shall meet or exceed the following physical criteria:
 - a. Core diameter: 8.3µm.
 - b. Cladding diameter: 125µm, ±1.0µm.

- c. Core/cladding offset: $\leq 0.5\mu\text{m}$.
 - d. Coating diameter: $254\mu\text{m}$, $\pm 7.0\mu\text{m}$.
 - e. Coating/cladding concentricity: $12.0\mu\text{m}$.
 - f. Minimum tensile strength: 100,000psi.
- 3. Singlemode fiber strands shall meet or exceed the following performance criteria:
 - a. Attenuation: 0.35dB/km at 1310nm and 0.25dB/km at 1550nm wavelengths, maximum.
 - b. Mode field diameter: $9.2\mu\text{m} \pm 0.3\mu\text{m}$ at 1310nm and $10.5\mu\text{m} \pm 1.0\mu\text{m}$ at 1550nm.
 - c. Cutoff wavelength: $\leq 1260\text{nm}$.
 - d. Dispersion: 3.2ps/nm•km at 1285-1330nm and 18ps/nm•km at 1550nm.
- 4. Primary coating:
 - a. Each fiber shall be completely covered with a "primary coating" (acrylate material).
 - b. Coating diameter: $250\mu\text{m}$, $\pm 5\mu\text{m}$.
- 5. Buffering:
 - a. Each coated fiber shall be fully covered with a material extruded over and directly onto the coating. This shall be the tight buffer.
 - 1) Tight buffer diameter: $900\mu\text{m}$, $\pm 5\mu\text{m}$.
 - 2) Material: PVC or equivalent flame retardant thermoplastic.
 - b. Buffer strands shall be individually color-coded to meet the requirements of ANSI/TIA/EIA-598-A-1995 (also reference ANSI/ICEA S-83-596-1994 and EIA- 230).
- 6. Cable sheath:
 - a. Strength element: The cable shall have an internal strength element such as aramid yarn.
 - b. Outer jacket: The cable shall have a seamless outer jacket, LS-PVC or equal, applied to and completely covering the internal components (fiber strands, strength element, etc.).
 - c. Tensile strength: The cable shall have a 300 lb minimum install rated load and a 90 lb minimum long term load.
 - d. Flame rating: OFNP for plenum rated or OFNR for non-plenum riser rated, according to NEC Article 770, tested to NFPA 262 and UL Listed as such.
- E. Backbone fiber optic terminations:
 - 1. Fiber optic patch panels:
 - a. Patch panels shall be an enclosed housing for protecting, storing and organizing the termination of fiber cables and fiber strands. Shall also contain facilities to store fiber slack and provide patch cord management.
 - b. Patch panels shall be passive physical equipment and apparatus used in terminating, interconnecting and cross-connecting fiber optic cabling. Panel shall possess a minimum fire resistant rating of UL94V-1 and shall conform to existing OSHA Health and Safety Laws.
 - c. Patch panels shall come equipped with safety labels such as laser identification or warning labels as required by system considerations.

- d. Panels shall be 1U, 2U and/or 4U high, 19" rack mountable, accepting up to 4 and/or 12 adapter panels with 12-ports in each panel. Panels shall contain rear fiber entry slots, wire retainers and fiber storage drums. Furnish with slide out rails for front access and jumper troughs for cable management. Panels shall be suitable for multimode and singlemode fiber cable terminations.
 - e. Panels shall be provided with LC couplings for termination of fiber pigtails with matching connectors.
 - f. Provide patch panel and port quantities as required for cable terminations.
2. Fiber optic connectors:
- a. Multimode:
 - 1) Materials:
 - a) Ferrule ceramic with pre-radiused finish/face.
 - b) Connector housing: Plastic.
 - 2) Connector shall have an integral strain relief feature, including a bend limiting rear boot.
 - 3) Connector shall be installable via either epoxy or anaerobic method.
 - 4) Connector type shall be LC.
 - b. Singlemode:
 - 1) Materials:
 - a) Ferrule ceramic (zirconia or alumina) with pre-radiused finish/face.
 - b) Connector housing: Plastic.
 - 2) Connector shall meet or exceed Ultra PC performance.
 - 3) Connector shall have an integral strain relief feature, including a bend limiting rear boot.
 - 4) Connector shall be premanufactured onto pigtails.
 - 5) Connector type shall be LC.
- F. Fiber optic patch cords:
- 1. Suitable for indoor installations within equipment rooms.
 - 2. Cords shall be factory-assembled from a single, continuous length of cordage, homogenous in nature, and terminated at both ends via connectors as required. Splices are not permitted anywhere.
 - 3. Cordage:
 - a. Conductors: 2 optical conductors/strands, matching physical and optical performance parameters of the multimode and singlemode cable plant specified above.
 - b. Construction: "Mini Zipcord" type with strength member (aramid yarn) and jacket of PVC.
 - c. Flame rating: NEC OFN rated or higher, and UL Listed as such.
 - 4. Connectors:
 - a. Multimode patch cords shall be terminated with either duplex LC connectors at both ends or with duplex LC connectors at one end for connection with the

cable plant and via connector type as required for connection to equipment at other end.

- b. Singlemode patch cords shall be terminated with either duplex LC Ultra PC connectors at both ends or with duplex LC Ultra PC connectors at one end for connection with the cable plant and via connector type as required for connection to equipment at other end.

G. Fiber Splice Trays:

- a. Splice trays shall support 12-24 fusion splices.
- b. Trays shall be compatible with the splice closure application and product.
- c. Provide the required quantity of fiber trays and splicing materials as required for a complete system.

H. Backbone fiber optic terminations:

1. Fiber optic patch panels:

- a. Patch panels shall be an enclosed housing for protecting, storing and organizing the termination of fiber cables and fiber strands. Shall also contain facilities to store fiber slack and provide patch cord management.
- b. Patch panels shall be passive physical equipment and apparatus used in terminating, interconnecting and cross-connecting fiber optic cabling. Panel shall possess a minimum fire resistant rating of UL94V-1 and shall conform to existing OSHA Health and Safety Laws.
- c. Patch panels shall come equipped with safety labels such as laser identification or warning labels as required by system considerations.
- d. Panels shall be 4U high, 19" rack mountable, accepting up to 12 adapter panels with 12 LC ports in each panel. Panels shall contain rear fiber entry slots, wire retainers and fiber storage drums. Furnish with slide out rails for front access and jumper troughs for cable management. Panels shall be suitable for multimode or singlemode fiber cable terminations.
- e. Panels shall be provided with LC couplings for termination of fiber cables with matching connectors.
- f. Provide patch panel and port quantities as required for cable terminations.

2.03 FIBER OPTIC MEDIA CONVERTERS

- A. The media converter shall be protocol-transparent fiber converter that provides extension of network distances by connecting 62.5/125 multimode fiber cable to a single-mode fiber cabling.
- B. The converter shall be a plug and play device. Connect the fiber cables to the appropriate interface and the installation is complete.
- C. The converter shall operate with a constant rate signal between 500Mbps to 1250Mbps allowing the converter to be used in Ethernet networks as well as other fiber-to-fiber protocol applications.
- D. The fiber port shall operate at 850nm, 1310nm or 1550nm with SC connectors..
- E. LEDs shall report the availability of power and the detection of devices attached to the fiber ports.
- F. The converter modules can be mounted utilizing optional wall-mounting hardware or with DIN-rail mounting brackets.
- G. The converter modules shall be powered by an external DC power supply (18-60VDC).

2.04 MISCELLANEOUS:

A. Fiber slack storage rings.

1. Leviton or equal
 - a. OSP #48900-OFR
 - b. ISP #48900-IFR

B. Velcro cable ties:

1. Width: 0.75" or larger.
2. Color: Same color as the cable to which it is being applied.

2.05 LABELS:

- A. Label type shall be a durable plastic tag, suitable for indoor and/or outdoor use, and shall contain UV inhibitors. The tag shall attach to the cable via a separate steel or plastic tie-wrap.
- B. Labels shall have a self-laminating feature.
- C. Printable area shall be 3.5" x 2", minimum.
- D. Color shall be yellow with black legend test.
- E. Plenum cable ties:
 1. Suitable for use in plenums or air handling spaces.
 2. Color: Maroon or other distinctive non-white color.

2.06 CABLE TESTING EQUIPMENT

A. Fiber optic cabling:

1. Fiber optic light source:
 - a. Connection interfaces shall be factory installed.
 - b. Output shall be continuous wavelengths.
 - c. The light sources may contain internal lenses, pigtails, and modal conditioners, provided they meet the launch conditions as described in "Post-Installation" Passive Link Attenuation Testing Procedures.
 - d. LASER-based light source for multimode fiber testing shall have the following:
 - 1) Center wavelength of 850nm \pm 30nm and 1300nm \pm 20nm
 - 2) Special width (FWHM) of \leq 50nm at 850nm and \leq 150nm at 1300nm.
 - 3) Minimum output power level of \geq 20dBm.
 - e. LASER-based light source for singlemode fiber testing shall have the following:
 - 1) Center wavelength of 1320nm \pm 20nm and 1550nm \pm 20nm
 - 2) Special width (FWHM) of \leq 5nm at 1310nm and \leq 5nm at 1550nm.
 - 3) Minimum output power level of \geq 3dBm.
2. Fiber optic power meter:
 - a. Power meter for multimode and singlemode testing shall be capable of measuring relative of absolute power (or both) and must be independent of modal distribution.
 - b. Power meters used must be calibrated and traceable to the National

Bureau of Standards.

c. Power meter used shall have the following:

- 1) Dynamic range of 0dBm to -40dBm minimum.
- 2) Accuracy of ± 0.2 dBm.

3. Fiber optic mandrel:

- a. Mandrel diameter for 50/125 μ m jacketed (3.0mm) fiber shall be 22mm.
- b. Mandrel diameter for 50/125 μ m unjacketed (0.9mm) fiber shall be 25mm.

4. Fiber optic OTDR:

a. Multimode source module:

Wavelength	Dynamic Range	Attenuation Deadzone	Reflective Deadzone	Loss Resolution	Distance Accuracy
850nm	24dB	6.5mt	3.0mt	0.001dB	0.1mt
1300nm	27dB	7.0mt	3.0mt	0.001dB	0.1mt

b. Singlemode source module:

Wavelength	Dynamic Range	Attenuation Deadzone	Reflective Deadzone	Loss Resolution	Distance Accuracy
1310nm	40dB	6.0mt	3.5mt	0.001dB	0.1mt
1550nm	28dB	12.0mt	3.5mt	0.001dB	0.1mt

c. Reader software: Windows-based software capable of reading stored traces and is fully functional with the testing equipment.

5. Fiber optic test cords:

a. Multimode fiber optic test cords:

- 1) The fiber of the multimode test cords shall have the core diameter and numerical aperture nominally equal to that of the multimode fiber optic passive link.
- 2) Test cord length for testing insertion loss: 1m to 5m.
- 3) Connectors of the test cords shall be compatible with the connector types of the light source and the power meter, and with the cabling plant.
- 4) The connectors shall exhibit ≤ 0.5 dB loss per connection @ both 850nm and 1300nm, as measured per FOTP-171 D2.

b. Singlemode fiber optic test cords:

- 1) The fiber of the singlemode test cords shall have the core diameter and numerical aperture nominally equal to that of the singlemode fiber optic passive link.
- 2) Test cord length for testing insertion loss: 1m to 5m.
- 3) Connectors of the test cords shall be compatible with the connector types of the light source and the power meter, and with the cabling plant.
- 4) The connectors shall exhibit ≤ 0.5 dB loss per connection @ both 1300

nm and 1550 nm, as measured per FOTP-171 D3. The connectors shall inhibit Fresnel reflections (i.e. have a "PC" finish).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of the telecommunication fiber optic cabling system installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.
- B. Verify that pathways and supporting devices are properly and completely installed prior to cable installation.
- C. Verify dimensions of pathways to include length, i.e. "true tape" conduit runs.
- D. Prior to installation, verify that equipment rooms are ready to accept cables and terminations.
- E. ISP backbone fiber optic cabling:
- F. ISP backbone fiber optic cabling:
 - 1. Cabling:
 - a. Cable runs shall have continuous sheath continuity, homogenous in nature, without any splices.
 - b. Maximum cable length of 1,600 feet (500m) between the terminations at MPOE, MDF's and IDF's.
 - c. Placement:
 - 1) Place cables within designated pathways.
 - 2) Maintain a minimum bend radius of 20 times the cable diameter during installation and a minimum bending radius of 10 times the cable diameter after installation.
 - 3) Maintain pulling tension within manufacturer's limits.
 - 4) Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation.
 - 5) Do not use cable-pulling compounds for indoor installations.
 - 6) Provide 20 to 30 feet minimum sheath cable slack at each end of the run within the equipment rooms. Store cable slack in the fiber slack storage reel mounted on wall.
 - 7) Place a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of pull rope.
 - d. Routing:
 - 1) Within equipment rooms, neatly dress and organize cables on designated cable routing facilities and fasten cables to routing facilities via tie wraps or Velcro type straps.
 - 2) When routing horizontally within equipment rooms, utilize the overhead cable support system. When routing vertically within equipment rooms, utilize the vertical cable support system and provide approved cable straps at 24" intervals.

e. Terminations:

- 1) Properly relieve strain from cables at termination points, at or within the fiber optic termination panels) per manufacturer's instructions.
- 2) Provide breakout kits to furcated fibers from buffer tubes. Provide required accessories and consumables for the complete termination of fiber strands.
- 3) Terminate fiber strands at both ends using the specified fiber optic connectors appropriate for the mode type of the fiber. Perform termination in accordance with manufacturer's instructions.
- 4) Provide 3 feet of unsheathed fiber (tight buffer) slack within the patch panel/termination enclosure at each end of the link. Properly store fiber slack in rear of patch panel into the routing rings, per manufacturer's instructions.

2. Termination apparatus:

- a. Provide fully assembled termination patch panels in designated equipment racks, located a top of rack. "Fully assembled" includes installation and mounting components and accessories such as adapter panels, coupling adapters, etc. required for operation.
- b. Provide accessories required for proper installation of each termination patch panel, including connector panels and adapters.
- c. Termination sequence:
 - 1) Rack-mount panels: Terminate singlemode fibers first (upper left-most position), then multimode fibers, all in sequential strand order.
 - 2) Wall-mount panels: Terminate singlemode fibers first (upper left-most position), then multimode fibers, all in sequential strand order.

G. OSP backbone fiber optic cabling:

1. Cabling:

- a. Cable runs shall have continuous sheath continuity, homogenous in nature, between either termination points or designated splice points. Only splices as noted on the Construction Documents are permitted.
- b. Maximum cable length of 4,900 feet (1,500m) between the terminations at MPOE or MDF's.
- c. Placement:
 - 1) Place cables within designated pathways.
 - 2) Maintain a minimum bend radius of 20 times the cable diameter during installation and a minimum bend radius of 10 times the cable diameter after installation.
 - 3) Maintain pulling tension within manufacturer's limits.
 - 4) Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation.
 - 5) Only use UL approved cable-pulling compounds when necessary to reduce pulling tension.
 - 6) Provide 20 to 30 feet minimum sheath cable slack at each end of the run within the equipment rooms. Store cable slack in the fiber slack

storage reel mounted on wall.

- 7) Place a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of pull rope.

d. Routing:

- 1) Route cables in innerduct between points of termination throughout entire length, except at the fiber take up reel.
- 2) Within equipment rooms, neatly dress and organize cables on designated cable routing facilities and fasten cables to routing facilities via tie wraps or Velcro type straps.
- 3) When routing horizontally within equipment rooms, utilize the overhead cable support system. When routing vertically within equipment rooms, utilize the vertical cable support system and provide approved cable straps at 24" intervals.

e. Terminations:

- 1) Properly relieve strain from cables at termination points, at or within the fiber optic termination panels) per manufacturer's instructions.
- 2) Provide breakout kits to furcated fibers from buffer tubes. Provide required accessories and consumables for the complete termination of fiber strands.
- 3) Terminate fiber strands at both ends using the specified fiber optic connectors appropriate for the mode type of the fiber. Perform termination in accordance with manufacturer's instructions.
- 4) Provide 3 feet of unsheathed fiber (tight buffer) slack within the patch panel/termination enclosure at each end of the link. Properly store fiber slack in rear of patch panel into the routing rings, per manufacturer's instructions.

2. Termination apparatus:

- a. Provide fully assembled termination patch panels in designated equipment racks, located at top of rack. "Fully assembled" includes installation and mounting components and accessories such as adapter panels, coupling adapters, etc. required for operation.
- b. Provide accessories required for proper installation of each termination patch panel, including connector panels and adapters.
- c. Termination sequence:
 - 1) Rack-mount panels: Terminate singlemode fibers first (upper left-most position), then multimode fibers, all in sequential strand order.
 - 2) Wall-mount panels: Terminate singlemode fibers first (upper left-most position), then multimode fibers, all in sequential strand order.

3.02 LABELING

A. General requirements:

1. Labeling, label colors, and identifier assignments shall conform to EIA/EIA-606-A Administration Standards and as approved by the Owner.
2. Provide permanent and machine-generated labels. Hand written labels will not be accepted.

B. Backbone and horizontal fiber optic cable labeling:

1. Cables:

- a. Text color shall be black with #10 font size.
- b. Identifier assignment:
 - 1) First field: Type of cable.
 - 2) Second field: Total strand count.
 - 3) Third field: Cable number.
 - 4) Fourth field: Strands in use and dead strands.
 - 5) Fifth field: Source and destination.
 - 6) Sixth field: Terminal number (MDC, BDF, IDF).
- c. Label installation:
 - 1) Provide labels on both ends of cables.
 - 2) Install such that they are visible by a technician from normal stance.
 - 3) Fully wrap label around the cable jacket (self lamination).
 - 4) Provide one label within 12" of the termination apparatus.
 - 5) Provide one label at the point where the cable enters/exits the equipment room.
 - 6) Provide one label at the approximate mid-point between where the cable enters/exits the room and the termination apparatus.

2. Fiber patch panels:

- a. Text color shall be black, #10 font size.
- b. Label installation:
 - 1) Provide labels at each port.
 - 2) Install labels into label window.

3.03 FIELD QUALITY CONTROL AND TESTING

A. General:

1. Calibrate test sets and associated equipment per the manufacturers instructions at the beginning of each day's testing and after each battery charge. Fully charge the testsets prior to each day's testing to ensure proper operation.
2. Ensure test equipment and test cords are clean and undamaged during testing activities. Per the Owners Representative's discretion, halt testing activity and clean testing equipment, test cords and related apparatus.
3. Permanently record test results electronically within test equipment at the time of testing.

B. Fiber optic testing:

1. Test fiber optic passive links as follows:

TESTS FOR FIBER OPTIC CABLING TABLE				
Subsystem	Type	Test	Direction	Wavelength

OSP backbone	Multimode	Characterization, passive link insertion loss	Both	850nm and 1300nm
OSP backbone	Singlemode	Characterization, passive link insertion loss	Both	1310nm and 1550nm
ISP backbone	Multimode	Passive link insertion loss	Both	850nm and 1300nm
ISP backbone	Singlemode	Passive link insertion loss	Both	1310nm and 1550nm

2. Precautions:

- a. Adhere to the equipment manufacturer's instructions during testing.
- b. Prior to testing activity or measurements taken, complete the following activities:
 - 1) Ensure the test equipment is at room temperature, approximately 70°F.
 - 2) Turn the light source and power meter power on for at least 5 minutes.
 - 3) Clean test/launch cords and system cords, if applicable, connectors and the cabling system adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.
- c. Do not power off OTDR's light source during testing activity.
- d. Do not remove launch cord from the OTDR's light source at any time (unless the testing is complete or the equipment is being put away for the evening or during trouble shooting).
- e. Do not bend the launch cord smaller than 20 times the cord diameter during testing activities, as this may induce loss into the cord reducing the accuracy of the measurements).

C. Fiber optic characterization testing:

1. Equipment settings/measurement parameters:

- a. Index of refraction: Match cable-under-test fiber parameters, default settings as follows:
 - 1) Multimode: 1.481 – 1.483 @ 850nm and 1.476-1.478 @ 1300nm.
 - 2) Singlemode: 1.466-1.467 @ 1310nm and 1.467-1.4677 @ 1550nm.
- b. Pulse width (20ns for multimode and 50ns for singlemode):
 - 1) Multimode: 4ns for cable lengths up to 980 feet (300m); 20ns for cable lengths between 980 feet (300m) and 6,560 feet (2,000m).
 - 2) Singlemode: 10ns for cable lengths up to 6,560 feet (2,000m); 50ns for cable lengths between 6,560 feet (2,000m) and 32,800 feet (10,000m).
- c. Backscatter:
 - 1) Multimode: -67dB @ 850nm, -74dB @ 1300nm.
 - 2) Singlemode: -74dB @ 1310nm and 1550nm.
- d. Event threshold: 0.05dB.
- e. Reflection threshold:
 - 1) Multimode: -45dB.

- 2) Singlemode: -60dB.
- f. Fiber break/end-of-fiber: 3dB.
2. Waveform: The waveform shall be real-time and normal density.
3. Obtain measurements using a "launch" cord connected to the test instrument and the cable under test.
 - a. The fiber of the launch cord shall match the fiber of the cable under test in physical and performance parameters (i.e. type, core/cladding size, index of reflection, refraction profile, etc.). The fiber of the launch cord should match the fiber of the cable under test in manufacturer and product.
 - b. Use launch cord length between 25 and 100 meters.
- D. Fiber optic passive link insertion loss testing:
 1. Test cords performance verification:
 - a. Connect test cord #1 between the light source and the power meter.
 - b. The value displayed on the power meter is the Reference Power (P_{ref}) measurement. If the power meter has a Relative Power Measurement Mode, enter this Reference Power Measurement (P_{ref}) value into the meter. If it does not, hand-write P_{ref} onto the record document for future reference.
 - c. Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.
 - d. Connect the "open" end of test cord #1 to an adapter of matching connector type. Connect one end of test cord #2 to the adapter and the other end to the power meter.
 - e. The value displayed on the power meter is the Power Measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the test cord #2 connection attenuation. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the connection attenuation:
 - 1) If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc.): Connection attenuation (dB) = ($P_{sum} - P_{ref}$)
 - 2) If P_{sum} and P_{ref} are in watts: Connection attenuation (dB) = $[10 \times \log_{10} (P_{sum}/P_{ref})]$
 - 3) The measured connection attenuation must be less than or equal to the value found in the Table below.
 - f. Flip the ends of test cord #2, so that the end connected to the power meter is now connected to the adapter, and the end connected to the adapter is now connected to the power meter.
 - g. The meter reading is the reversed Power Measurement (P_{sum}). Perform the proper calculations if not using Relative Power Measurement Mode.
 - h. Verify that both connection attenuation measurements are less than or equal to the value found in the following Table:

ACCEPTABLE TEST CORD CONNECTION ATTENUATION	
Cable Type	LC (or other Mini-Connector) Cord
Multimode	0.20dB maximum

Singlemode	0.30dB maximum
------------	----------------

- i. If both measurements are found to be less than or equal to the values found in the Table, then test cord #1 is acceptable for testing purposes. Unacceptable attenuation measurements may be attributable to test cord #1 or #2. Examine each cord with a portable microscope and clean, polish or replace as necessary.
 - j. Repeat this test procedure from the beginning, reversing the test cords in order to verify the performance of test cord #2.
2. Test equipment set-up:
 - a. Follow the test equipment manufacturer's initial adjustment and set-up instructions.
 - b. If the meter has a Relative Power Measurement Mode, select this mode.
 - c. If the meter can display power levels in dBm, select this unit of measurement to simplify subsequent calculations.
 - d. Set the light source and power meter to the same wavelength.
 3. Multimode passive link insertion loss testing procedure:
 - a. Determine launch conditions (from the light source as Category 1 per OFSTP-14):
 - 1) General: The launch category of a light source can be determined by measuring its Coupled Power Ratio "CPR." The CPR is a measurement of the modal power distribution launched into a multimode fiber. A light source that launches a higher percentage of its power into the higher order modes of a multimode fiber produces a more over-filled condition and is classified as a lower Category than a light source that launches more of its power into just the lower order modes producing an under-filled condition. Under-filled conditions result in lower link attenuation, while over-filled conditions produce higher attenuation. Therefore, adjusting the acceptable link attenuation to compensate for a light source's launch characteristic increases the accuracy of the test procedure.
 - 2) Provide two test cords, one multimode (test cord #1) and one singlemode (test cord #2). Directly terminate both cords on connectors that are compatible with the light source and power meter.
 - a) The fiber of the multimode test cord shall have the core diameter and numerical aperture nominally equal to those of the permanent link.
 - b) The fiber of the singlemode test cord shall contain Class IVa singlemode fiber with a mode field diameter of $5.0\mu\text{m} \pm 0.5\mu\text{m}$ for 850nm tests and $9.0\mu\text{m} \pm 1.0\mu\text{m}$ for 1300nm tests.
 - 3) Connect test cord #1 between the light source and the power meter. Avoid placing bends in the cord that are less than 4" in diameter.
 - 4) The meter reading is the Reference Power Measurement (P_{ref}). If the power meter has a Relative Power Measurement Mode, enter the P_{ref} value into the meter. If it does not have this mode, then hand-write the P_{ref} for future reference.
 - 5) Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.

- 6) Connect test cord #2 between the power meter and test cord #1, using an appropriate adapter between the test cords. Test cord #2, the singlemode cord, shall include a high order mode filter. This can be accomplished by twice wrapping the cord around a 1.2" diameter (30mm) mandrel.
- 7) The meter reading is the Power Measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the CPR. If the meter does not have this mode, perform the following calculation to determine the CPR:
 - a) If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc.): CPR (dB) = $(P_{sum} - P_{ref})$
 - b) If P_{sum} and P_{ref} are in watts: CPR (dB) = $[10 \times \log_{10} (P_{sum}/P_{ref})]$

COUPLED POWER RATIO (CPR) TABLE					
	Cat-1 Overfilled	Cat-2	Cat-3	Cat-4	Cat-5 Underfilled
850nm source	20 - 24	16 – 19.9	11 – 15.9	7 – 10.9	0 – 5.9

- b. Test method: Perform the passive link insertion loss testing of multimode fibers according to the "Test Method B: One Jumper Reference," per OFSTP-14, for permanent links, and perform according to the "Test Method C: Three Jumper Reference," per OFSTP-14, for channel links.
 - 1) After setting up the test equipment, verifying the performance of the test cords and determining the light source's CPR, the insertion loss of the passive link segments can be measured.
 - 2) Connect test cord #1 between the light source and the power meter.
 - 3) The meter reading is the Reference Power Measurement (P_{ref}). If the power meter has a Relative Power Measurement Mode, enter the P_{ref} value into the meter. If it does not have this mode, then hand-write the P_{ref} for future reference.
 - 4) Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.
 - 5) Connect test cord #1 to the passive link segment input.
 - 6) At the opposite end of the passive link segment, connect test cord #2 to the link segment input and the power meter.
 - 7) The meter reading is the Power Measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the insertion loss. If the meter does not have this mode, perform the following calculation to determine the insertion loss:
 - a) If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc.): Link segment attenuation (dB) = $(P_{sum} - P_{ref})$
 - b) If P_{sum} and P_{ref} are in watts: Link segment attenuation (dB) = $[10 \times \log_{10} (P_{sum}/P_{ref})]$
 - 8) Record P_{sum} for inclusion into the record documents.

4. Singlemode passive link insertion loss testing procedure:
 - a. Determine the launch conditions:
 - 1) Use the launch conditions as described in FOTP-78.
 - 2) Employ a method to remove high-order propagating modes as described in FOTP-77.
 - b. Test method: Perform the passive link insertion loss testing of singlemode fibers according to the "Test Method A.1: One Jumper Reference," per OFSTP-7.
 - 1) After setting up the test equipment and verifying the performance of the test cords, the insertion loss of the passive link segments can be measured.
 - 2) Connect test cord #1 between the light source and the power meter.
 - 3) The meter reading is the Reference Power Measurement (Pref). If the power meter has a Relative Power Measurement Mode, enter the Pref value into the meter. If it does not have this mode, then hand-write the Pref for future reference and to be included in the Record Documents.
 - 4) Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.
 - 5) Connect test cord #1 to the passive link segment input.
 - 6) At the opposite end of the passive link segment, connect test cord #2 to the link segment input and the power meter.
 - 7) The meter reading is the Power Measurement (Psum). If the power meter is in Relative Power Measurement Mode, the meter reading represents the insertion loss. If the meter does not have this mode, perform the following calculation to determine the insertion loss:
 - a) If Psum and Pref are in the same logarithmic units (dBm, dBu, etc.): Link segment attenuation (dB) = (Psum - Pref)
 - b) If Psum and Pref are in watts: Link segment attenuation (dB) = $[10 \times \log_{10} (Psum/Pref)]$
 - 8) Record Psum for inclusion into the record documents.
5. Acceptable measurement values:
 - a. Remove and replace any cabling links failing to meet the criteria described in this Specification, at no cost to the Owner, with cables that prove to meet the minimum requirements.
 - b. The general insertion loss equation for any link segment is as follows:
 - 1) Insertion loss = cable loss + connection loss + splice loss + CPR adjustment.
 - 2) Note: A connection is defined as the joint made by two mating fibers terminated with remateable connectors.
 - c. 50/125µm multimode attenuation coefficients:
 - 1) Cable loss = Cable length (km) x (3.0dB/km @ 850nm) or (1.0dB/km @ 1300nm).
 - 2) Connection loss = (Connections x 0.14dB) + 0.24dB.
 - 3) Splice loss = Splice x 0.05dB.

- 4) CPR adjustment = See Table below.

MULTIMODE LIGHT SOURCE CPR ADJUSTMENT TABLE					
	Cat-1	Cat-2	Cat-3	Cat-4	Cat-5
Links w/ LC connectors	+0.25	0.00	-0.10	-0.20	-0.30

- d. Singlemode attenuation coefficients:

- 1) OSP cable loss = Cable length (km) x (0.40dB/km @ 1310nm) or (0.30dB/km @1550nm).
- 2) ISP cable loss = Cable length (km) x (0.650dB/km @ 1310nm) or (0.50dB/km @1550nm).
- 3) Connection loss = (Connection x 0.24dB) + 0.24dB.
- 4) Splice loss = Splices x 0.07dB.
- 5) CPR adjustment = Not applicable for singlemode.

3.04 INSPECTION AND ADJUSTMENTS

- A. Contractor shall inspect all installed Work in conjunction with the General Contractor and develop a "punchlist" for all items needing correction. Provide punchlist to the Owners Representative prior to their final walk of Project.
- B. Punchlist work and the required remediation shall be performed prior to system final acceptance.
- C. Replace or repair work completed by others that was defaced or destroyed during the installation of the telecommunication cabling system by this contractor.
- D. Make changes to adjust the system to optimum operation for final use. Contractor is responsible for making changes to the system such that any defects in workmanship are correct and all cables and the associated termination hardware passes the minimum test requirements.

3.05 CLEANING

- A. Remove all unused, excess and left over products, to include debris, spills, and installation equipment.
- B. Leave finished work and adjacent surfaces in neat, clean conditions with no evidence of damage.
- C. Legally dispose of debris.
- D. Clean installed products in accordance with manufacturer's instructions prior to final punchlist.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 27 15 00**STRUCTURED CABLING****PART 1 - GENERAL****1.01 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. Horizontal twisted pair cabling.
 2. Telecommunications cabinets and racks.
 3. Telecommunication testing.
- 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.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
1. Federal Communications Commission (FCC) Regulations:
FCC Part 15; Radio Frequency Devices & Radiation Limits.
FCC Part 68; Connection of Terminal Equipment to the Telephone Network.
 2. Electronics Industries Alliance (EIA): EIA; Testing Standards.
 3. American National Standards Institute, Inc. (ANSI) / Telecommunications Industry Association (TIA) / Electronics Industries Alliance (EIA):
ANSI/TIA/EIA-568-C; Commercial Building Telecommunications Cabling Standards, including the following:
 - Part 1: General Requirements.
 - Part 2: Balanced Twisted-Pair Cabling Components.
 - Part 2, Addendum 1: Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cable.
 - TIA SP 3-4426 (12/28/06 or latest version): Transmission Performance Specifications for 4-Pair 100 Ohm Augmented Category 6 Cable (to be published as TIA-568-C.2-10).
- ANSI/TIA/EIA-569-A; Commercial Building Standard for Telecommunications Pathways and Spaces, including the following:
- TIA/EIA-569-A-1: Perimeter Pathway Addendum.
 - TIA/EIA-569-A-2: Furniture Pathway Fill Addendum.
 - TIA/EIA-569-A-3: Access Floors.
 - TIA/EIA-569-A-4: Poke-Thru Devices.
 - TIA/EIA-569-A-6: Multi-Tenant Pathway and Spaces.
 - TIA/EIA-569-A-7: Cable Trays and Wireways.
- ANSI/TIA/EIA-598-B; Optical Fiber Cable Color Coding.
ANSI/TIA/EIA-606-B; Administration Standard for Commercial Telecommunications Infrastructure.
ANSI/J-STD-607-A; Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
ANSI/TIA/EIA-758; Customer-Owner Outside Plant Telecommunications Cabling Standard (TIA/EIA-758-1: Addendum No. 1).

- TIA TSB-155; Guidelines for the Assessment and Mitigation of Installed Category 6A Cabling to Support 10GBase-T.
4. Building Industry Consulting Service International, Inc. (BICSI):
- BICSI (TDMM); Telecommunication Distribution Methods Manual. BICSI; Customer-Owner Outside Plant Design Manual.
- BICSI (WDRM); Wireless Design Reference Manual. BICSI (NDRM); Network Design Reference Manual.
5. Insulated Cable Engineers Association (ICEA):
- ICEA S-80-576-2002; Category 1 & 2 Individually Unshielded Twisted Pair Indoor Cables for Use in Communications Wiring Systems.
- ICEA S-83-596-1994; Fiber Optic Premises Distribution Cable.
- ICEA S-87-640-1999; Fiber Optic Outside Plant Communications Cable.
- ICEA S-90-661-2002; Category 3, 5 & 5e Individually Unshielded Twisted Pair Indoor Cable for Use in General Purpose and LAN Communication Wiring Systems.
- ICEA S-104-696-2001; Standard for Indoor-Outdoor Optical Cable.
6. Underwriters Laboratories, Inc. (UL):
- UL 444; Communication Cables.
- UL 497; Protectors for Paired-Conductor Communication Circuits. UL 1651; Optical Fiber Cable.
- UL 1690; Data-Processing Cable.
- UL 1963; Communications-Circuit Accessories. UL 2024A; Optical Fiber Cable Routing Assemblies.

1.04 DEFINITIONS

- A. Above finish floor (AFF) - Standard mounting height (e.g., 18 inch AFF) for a device using the center line of the device as the measurement point.
- B. Administration - The methodology defining the documentation requirements of a cabling system and its containment, the labeling of functional elements and the process by which moves, additions, and changes are recorded.
- C. ANSI/TIA/EIA - Associations involved in developing telecommunications industry standards.
- D. Attenuation - The decrease in magnitude of transmission signal strength between points, expressed in dB as the ratio of output to input signal level.
- E. Attenuation-to-crosstalk ratio (ACR) - The ratio obtained by subtracting insertion loss (attenuation [dB]) from near-end crosstalk (dB). ACR is normally stated at a give frequency.
- F. Auditory assistance device - An intentional radiator used to provide auditory assistance to a handicapped person or persons. Such a device may be used for auricular training in an educational institution, for auditory assistance at places of public gatherings, such as a church, theater, or auditorium, and for auditory assistance to handicapped individuals, only, in other locations.
- G. Backboard - Backboard generally refers to the 3/4" A-C grade plywood sheeting, lining the walls of the telecommunications room. Plywood shall be void-free, with two coats of fire retardant paint matching the painted interior walls covering both sides.
- H. Backbone - A facility (e.g., pathway, cable, or conductors) between any of the following spaces: telecommunications rooms, common telecommunications rooms, floor-serving terminals, entrance facilities, equipment rooms, and common equipment rooms.

- I. Basic link test configuration - Horizontal cable of up to 90m (295 ft) plus up to 2m (6.5 ft) of test equipment cord from the main unit of the tester to the local connection, and up to 2m (6.5 ft) of test equipment cord from the remote connection to the remote unit of the tester. Maximum length is 94 m (308 ft).
- J. Bonding Conductor (BC) - A conductor used specifically for the purpose of bonding.
- K. Cable Labeling System –
 - 1. The scheme employed when identifying cable or its associated hardware.
 - 2. Scheme adapted for labeling cables to identify them based on ANSI/TIA/ EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure. See administration.
- L. Cable Runway - Hardware designed and manufactured for horizontal pathway distribution of cable and inside wiring inside the MC, IC, or TR rooms.
- M. CAT - Category used when identifying the performance characteristics of twisted pair cabling.
- N. Ceiling Distribution System - A distribution system that utilizes the space between a suspended or false ceiling and the structural surface above.
- O. Closed-Circuit Television (CCTV) - A private television system, typically used for security purposes, in which the signal is transmitted to a limited number of receivers.
- P. Communications plenum cable (CMP) - Type CMP communications plenum cable shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics. (NEC)Cables must pass required test for fire and smoke characteristics of wires and cables, NFPA 262 or UL 910.
- Q. Communications Riser Cable (CMR) - Type CMR communications riser cable shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor. (NEC) Cables must pass requirements for flame propagation.
- R. Electromagnetic Interference (EMI) - Radiated or conducted electromagnetic energy that has an undesirable effect on electronic equipment or signal transmissions.
- S. Entrance Conduit - Conduit that connects the campus underground infrastructure with the building's Telecommunications Room.
- T. Fire Retardant - Any substance added to delay the start or ignition of fire or slow the spread of the flame of any material.
- U. Firestopping - The process of installing [specialty] listed fire-rated materials into penetrations of fire-rated barriers to reestablish the fire-resistance rating of the barrier.
- V. Firestopping Location. A penetration through a fire-rated wall with a sleeve.
- W. Firestop System - A specific installation consisting of the material(s) (firestop penetration seals) that fill the opening in the wall or floor assembly, and around and between any items that penetrate the wall or floor (e.g., cables, cable trays, conduit, ducts, pipes), and any termination devices (e.g., electrical outlet boxes) along with their means of support.
- X. Grounding Conductor - A conductor used to connect the grounding electrode to the buildings main grounding busbar.

- Y. Grounding System - A system of hardware and wiring that provides an electrical path from a specified location to an earth ground point.
- Z. Horizontal Cabling - The part of the cabling system that extends from the work area telecommunications outlet to the horizontal cross-connect in the telecommunications room.
- AA. Hybrid Cable - An assembly of two or more cables, of the same or different types or categories, covered by one overall sheath.
- BB. Infrastructure (Telecommunications) - A collection of those telecommunications components, excluding equipment, that together provide the basic support for the distribution of all information within a building or campus.
- CC. Intermediate Cross-connect (IC) - the connection point between a backbone cable that extends from the main cross-connect and the backbone cable from the horizontal cross-connect.
- DD. Loose Tube - A type of optical fiber cable construction where one or more fibers are laid loosely in a tube. Also called loose tube fiber.
- EE. Main Cross-connect (MC) - The cross-connect normally located in the Telecommunications Equipment Room for cross-connection and interconnection of entrance cables, first-level backbone cables, and equipment cables.
- FF. Metropolitan Area Network (MAN) - A data communications network that covers an area larger than a campus area and smaller than a wide area network. Typically interconnects two or more LANs and usually covers an entire metropolitan area.
- GG. MPOE - Minimum Point of Entry, Utility Partnerships/Alternate Carrier, usually located within the Telecommunications Room.
- HH. Multimode Fiber (MMF) - An optical fiber that carries many paths of light or an optical waveguide that allows many bound modes to propagate.
- II. Single-mode Fiber (SMF) - An optical fiber, usually step-index grade, which supports only one mode of light propagation. This does not necessarily imply single wavelength operation. The light source is normally a laser.
- JJ. Strand (STR) - A single unit of optical fiber within a cable (e.g., a 12-strand fiber cable has 12 individual optical fibers within the cable sheath).
- KK. Telecommunications Entrance Facility - Utility Partnerships/Alternate Carrier Minimum Point of Entry that is usually located within the Main Cross-connect Room (MC).
- LL. Telecommunications Equipment Room (TER) - A centralized space that provides space and maintains a suitable operating environment for the termination of backbone and campus cabling and house centralized communications and/ or computer equipment (such as Core Switches and Servers). Note: An equipment room is considered distinct from a telecommunications closet because of the nature or complexity of the equipment housed by the equipment room.
- MM. Telecommunications Main Grounding Busbar (TMGB) - A grounding busbar, located in the MC, connected to the main building ground electrode by a continuous 2/0 - #4 AWG wire (Wire size is dependent on the distance between the busbar and the building main).
- NN. Telecommunications Room (TR) - A room dedicated to housing a group of telecommunications connectors (e.g., patch panel or punch-down block) that allows equipment and backbone cabling to be cross connected with patch cords or jumpers.

OO. Underwriters Laboratories (UL) - A United States-based independent testing laboratory that sets safety tests and standards.

PP. Uninterruptible Power Supply (UPS) - A device that is inserted between a primary power source (e.g., a commercial utility) and the primary power input of equipment to be protected (e.g., a computer system) to eliminate the effects of transient variances or temporary outages. Retain acronyms, abbreviations, and terms that remain after this Section has been edited.

1.05 SYSTEM DESCRIPTION

A. Provide a complete telecommunication cabling system installation as specified herein and as shown on the Drawings. In general, system shall include, but not be limited to, the following:

1. Work Station Horizontal twisted pair cabling:
 - a. Horizontal twisted pair cables shall route between the IDF and workstation outlets, and shall consist of Category 5e 4-pair, UTP, plenum or riser rated copper cables.
 - b. Category 5e horizontal twisted pair cable will support communication devices such as but not limited to the following:
 - 1) Telephones (VoIP)
 - 2) Intercom/clocks/bell System
 - c. Category 5e horizontal twisted pair cables for VoIP and Intercom/clock system applications shall terminate on Category 5e, patch panels for interface with routers/switches.
 - d. Copper jack standard is Category 5e.
 - e. Category 6A cable for owner furnished owner installed (OFOI) wireless access points.
2. Patch cords:
 - a. UTP patch cords shall match the physical and performance criteria of the specified horizontal twisted pair cable from the same manufacturer. The cords shall be terminate with:
 - 1) 568B-568B for Data between network switch patch panel and VoIP telephone set. Cord shall be blue
 - b. Patch cords shall be furnished in varying lengths as required.
 - c. Patch cord quantities shall match the following:
 - 1) Two patch cords for each category 5e cable installed. This includes one standard line cord at the work station and one patch cord at the IDF/MDF room.

B. Workstation wall outlets:

1. Standard telecommunication outlets shall consist of the following, unless otherwise noted on the Drawings:
 - a. Two horizontal twisted pair cable(s) per outlet UON. Blue cable
 - b. Single -gang cover plate with 4-ports.
 - c. RJ-45 connector jacks for twisted pair terminations, T568B. Color to match cable.
 - d. Blanks as required.
2. All data outlets shall be located within 12" from a 120V duplex power outlet.
3. Wall mounted telephone outlets shall consist of the following, unless otherwise noted on the Drawings:
 - a. One horizontal twisted pair cable per outlet. Blue cable
 - b. Single-gang metal coverplate with 1-port and two support studs.
 - c. One RJ-45 connector jack for twisted pair terminations, T568B. Color to match cable.

- C. WAP ceiling outlets:
1. Ceiling telecommunication outlets shall consist of the following, unless otherwise noted on the Drawings:
 - a. Two horizontal category 6A twisted pair cable(s) per outlet UON. Blue cable
 - b. Surface Mounted Box (SMB).
 - c. Cat 6A RJ-45 connector jacks for twisted pair terminations, T568B. Color to match cable.
 - d. Blanks as required.
 - e. Terminate cable on a 24 port pre-punched patch panel with individual category 6A jacks as required.
 - f. One horizontal twisted pair cable per outlet. Blue cable
 - g. One RJ-45 connector jack for twisted pair terminations, T568B. Color to match cable.
- D. Wall Mounted Cabinets and racks
1. Cabinets and racks will be required where existing switches are wall mounted.
 2. Locations for new or replacement of wall racks/cabinets are indicated on drawings.
- E. Refer to Drawings for complete documentation of above requirements and all additional requirements.

1.06 SUBMITTALS

- A. Submit 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. Describe system operation, equipment, dimensions and indicate features of each component.
 3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 4. Shop Drawings prepare in Cad 2016 or newer, to include the following:
 - a. Building floor plans showing location of all new outlets, raceways, conduits and cable routing to each device at same scale as construction documents.
 - b. Text shall be a minimum of 3/32" high when plotted at full scale.
 - c. Screen all background information.
 5. Furnish structural calculations for equipment anchorage as described in Section 270010: Basic Communications Requirements.
 6. Complete bill of materials listing all components.
 7. Warranty.
- B. Installer's qualifications: Furnish satisfactory proof of required experience specified herein for system installer.
1. The installing contractor shall be certified by the manufacturer for the product installed to provide a manufacturers product and application warranty.
 2. Technicians shall be certified by the manufacturer of the system components installed per the manufacturers requirements to provide a certified structured cabling system.
- C. Record Drawings:
1. Furnish Record Drawings utilizing Shop-Drawing submissions with updated field conditions. These Drawings shall include but not be limited to the following:
 - a. Plot plans and building floor plans, showing point-to-point wiring location of all devices.

- b. Block Diagram/Riser Diagram showing the system components and all conduit and wire type/sizes between each.
2. Drawings shall be incorporated into the Record Drawing submission.
3. Final acceptance will not be made until the Engineer has approved the Record Drawings.

1.07 OPERATION AND MAINTENANCE MANUAL

- A. Supply operation and maintenance manuals to include the following:
 1. A detailed explanation of the operation of the system.
 2. Pictorial parts list and part numbers.
 3. Schematic wiring diagrams.
 4. Telephone numbers for the authorized parts and service distributor.
 5. Final testing reports.

1.08 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. Manufacturer qualifications: Manufacturer must have a minimum 5 continuous years of experience in design and manufacturing of the materials and equipment specified herein.
- D. Installer's qualifications:
 1. Installer must have a minimum 5 continuous years of experience in satisfactory completion for Projects similar in scope and cost. Provide backup information on 5 such Projects.
 2. Installer shall possess a current, active and valid C7 California State Contractors License.
 3. Conduit contractor shall possess a current, active and valid C10 California State Contractors License.
 4. The installer shall be the Manufacturer's certified reseller/installer of the telecommunication equipment/cable system provided. The certification shall have been completed 60 days prior to project bid date. Provide evidence of this certification.

1.09 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Telecommunication system 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 shipping shall be replaced and returned to Manufacturer at no cost to Owner.
- B. Storage: Store in 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.
- C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal components damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.10 WARRANTY

- A. Units and components offered under this Section shall be covered by a Life Time product and application warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall be provided from the component manufacturer and shall name the owner on the warranty certificate. Warranty shall begin upon acceptance by the Owner.
- B. Contractor shall provide required drawings, test results, application and any other items required by the manufacturer to produce the required warranty.

1.11 MAINTENANCE

- A. Maintenance services:
 - 1. Distributor of the major system components shall maintain a replacement parts department and provide testing equipment when needed. A complete parts department shall be located close enough to supply replacement parts within a 4 hour period.
 - 2. Service must be rendered within 4 hours of system failure notification.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be in compliance with all features specified herein and indicated on the Drawings.
 - 1. Horizontal twisted pair cable:
 - a. Berktek/Leviton
 - b. General/Panduit
 - c. Commscope
 - d. Belden
 - 2. Cat 5e/6A Twisted pair patch cord cable:
 - a. Leviton
 - b. Panduit
 - c. Commscope
 - d. Belden
 - 3. Category 5e/6A Horizontal Structured Cable Systems
 - a. Leviton/Berktek
 - b. Panduit/General
 - c. Commscope
 - d. Belden
 - 4. Cabinets and racks
 - a. Chatsworth Products
 - b. B-Line
 - c. Approved equal
 - 5. Test equipment:
 - a. Fluke Networks.
 - b. Agilent Technologies WireScope 350 Test Set.
 - c. Tektronix.

2.02 HORIZONTAL TWISTED PAIR CABLING

- A. Indoor Horizontal cables:
 - 1. Application:
 - a. Suitable for indoor installations, exposed within equipment rooms, above suspended ceilings and below raised floors in cable trays, hangers or on deck, or within walls. If space is used as an air plenum, cable shall either be plenum rated or installed in EMT conduit.

- b. Each cable run shall be continuous single cable, homogenous in nature, without splices.
- c. Cables shall meet CAT 5e and Category 6A performance criteria.
- d. Cables shall be CMR or CMP rated as required for rating of space..
- 2. Conductors:
 - a. Insulated conductors: Category 5e, Eight #24 AWG, solid copper wire insulated with FEP for plenum applications or thermoplastic polyethylene or high-density polyolefin for non-plenum rated applications.
 - b. Insulated conductors: Category 6A, Eight #234 AWG, solid copper wire insulated with FEP for plenum applications or thermoplastic polyethylene or high-density polyolefin for non-plenum rated applications
 - c. Twisted pairs: Two insulated conductors twisted together to form a pair and four such paired cables to form a unit with individually color-coded pairs to conform to industry standards (ANSI/ICEA Publication S-80-576-1994 and EIA-230).
- 3. Cable sheath:
 - a. Outer jacket: Seamless outer jacket, flame-retardant PVC, applied to and completely covering the internal components (twisted pairs).
 - b. Flame rating: CMP according to NEC Article 800, tested to NFPA 262 and UL Listed as such.
- 4. Electrical performance: Meet or exceed TIA/EIA-568-C.2 for CAT5e and Category 6A UTP cabling.
- 5. Color
 - a. Blue

2.03 SITE BACKBONE TWISTED PAIR CABLING

A. Outdoor category 5e Backbone cables:

- 1. Application:
 - a. Suitable for indoor/outdoor installations, in underground duct, exposed within equipment rooms, above suspended ceilings and below raised floors in cable trays, hangers or on deck, or within walls. If space is used as an air plenum, cable shall be installed in EMT conduit.
 - b. Each cable run shall be continuous single cable, homogenous in nature, without splices.
 - c. Cables shall meet CAT 5e performance criteria.
 - d. Cables shall have a moisture barrier waterproof gel. Rated as required for underground duct.
- 2. Conductors:
 - a. Insulated conductors: Eight #24 AWG, solid bare annealed copper.
 - b. Twisted pairs: Two insulated conductors twisted together to form a pair and four such paired cables to form a unit with individually color-coded pairs to conform to industry standards (ANSI/TIA 568-C.2)
- 3. Cable sheath:
 - a. Outer jacket: UV-and Abrasion Resistant Polyethylene
 - b. Flooding Compound: Waterproof Gel.
 - c. Armor: None
- 4. Color
 - a. Black

B. Patch Cords

- 1. Application: Suitable for indoor installations within equipment rooms or workstation environments.
- 2. Cords assembled from a single, continuous length of cordage, homogenous in nature and terminated at both ends via 8-position modular plugs. Splices are not permitted anywhere.

3. Cordage:
 - a. Insulated conductors: Category 5e, Eight #24 AWG, solid copper wire insulated with thermoplastic polyethylene or high-density polyolefin for non-plenum rated applications.
 - b. Insulated conductors: Category 6A, Eight #23 AWG, solid copper wire insulated with thermoplastic polyethylene or high-density polyolefin for non-plenum rated applications.
 - c. Twisted pairs: Two insulated conductors twisted together to form a pair and four such paired cables to form a unit with individually color-coded pairs to conform to industry standards (ANSI/ICEA Publication S-80-576-1994 and EIA-230).
4. Cable sheath:
 - a. Outer jacket: Seamless outer jacket, flame-retardant PVC, applied to and completely covering the internal components (twisted pairs).
 - b. Flame rating: CM according to NEC Article 800, tested to UL listed as such.
5. Electrical performance: Meet or exceed TIA/EIA-568-C.2 for Cat 5e and Category 6A UTP cabling.

2.04 CATEGORY 5E DISTRIBUTION PATCH PANELS

- A. Application: To terminate horizontal distribution cable for IP Intercom and VoIP telephone. The patch panels shall match the category of the horizontal cable and be from the same cable manufacturer or matched to the cable manufacturer for maximum warranty as required by the manufacturer.
 1. Copper patch panels shall be 19" rack mountable 24/48 ports and shall be no more than two rack mounting units in height.
 2. All copper patch panels shall have IDC-type terminating blocks.
 3. There shall be port identifier label space on the front and shall also include a port identifying number.

2.05 CATEGORY 6A DISTRIBUTION PATCH PANELS

- A. Application: To terminate horizontal distribution cable for OFOI Wireless Access Points. The patch panels shall match the category of the horizontal cable and be from the same cable manufacturer or matched to the cable manufacturer for maximum warranty as required by the manufacturer.
 1. Copper patch panels shall be 19" rack mountable 24 port pre punched and shall be no more than one rack mounting unit in height.
 2. Copper patch panels shall have individual Category 6A jacks.
 3. There shall be port identifier label space on the front and shall also include a port identifying number.

2.06 COPPER BACKBONE AND ANALOG SPEAKER TERMINATION BLOCKS

- A. Application: To terminate cat 5e backbone and speaker cables for analog telephone and intercom speakers.
- B. Materials
 1. 66M1-50 style termination blocks.

2.07 WORKSTATION JACKS AND WALLPLATES

- A. Outlet faceplates shall be suitable for indoor installations to standard single gang flush wall mounted outlet box plaster rings, and floor boxes.

- B. Outlets:
1. Data Jacks shall be 8 pin, IDC termination and rated Category 5e or category 6A.
 - a. Voice/Data/ Jack: Blue
 2. Standard wall mounted faceplates:
 - a. Faceplate shall be single-gang, flush mounted with 4 ports and shall include required accessories.
 - b. Faceplate shall match existing, ABS Plastic with a ID label window at the top and bottom of the plate.
 3. Telephone Wall Plate
 - a. Faceplate shall be single-gang, flush mounted with 1 port and Two mounting posts and shall include required accessories.
 - b. Faceplate shall be stainless steel.
 4. Surface mounted boxes (SMB)
 - a. Two piece boxes with a minimum of two ports
 - b. ABS Plastic with a ID label window at the top of the box.

2.08 WALL MOUNT CABINETS

- A. Wall-mount cabinets manufactured from steel sheet. Non-seismic applications - Maximum equipment weight of 300 lb (136 kg) when secured to the structural wall with standard anchors. Non-seismic load is tested per UL 2416 and the cabinet is UL Listed NWIN.E227626.
1. Size: As coordinated with useable space requirements selected.
 - a. Equipment Mounting Rails: One pair, #12-24 threaded; spaced horizontally to support 19 inches (482.6 mm) wide EIA-310-D compliant rack-mount equipment and shall provide 12U of rack-mount space.
 - b. Front Door: Tempered glass window
 - c. Rear Panel:
 - 1) 5 inches (130 mm) deep with factory-prepped bonding point and cable access via pre-punched knockouts for conduit along the top and bottom edges of the panel.
 - 2) Removable panels: the top and bottom panels are removable to allow retrofit of existing wall-mounted panels and include two rectangular, 9 inches (230 mm) x 2.2 inches (55 mm) knockouts for installation around loose cables, one on the top and one on the bottom.
 - 3) Knockouts: Four 1 inch (25.4 mm) knockouts for 3/4" trade size conduit; two on top and two on boom and four 3 inches (76 mm) knockouts for trade size 2.5 inch (63.5 mm) conduit; two on the top and two on the bottom. The back edge of the knockouts will be located 1.5 inches (38 mm) from the back surface of the panel (cabinet/wall). Two rectangular, 9 inches (230 mm) x 2.2 inches (55 mm) knockouts for loose cables, one on the top and one on the bottom.
 - 4) Grommets: Rubberized or plastic/composite which fit within the 3 inch (76 mm) knockouts to protect cables when conduit is not used to route cables.
 - 5) Cutout: One 6 inches (150 mm) high by 6 inches (150 mm) on the rear of the panel for cables passing through a recessed junction box.
 - d. Color: Powder coat Black.
 2. Basis Of Design: Chatsworth Cube IT.
- B. Open Swing Gate Rack
1. Wall-mount rack with swing gate, pivots open 90-degrees.
 - a. Material: Sheet aluminum and steel and aluminum extrusions.
 - b. Capacity: 100 lb (45.4 kg).

- c. Mounting Channels: Tapped #12-24 flange with the EIA-310-D Universal hole pattern.
 - d. UL and cUL Listed as an Audio/Video, Information and Communications Technology Equipment Cabinet, Enclosure and Rack Systems, NWIN and NWIN7 category, file number 227626.
 - e. Size:
 - 1) 12U by 19 inch EIA by 29.1 inches (739 mm) high by 21.7 inches (551 mm) wide by 17 inches (430 mm) deep usable
 - f. Color: black.
 - 2. Basis Of Design: Chatsworth Swing Gate Wall rack
- C. Labels:
- 1. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer or hand-held printer.
 - 2. Labels for horizontal cables:
 - a. Adhesive backed labels and self-laminating feature.
 - b. Fit the horizontal cables specified herein by fully wrapping around the cable jacket.
 - c. Size: 2" x .05" printable area, minimum.
 - d. Color: White with black lettering
- D. Miscellaneous components:
- 1. Velcro cable ties:
 - a. Width: 0.75".
 - b. Color: Velcro cable ties the same color as the cable to which it is applied.
 - 2. Plenum cable ties:
 - a. Suitable for use in plenums or air handling spaces.
 - b. Color: Maroon or other distinctive non-white color.

2.09 CABLE TESTING EQUIPMENT

- A. Twisted pair cabling:
- 1. Horizontal cable tester:
 - a. Equipment shall meet TIA/EIA-568C.2 Addendum 1 requirements for Level III accuracy, as applicable for cable type specified herein.
 - b. Test standards: ISO/IEC 11801 Class C and D; ISO/IEC 11801-2000 Class C and D, 1000Base-Y, 100Base-TX; IEEE 802.3 10Base-T; ANSI TP-PMD; IEEE 802.5.
 - c. Areas of test measurement (minimum):
 - 1) Wire Map.
 - 2) Length.
 - 3) Insertion Loss.
 - 4) The following at both master unit and remote unit:
 - a) Near End Crosstalk (NEXT) loss.
 - b) Power Sum NEXT (PSNEXT) loss.
 - c) Equal Level Far End Crosstalk (ELFEXT).
 - d) Power Sum ELFEXT.
 - e) Return Loss (RL).
 - f) Attenuation-to-Crosstalk Ratio (ACR).
 - g) Power Sum ACR (PSACR).
 - 5) Propagation Delay and Delay Skew.
 - 6) Characteristic Impedance.
 - 7) DC Loop Resistance.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of the telecommunication cabling system installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.
- B. Verify that pathways and supporting devices are properly and completely installed prior to cable installation.
- C. Verify dimensions of pathways to include length, i.e. "true tape" conduit runs.
- D. Prior to installation, verify that equipment rooms are ready to accept cables and terminations.

3.02 INSTALLATION

- A. Horizontal management panels:
 - 1. Provide the horizontal management panels mounted to racks with one above the top patch panel and one below the bottom patch panel in each rack bay where patch panels occur. Panels shall be angled
 - 2. Provide fasteners and parts required to complete the installation.
- B. Accessories: Provide all accessories as required for a complete installation. Include one bag of rack mounting screws, as come packaged with rack product. Attach the screws directly to the rack, which shall constitute turn-over to the Owner.
- C. Horizontal twisted pair cabling:
 - 1. Horizontal cable installation and routing:
 - a. Cable runs shall have continuous sheath continuity, homogenous in nature with no splicing.
 - b. Cabling shall not exceed a cable length of 295' (90m) from the termination point at the Telecom room to the termination at the workstation outlet, including service slack, when measured using test equipment.
 - c. Place cables within the designated pathways, such as cable tray or basket tray, cable runway, cable hangers, etc. Do not fasten, support or attach cables to other building infrastructures (i.e. ducts, pipes, conduits, etc.), other systems (i.e. ceiling support wires, wall studs, etc.), or to the outside of conduits, cable trays and non-approved pathway systems.
 - d. Place and suspend cables during installation and termination in a manner to protect them from physical damage or interference. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation or termination at no additional cost.
 - e. Route cables at 90° angles, allowing for bending radius.
 - f. Do not exceed pulling tension of 25 lbs.
 - g. Do not use cable-pulling compounds.
 - h. Do not exceed a minimum bend radius of 6 times the cable diameter during and after installation.
 - i. Route cables beneath other building infrastructures (i.e. ducts, pipes, conduits, etc.) in above ceiling applications. Do not route cables over building infrastructure/s. The installation shall result in easy accessibility to the cables in the future.
 - j. Place cables 6" minimum away from power sources to reduce interference from EMI.
 - k. Do not set 360° service loops in place for slack storage. Instead, set slack as forward- and-back or as figure eights.

- I. Place a pull string along with cables where run in conduits and spare capacity in conduit remains. Tie off ends of the pull string to prevent the string from falling onto the conduit.
 - m. When exiting the primary pathway, such as cable or basket tray, to the workstation outlets, exit via the top of the pathway. Secure the cables to the pathway using an approved velcro cable tie.
2. Cable routing and dressing within telecommunications rooms:
 - a. Within rooms, only use Velcro type straps.
 - b. Place cables within the overhead cable support system. When routing vertically on walls, fasten the cables onto vertical supports every 24" on center.
 - c. Provide 12" minimum sheath cable slack, length not to exceed permanent link maximum length requirement. Place the slack in the overhead cable support system.
 - d. At the rack bay, route and neatly dress cables from the overhead cable support system into the back of the vertical management sections. Divide the cables equally between both sides of an equipment rack such that a cable does not travel past the midpoint of the rack prior to termination. Fasten the cables to the cable support bar at the back of the patch panel using approved ties.
3. Termination in the telecommunications rooms:
 - a. Provide termination apparatus and accessories required for a complete installation. Install and assemble termination apparatus, accessories and associated management apparatus according to the manufacturer's instructions.
 - b. Properly relieve strain from the cables to and at termination points per manufacturer's instructions. Provide a strain relief bar at the back of the modular patch panels for proper strain relief.
 - c. Terminate cables and twisted pairs in accordance with manufacturer's latest installation requirements and TIA/EIA-568-C standard installation practices. Terminate cable pairs onto the termination apparatus compliant to T568B wiring.
 - d. Modular patch panels and horizontal management panels:
 - 1) Provide quantity of patch panels to support the terminations of cables served from respective Telecom Room.
 - 2) Install and assemble patch panels and wire management panels according to the manufacturer's instructions.
 - 3) Install the termination hardware and cable management as shown on the Drawings.
 - 4) Terminate cables in sequential order using the link's identifier starting at the top left and completing a block before moving to the next block below.
 - 5) Terminate all WAP cables on it's own patch panel.
4. Cable routing and dressing at workstations:
 - a. Provide 18" cable slack at each workstation outlet, length not to exceed permanent link maximum length requirement. Place the slack within ceiling space neatly on a cable hanger or other approved cable support device.
 - b. Route to partition furniture mounted faceplates:
 - 1) Route cables from primary or secondary pathway within ceiling through the furniture partition feed pathway (stub from wall or floor box) into opening at bottom of furniture system. Exercise caution to prevent scraping, cutting or other damage to cable jacket.
 - 2) Provide spiral wrap around cables from furniture-feed pathway to point where cables enter furniture.
5. Termination at the workstation outlets:
 - a. Provide device components, connectors, and accessories required for a complete installation. Install and assemble connectors, jacks, adapters,

- termination apparatus, accessories and associated management apparatus according to the manufacturer's instructions.
 - b. Provide blue connectors for data links, yellow connectors for wireless data, and green connectors for cameras.
 - c. Wall mounted standard devices:
 - 1) Install devices at heights indicated on drawings.
 - 2) Mount faceplates plumb, square and at the same level as adjacent power receptacles.
 - 3) Patch gaps around faceplates so that faceplate covers the entire wall opening.
 - d. Partition furniture mounted devices:
 - 1) Coordinate installation of the faceplate adapters with the furniture contractor, including color.
 - 2) Mount faceplate adapters into the designated openings for horizontal cables.
 - e. Terminate cables and twisted pairs in accordance with the manufacturer's latest installation requirements and TIA/EIA-568-B standard installation practices. Terminate cable pairs onto the connector compliant to T568A wiring.
6. Patching and cross connecting:
- a. In equipment rooms, provide one modular patch cord for each connector jack in each workstation outlet. Install from the horizontal termination field to the network switches/equipment. Neatly dress patch cords within the horizontal and vertical cable management components. Cords lengths shall be coordinated with the owners IT representative.
 - b. At work station, provide one modular patch cord for each cable jack installed in each workstation outlet. Cords shall include:
 - 1) 100% of cords shall be 10'
 - 2) labeling
- D. General requirements:
- 1. Labeling, label colors, and identifier assignments shall conform to EIA/EIA-606-A Administration Standards and as approved by the Owner.
 - 2. Provide permanent and machine-generated labels. Hand written labels will not be accepted.
- E. Horizontal twisted pair labeling:
- 1. Cables:
 - a. Text color shall be black, #10 font size.
 - b. Label installation:
 - 1) Provide labels on both ends of cable.
 - 2) Install labels such that they are visible by technician from a normal stance.
 - 3) Fully wrap label around the cable jacket (self lamination).
 - 4) Provide one label within 4" of the termination apparatus.
 - 2. Modular patch panels:
 - a. Text color shall be black, #10 font size .
 - b. Label installation:
 - 1) Provide a Letter designation for each panel (A, B, C etc...). Patch Panel port number will match the cable designation at the station end..
 - 3. Outlets:
 - a. Text color shall be black, #10 font size.
 - b. Label installation:
 - 1) At faceplates, provide labels above and below jacks.
 - 2) At surface boxes, provide labels on the top of the box.

3.03 FIELD QUALITY CONTROL AND TESTING

A. General:

1. Calibrate test sets and associated equipment per the manufacturer's instructions at the beginning of each day's testing and after each battery charge. Fully charge the test sets prior to each day's testing to ensure proper operation.
2. Ensure test equipment and test cords are clean and undamaged during testing activities. Per the Engineer's discretion, halt testing activity and clean testing equipment, test cords and related apparatus.
3. Permanently record test results electronically within test equipment at the time of testing.

B. Twisted pair testing:

1. Test for UTP cabling as follows:

TESTS FOR CATEGORY 5E & 6A CABLING TABLE				
SUBSYSTEM	TYPE	TEST	Configuration	NOTES
Horizontal	CAT5e Cat 6A	Category 5e Category 6A	Permanent Link	Per TIA/EIA-568-C.2

2. Precautions:

- a. Adhere to the equipment manufacturer's instructions during all testing.
- b. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature, approximately 70°F.
- c. Fully charge power sources before each day's testing activity.

3. Horizontal twisted pair testing:

a. Test equipment set-up:

- 1) Set-up the tester to perform a full cat 5e test, as a Permanent Link configuration.
- 2) If the tester has the capability, set the cable type as product specific setting. If not, set as generic cat 5e cable.
- 3) Set the tester to save the full test results (all test points, graphs, etc.).
- 4) Save the test results with associated cable link identifier.
- 5) Calibrate the test set per the manufacturer's instructions.

b. Acceptable test results measurements:

- 1) Overall test results:
 - a) Links which report a Fail, Fail or Pass for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.
 - b) Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.
 - c) Remove and replace any cabling links failing to meet the criteria described in this Specification, at no cost to the Owner, with cables that prove to meet the minimum requirements.
- 2) Wire map: Provide continuous pairs and terminate all of the cabling links correctly at both ends, no exceptions taken.
- 3) Length: Ninety-four meters (308 feet) is the maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration, including test cords.

- 4) Insertion loss: The acceptable insertion loss measurements for any horizontal cabling link is that which is no greater than that listed in TIA/EIA-568-C.2.
- 5) Worst pair-to-pair near end crosstalk (NEXT) loss: The acceptable worst pair-to-pair NEXT loss for any horizontal cable is that which is no greater than that listed in TIA/EIA-568-C.2.
- 6) Power sum NEXT loss: The acceptable power sum PS-NEXT loss for any horizontal cable is that which is no greater than that listed in TIA/EIA-568-C.2.
- 7) Worst pair-to-pair ELFEXT and FEXT loss: The acceptable worst pair-to-pair ELFEXT and FEXT loss for any horizontal cable is that which is no greater than that listed in TIA/EIA-568-C.2.
- 8) Power sum ELFEXT and FEXT loss: The acceptable PS-ELFEXT and PS-FEXT loss for any horizontal cable is that which is no greater than that listed in TIA/EIA-568-C.2.
- 9) Return loss: The acceptable return loss measurements for any horizontal cabling link is that which is no greater than that listed in TIA/EIA-568-C.2.
- 10) Propagation delay and delay skew: The acceptable propagation delay and delay skew measurements for any horizontal cabling link is that which is no greater than that listed in TIA/EIA-568-C.2.

C. Record documents:

1. Permanently record all test results.
2. Export test results' numerical values to a single Microsoft Excel spreadsheet.
3. Submit test results in a format acceptable to the Owner, Owner's Representative and the Engineer before system acceptance.
4. Cable, fiber and pair identifiers of the test reports shall match the identifiers as labeled in the field, i.e. use the same ID on the cable/termination label as what appears on the test report.
5. Measurements shall carry a precision through one significant decimal place, minimum.
6. Use feet for the units for measurements shown on the print of the test measurements.
7. Print report such that fiber strands of a given cabling link have matching axis scales. The "X" and the "Y" axis shall be the same from report-to-report.
8. The trace of the printed test report shall show the launch cord.
9. For each fiber optic cable test, report shall contain the following information:
 - a. Project name and address.
 - b. Test company's and Operator's name.
 - c. Date measurements were taken.
 - d. Test equipment type to include model and serial numbers.
 - e. Cable identification number, fiber/strand number and fiber type (i.e. multimode, , etc).
 - f. Measurement direction.
 - g. Set-up parameters (i.e. wavelength, pulse width, refractive index, event threshold, etc.)
 - h. Length of fiber.
 - i. Overall link loss.
 - j. Passive link insertion loss testing:
 - 1) Wavelength.
 - 2) Loss measurement.
 - k. Pass/Fail
10. For each cabling link, include either a schematic graphic or a brief narrative accurately describing the test set-up. The description shall include test/launch cord (with length), expected events (connectors, slices, etc.) with expected distances,

etc. This information will eliminate many questions the Engineer will have while reviewing the reports.

11. For each twisted pair horizontal cable test, report shall contain the following information:
 - a. Project name and address.
 - b. Test company's and Operator's name.
 - c. Date measurements were taken.
 - d. Test equipment type to include model and serial numbers.
 - e. Cable identification number and pair number.
 - f. Measurement results.
 - g. Pass/Fail

3.04 INSPECTION AND ADJUSTMENTS

- A. Contractor shall inspect all installed Work in conjunction with the General Contractor and develop a "punchlist" for all items needing correction. Provide punchlist to the Engineer prior to their final walk of Project.
- B. Punchlist work and the required remediation shall be performed prior to system final acceptance.
- C. Replace or repair work completed by others that was defaced or destroyed during the installation of the telecommunication cabling system by this contractor.
- D. Make changes to adjust the system to optimum operation for final use. Contractor is responsible for making changes to the system such that any defects in workmanship are correct and all cables and the associated termination hardware passes the minimum test requirements.

3.05 CLEANING

- A. Remove all unused, excess and left over products, to include debris, spills, and installation equipment.
- B. Leave finished work and adjacent surfaces in neat, clean conditions with no evidence of damage.
- C. Legally dispose of debris.
- D. Clean installed products in accordance with manufacturer's instructions prior to final punch list.

END OF SECTION

SECTION 27 50 00**SCHOOL COMMUNICATION SYSTEM****PART 1 - GENERAL****1.01 SUMMARY**

- A. Provide New Public Address System Head-End Equipment. Match District Standards, reconnect to existing Campus Devices and Circuitry.
- B. 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. Equipment cabinet
 - 2. Mixers.
 - 3. Amplifiers.
 - 4. Monitor
 - 5. Keyboard
 - 6. Accessories.
- C. 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.

1.02 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
 - 1. Electronic Industries Association (EIA):
 - EIA REC 127-49 Power Supplies.
 - EIA RS 160-51 Sound Systems.
 - EIA RS 299-A Loudspeakers, Dynamic Magnetic Structures and Impedance.
 - EIA RS 310-A Racks, Panels and Associated Equipment.
 - EIA SE 101-A-49 Amplifiers for Sound Equipment. EIA SE 103-4 Speakers for Sound Equipment.
 - EIA SE 105-A Microphones for Sound Equipment.
 - 2. Underwriters Laboratories, Inc. (UL):
 - UL 13 Power-Limited Circuit Cables
 - UL 50 Enclosures for Electrical Equipment.
 - UL 813 Commercial Audio Equipment.

1.03 SYSTEM OVERVIEW AND SCOPE OF WORK

- A. The work provided herein consists of furnishing and installing all equipment, cabling and labor required for a complete, operable, new computer based administrative communication and control system as shown on the plans and specifications.
- B. The system shall provide a communications path to all classrooms, workrooms, multi-purpose rooms, offices and corridor speaker locations and all exterior speaker locations. The communications path shall be separate from voice processing system allowing simultaneous use of classroom telephone and receipt of intercom pages to the speaker without interruption.
- C. A VoIP telephone system shall be interfaced to the telephone system allowing any telephone location, to initiate a page, call a specific room or zone, or initiate an

emergency or timed tone. Telephone system must provide FXO/FXS or a SIP Trunk. For classroom call-in routing telephone system shall provide proper routing of static dial string(s) and for traditional telephony interfaces (FXO/FXS) use RFC-2833 for DTMF signaling.

1. Interfaces providing FXS telephony connection (PSTN/POTS/Extension) shall provide proper disconnect, specifically polarity reversal during connection/disconnection.
- D. The equipment specified herein and shown on the drawings is based upon equipment as manufactured by Three Sixty. The intent is to establish a standard of quality, function, and features. It is the responsibility of the bidder to ensure that the system meets or exceeds all standards set forth in these specifications.
- E. The contractor shall provide all support to the District to interface the system to other communication devices.
- F. The installation contractor shall be factory authorized to install, program and maintain the voice communication system.

1.04 SUBMITTALS

- A. Contractor is to submit the following prior to construction for approval.
- B. Contractor will provide, prior to installation, a current letter of recommendation from the manufacturer, addressed to the owner. Letter of recommendation must be given to General Contractor at time of bid. Contractor must be certified with the manufacturer at least twelve(12) months prior to letter of recommendation. Please reference project number.
- C. Contractor will provide data of factory certified installers experience and qualifications, which shall include three (3) years on projects of similar complexity. Include names and locations of two (2) projects successfully completed using a Three Sixty Voice Communications & Sound System. Include written certification from users that systems have performed satisfactorily for not less than 18 months.
- D. Provide documentation stating you have been in the telecommunication contracting business for a minimum of five (5) years under the same name and are located within a four (4) hour response time of the District.
- E. Product Data:
1. Manufacturer's data, user and installation manuals for all equipment and software programs including computer equipment and any other equipment required for the Voice Communications & Sound System
 2. Preparation instructions and recommendations
 3. Storage and handling requirements and recommendations
 4. Installation methods
 5. Labeling and schematic for cabling and components. Voice Communications & Sound System contractor must coordinate with Electrical contractor for labeling of cable.
 6. Parts list and quantity of each part
- F. Shop drawings shall provide details of proposed system and the work to be provided. Include point-to-point drawings of systems and wiring diagrams of individual devices.
1. Detailed wiring diagrams and system description
 2. System device locations on architectural floor plans
 3. Full Schematic of system, including wiring information for all devices
- G. Training Schedule to provide details for the District staff. Include time line with class types

and descriptions and amount of people that can attend along with location.

1.05 CLOSE OUT

- A. Documentation to be submitted by the Contractor upon completion of system installation:
 - 1. Upon completion of installation, the Contractor shall prepare "As Built" drawings of the system. These As Built shall be 30 inches by 42 inches (76 cm by 107cm) drawings of each floor plan indicating exact device locations, cable routes and wire numbers as tagged on the cable tag.
 - 2. The contractor shall provide an electronic copy of As Built drawings in auto Cad 2016 or newer and a pdf copies of all floor plans.
 - 3. As Built shall be submitted to the owner for approval prior to the system acceptance walk through.
 - 4. Operation and maintenance manuals: three sets of operating manuals shall be provided electronically and in written binder format explaining the operation and maintenance of the system.
 - 5. Maintenance required and maintenance schedule
 - 6. The system contractor shall generate a list of call stations and their associated rooms to be given to the school.

1.06 DELIVERY STORAGE AND HANDLING

- A. Deliver materials in manufacturers original new, unopened, undamaged containers; and unharmed original identification labels.
- B. Store products in manufacturers unopened packaging until ready for installation
- C. Protect and store materials from environmental and temperature conditions following manufacturer's instructions.
- D. Handle and operate products and systems according to manufacturer's instructions

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Galaxy 360 - Substitutes will not be considered.

2.02 SYSTEM DESCRIPTION, FUNCTIONS AND FEATURES

- A. Definitions:
 - 1. SIP – SIP protocol specifically SIP 2.0, RTP (UDP), G711u, RFC-2833.
 - 2. Zone event – any event to grouped 25/70-volt speakers and/or compatible IP-endpoints (IP speakers, IP amps, etc.) and includes pages, emergency zone alert types, audio streams, playlist and scheduled events.
 - 3. Intercom event – any full duplex event to a speaker (25/70-volt or compatible IP-endpoint) capable of full duplex communication and includes the processing of intercom, call-ins and emergency call-ins.
 - 4. Phone/handset/reachable SIP endpoint – any initiating/receiving device (phone or variant) that "reaches to/reached from" the Galaxy system via SIP (LAN/WAN or otherwise), including but not limited to; SIP Phones, SIP Trunking services provided by VoIP based phone systems or telco providers, other Galaxy Systems, PRI's/T1's etc., compatible SIP interfaces/SIP softphones such as Galaxy View or similar software based compatible SIP clients, or any device/system/PBX etc. that touches the system via FXO/FXS technologies through supported ATA devices (VoIP to FXO/FXS gateway)
- B. The system minimally consists of a central equipment cabinet, containing a system

server running upgradable module based software and a network switch, and some local/remote variance of speaker cards, phones/handsets, amplifiers, classroom loudspeaker assemblies, IP paging endpoints (speakers, amplifiers etc.) and all associated material, hardware, wiring, and options as described herein to provide a complete working system which shall meet the specified requirements.

- C. The system may contain Remote Addressable Units (RAU)
1. Remote Addressable Units shall consist of:
 - a. Rack mount 120/240w amplifiers located in Central System Equipment
 - b. Rack Audio Bridge in 1U fully enclosed chassis located in Central System Equipment
 - c. Speaker/Call-in cards in 1U fully enclosed chassis located in Remote System Equipment
 - d. Fiber Transmitters and Receivers (if fiber is used) or copper connections (if copper is used)
 - e. Remote System Equipment shall be connected in a star topology to the Head end via:
 - 1) Copper: CAT5e cable; All speaker cards connected via copper may be equipped with EVO Emergency Voice override to allow for emergency paging in the event of a power failure. Part # IC1100RC
- D. IP and 24/70-volt general wiring for speaker and call-in should be cabled in CAT 5e cable. 24/70 volt speakers will be cross connected to site cabling at the STC to connect to the intercom headend. IP speakers shall be category 5e cables to the buildings IDF cabinet/s.
- E. UPS (uninterruptible power supply) shall be provided to maintain system integrity in instances of power loss. Refer to Section 272010.
- F. System computer shall include the capabilities to act as the master clock, correcting compatible brands of analog and digital secondary clocks. The system clock shall be capable of synchronizing to Internet or time server(s).
- G. The system shall provide the following communication paths and functions:
1. For 25/70-volt speaker architectures a minimum of 1 intercom and 1 zone path shall be provided with the ability to add additional intercom/zone paths.
 2. Phone/handset to a single speaker.
 3. Phone/handset to phone/handset.
 4. Phone/handset to any of the programmable paging zones.
 5. Phone/handset to record and forward to any of the programmable paging zones.
 6. Phone/handset to any of the programmable emergency zone alerts in the system.
 7. Phone/handset initiation/canceling of audio stream channels
 8. Ability to initiate programmable emergency zone alerts using dry contact closures.
 9. Ability to schedule tones, playlist or audio streams to paging zones.
 10. Ability to limit access to individual paging, emergency alerts, and intercom speakers using phone/handset authorization, with a 4-6 digit pin or both.
 11. Assignable prioritization of individual page or emergency zone alerts.
 12. Partial creation of paging, emergency alert, or scheduled event(s) with automatic inclusion of released zone/intercom paths due to prioritization or event type override.
 13. Queueing of scheduled tones when all existing zone path(s) are unavailable.
 14. Automatically re-establishing full or partially interrupted playlist or audio stream events.

15. Each Room/Call-in closure can be set to function as Intercom Call-in/Emergency Call-in and/or Tone Event and/or be included in a check-in response during emergency/drill events.
 - a. Each room/call-in shall be capable of producing a 'Normal' call-in event and an 'Emergency' call-in event. Routing of call-in events shall include caller-id, number and denote 'Emergency' call -in events. Each call-in shall be able to be include day/time-of-day routing to specified phone(s)/handset(s) with roll-over or simultaneous ringing options.
 - b. Each room/call-in shall be capable of initiating a tone event(s) as a function day/time- of-day. The tone event will generate any system-defined tone for the specified duration (or as long as the contact remains closed) to any programmable zone and shall also include additional notification, and relay response options.
 - c. Each room/call-in shall be capable of being included in check-in group(s)/process and which shall be assignable to any paging or emergency zone event as function of day/time-of-day. Live and past (view/download/remove) check-in status is available through the Galaxy View software with option to "manually" check-in rooms by authorized users. Programmed 'Emergency' call-ins processes shall remain unaffected by "check-in", 'Normal' call-ins shall be processed as usual once room is "checked-in" (first closure checks-in subsequent single/non-holding closures are processed as 'Normal' call-ins).
16. Ability to add additional tones or pre-recorded messages (.wav, or .mp3) to the system for use in emergency alerts, notifications and scheduled events.
17. Provide protected, feature configurable multi-user access to programming the system from any Windows based computer capable of running Galaxy Compose that can reach the system via TCP/IP network.
18. Provide protected, feature configurable multi-user access to live viewing, response and control of the system from any Windows based computer capable of running Galaxy View that can reach the system via TCP/IP network: All features and functionality shall also be able to be extended to simultaneously include other reachable Galaxy systems for multi-system view, response and control.
19. Parallel distribution/monitoring of live audio from any intercom type and/or any zone type event to any combination of reachable endpoints, as a function of day/time-of-day or in real time.
20. File playback based notification of any intercom type and or zone type event to any combination of reachable SIP endpoints, as a function of day/time-of-day or in real time.
21. TTS (Text-to-Speech) notifications capable of dynamically detailing intercom and zone event information to reachable SIP endpoints, as a function of day/time-of-day in real time.
22. Email notifications capable of dynamically detailing intercom and zone event information to email groups as a function of day/time-of-day or in real time.
23. Recording and management of intercom and zone events as a function of day/time-of-day or in real time.
24. IP multicast XML templated messages capable of dynamically detailing intercom or zone event information as a function day/time-of-day or in real time.
25. Desktop pop-up application capable of receiving/filtering/displaying multiple multicast XML messages that contain static or dynamic information related to any intercom/zone event(s) from any Windows based computer capable of running Galaxy Alert and able to receive multicast messages originating from Galaxy Server.
26. Serial (RS-232/RS-485 or compatible variance) notifications capable of including any intercom, call-in button status, or zone event information as a function of day/time-of-day or in real time.

27. Scheduling weekly/daily emails containing system and call logs to email groups.
28. Email notifications of critical changes in system status/monitored network devices to email groups.
29. Text-to-Speech notifications of critical changes in system status/monitored network devices to reachable SIP endpoints.
30. Provide 2 auxiliary dry contact closures per speaker card. Any contact closure can be assigned any combination of open/close/open-close for duration/close during event as function of time in association with any intercom or zone event. Additionally, any contact closures can be configured to close for set durations at any combination of 1hr, 12hr, 24hr intervals.
31. FXO devices/objects/analog phone etc. attached to an FXS on an approved ATA gateway (FXS to VoIP on system) shall be able to be configured to automatically dial any pre- defined dial-string on the system when the line is 'picked-up' as a function of day/time- of-day.
32. Ability to define custom dial strings/patterns for use by phone/handset/reachable sip endpoints/intercom/page events/notifications as a function of day/time-of-day for inbound/outbound or internal communications.
33. Provide voicemail for each system defined phone extensions (SIP accounts).
34. Ability to automatically forward system defined phone extensions (SIP accounts) to voicemail as a function of day/time-of-day.
35. Provide the ability to layer auto-attendant menus, with each menu able to define a custom greeting, 0-9 digit routing, as a function of day/time-of-day, and assignable access to all features/objects on the system.
36. Ability to simultaneously multicast any/all intercom and zone event audio, for use by any compatible endpoint such as IP Speakers/Horns/Amplifiers etc.
37. Ability to initiate/control/view intercom events, zone events, serial notifications, close/open contact closures, phones, as well as live triggering of assignable intercom/zone event notifications (TTS, email, monitoring, recording, broadcasting, serial, contact closure.) via customizable and layer-able visual/pictorial/topographical representations of the system and the locations of it associated objects/events.

2.03 SYSTEM COMPONENTS

A. Central System Equipment

1. Galaxy Power Edge Server: T9008GXY
 - a. 1RU w/Raid 1 Xen pro w/Rdnt PS-Galaxy Software: 120GB
 - b. Redundant Power Supply
 - c. 8GB Memory
 - d. Windows 7x64 Professional or most current.
2. Network Switch: IC4000R
3. Communications Card: IC1110R-8 Rack Mount Converter Card with 8 Ports
4. Audio Bridge: IC2000
 - a. VoIP ATA (IP to Traditional Telephony Translation)
 - b. 4 Analog phone adapters
 - c. 4 line adapters
 - d. Auto provisioned
5. Amplifier: 120 or 240 Watt Modular Amplifier; provide minimum (2) amplifiers sufficient to provide 1 Watt per interior analog speaker and 12 Watt per exterior speaker. Three Sixty TS120/240 as required
6. VOX Card: IC1130R Rack Mount VOX Card
7. Speaker Card: IC1100
 - a. 16 Intercom/Page selection with 16 call-in
 - b. RS-485 serial control
 - c. 64 Total watts
 - d. 2, 5v relays
8. Rack Mounted UPS / Battery Back-up: TUPS1500 1500VA Uninterruptible Power

Supply

9. KVN: Keyboard, Mouse and Monitor
10. Cabinet: 6622 Stand Alone Cabinet with 22 Rack Units of Vertical Space or larger depending upon size of system.

B. Intercom System Speakers

1. Interior 24/70V Speakers (Replace existing general all call speakers)
 - a. The loudspeaker shall be an 8" (203mm) dia., dual cone type with frequency response of 50Hz to 18kHz (± 10 dB).
 - b. Loudspeaker shall include a factory-wired 25/70.7V transformer with power taps of .25, .5, 1, 2, and 4 watts. The baffle shall be treated 14-gauge steel finished in baked white powder epoxy.
 - c. The system shall utilize an interior steel security screen between the speaker and baffle opening.
 - d. The speaker shall fit over the existing enclosure and shall be approximately 11.6" x 11.6" square.
 - e. Speaker Part #: TQS01
2. Interior IP Speakers (Replace existing classroom speakers)
 - a. The loudspeaker system shall include factory assembled loudspeaker, IP addressable PCB amplifier/ control and metal baffle.
 - b. The loudspeaker shall be an 8" driver with a 10oz (260g) ceramic magnet and seamless cone. The impedance shall be 8 ohms and a voice coil diameter of 1" (25mm).
 - c. The loudspeaker dispersion shall be 105° (800Hz - 4kHz) and frequency response of 86Hz – 15.5kHz (± 5 dB). The max peak output at 1W/1m shall be 98dB SPL.
 - d. The amplifier/control board shall be capable of producing 15-watts RMS when using an IEEE 802.3at compatible PoE+ switch or 24VDC local power supply and 10-watts RMS when used with an IEEE 802.3af compliant PoE switch.
 - e. Interconnect shall be via female RJ-45 connector mounted to the PCB. All control functionality shall be determined via software.
 - f. Finish shall be neutral white electrostatic powder coat.
 - g. Model: SIP Speaker
 - 1) Wall Mount Adapter: IP-011151
3. Exterior 24/70V Speakers (Replace exterior speakers)
 - a. Unit shall be 8" diameter loudspeaker /transformer combination
 - b. The low-frequency reproducer cone shall be a full 8" (203mm) in diameter and the high frequency reproducer cone shall be 3" (76mm) in diameter. The woofer shall have a 10oz. (260g) ceramic magnet; the tweeter shall have a 2.35oz. (67g) ceramic magnet. The two reproducer sections shall be coupled through a built-in crossover network. The crossover frequency shall be at 2800Hz. Frequency response range shall be 70Hz – 15.5kHz, (± 5 dB). Sensitivity shall be 98dB at 1 Watt/ 1 meter. Voice coil impedance shall be 8 Ω .
 - c. Low frequency voice coil diameter shall be 1" (25mm) and operate in a magnet field of at least 10,600 gauss.
 - d. Transformer primary voltage shall be 25V/70.7V with a frequency response range of 100Hz – 10kHz and power taps at .5, 1, 2, and 4 watts. Insertion loss shall not exceed 1.5dB. The maximum depth of the loudspeaker shall not exceed 27/8" (73mm).
4. Exterior IP Speakers
 - a. The loudspeaker system shall include factory assembled horn loudspeaker, IP addressable PCB amplifier/control, and metal baffle.

- b. The metal baffle shall be constructed from cast aluminum alloy and able to protect from vandal tampering or impact.
 - c. The loudspeaker shall be a 3.8" high-output compression driver. The impedance shall be 8 ohms and a voice coil diameter of 1.25" (31.75mm).
 - d. The loudspeaker dispersion shall be 95° (800Hz - 4kHz) and frequency response of 700Hz –5kHz (±5dB). The max peak output at 1W/1m shall be 120dB SPL.
 - e. The amplifier/control board shall be capable of producing 15-watts RMS when using an IEEE 802.3at compatible PoE+ switch or 24VDC local power supply and 9-watts RMS when used with an IEEE 802.3af compliant PoE switch. Interconnect shall be via female RJ-45 connector mounted to the PCB. All control functionality shall be determined via software.
 - f. The unit shall be Atlas IED model IHVP+ or equal
 - g. The metal loudspeaker baffle overall dimensions shall be 10.75" (273.1mm) x 10.75" (273.1mm) x 4.49" (114mm) HxWxD. Finish shall be neutral white electrostatic powder coat.
 - 1) The enclosures shall include: SEST-IH surface mount enclosure
- C. Master Clock
- 1. The Master Clock shall be the Threesixty 3000 Series.
 - 2. The master clock shall have an LED display, as well as a backlit, two row by twenty character LCD display. It shall also have a 16 button rubber tactile keypad next to the displays that shall allow a user to program the master clock.
 - 3. The master clock shall have up to ten pre-programmed NTP servers which will be accessible for modification over a network interface.
 - 4. The master clock will be capable of receiving signals from existing master clocks via RS485, 59 minute correction, 58 minute correction, National Time and Rauland transmission protocol, or Dukane transmission protocol.
 - 5. The master clock (when a wireless transmitter is attached) shall be capable of translating a wired synchronization signal into the wireless signal, and then broadcasting the wireless signal to Threesixty TIAL secondary clocks
 - 6. The master clock shall contain two clock circuits that have the capability to run synchronous wire systems such as 59 minute correction, 58 minute correction, National Time/Rauland or a once a day pulse for intercom systems.
 - 7. The master clock will be capable of acting as a repeater for another master clock.
 - 8. The master clock shall contain the necessary circuitry and programs so that a typical web browser, like Internet Explorer, can access the clock over a local area network. When accessed this way, the clock settings can be modified through a graphic user interface. The interface shall allow the user to program all of the display features for secondary clocks, the IP settings of the master clock, and any system setting that the master clock has.
 - 9. SNTP Server – The master clock shall have the capability to distribute time via SNTP protocol over a computer network. This means that IP devices on the network will be able to acquire SNTP data from the master clock if directed to do so.
 - 10. The master clock model #:
 - a. 3000 Series: TIMA-3S0-1000-1
- D. Classroom/Office Wireless Clock - For replacement of existing clocks
- 1. The secondary clock shall be a Three sixty TIAL Series wireless clock. It shall be an analog clock with a black hour hand, a black minute hand, and a red second hand.
 - 2. The clock will be capable of receiving and then re-transmitting a signal from any other Sapling device that transmits data using Sapling's wireless protocol.
 - 3. The clock shall use frequency-hopping technology to receive time data on a

frequency range of either 915–928 MHz or 2.4GHz, depending on the type of transmitter that was ordered.

4. The clock shall also be able to retransmit time data on the same frequencies: either 915- 928MHz or 2.4GHz, depending on the type of transmitter that was ordered. The frequency-hopping technology shall allow the clock to transmit time data without causing interference to other wireless devices that may be transmitting at the same time.
5. The clock shall be designed to be used with the Three sixty TIMA 3000 series Master Clock (with the transmitter option installed) or the Three sixty TIMA series Repeater. Time data shall be transmitted and received by the clock via Three sixty wireless communication protocol.
6. The clock shall also be designed to receive and retransmit time data. Upon receipt of the wireless signal, the clock will immediately self-correct.
7. The clock's transmitter shall be able to successfully transmit data over a line-of-sight, unobstructed distance of up to 1320 feet (402 meters).
8. The clock shall include an executable method for automatic hand calibration, as well as a diagnostic function that allows the user to view the quality of the signal, the last time the clock received a correction signal, the performance and results of a gearbox test, and a comprehensive analysis of the entire clock movement. These diagnostic functions shall be enabled by pressing a button on the clock movement.
9. The clock shall require fewer than five (5) minutes to perform a correction of the hand positions.
10. The battery-powered model of the clock shall be capable of receiving a signal every two(2) or four (4) hours. The 24V, 115VAC models of the clock shall be capable of receiving a signal every minute.
11. The clock shall have a smooth surface ABS case which can be attached either directly to the wall, or to a standard-sized gang box.
12. The clock case shall be produced in round cases with diameter 12 inches, or square cases with widths of 12 inches. The dial is to be made of durable polystyrene material. The crystal is to be made of shatterproof, side molded polycarbonate.
13. The clock shall be FCC compliant, in accordance with part 15 Section 15.247.
14. The clock models shall be:
 - a. Round 24V/110V Operated: TIAL-2BS-12R-14
 - b. Round Battery Operated: TIAL-2BS-12R-0
 - c. 12" Clock Wire Guard: SAG-1200 (Gymnasium/Locker and Multi-Purpose)
 - d. 12" Universal Mounting Bracket: M-UMB-12-1
 - e. 12" Surface Mount Ring: A-Mount-12S-2

E. Miscellaneous

1. Remote Access Software: provide the capability to install at owner's request (2) copies of Remote Access Software

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of the intercom system installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.02 PREPARATION

- A. Verify exact speaker locations with respect to light fixtures, mechanical diffusers, sprinkler head and fire alarm devices.

- B. Review any conflicts with the project manager prior to installation.

3.03 INSTALLATION

- A. General:
 - 1. Install the intercom system in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.
 - 2. Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.
- B. Wiring:
 - 1. Building wiring to analog speaker devices shall be re-used.
 - 2. New building category 5e cabling will be provided for IP speaker end points.
 - 3. OSP category 5e cable will be provided between the intercom headend and the building signal termination can (STC).
 - 4. Patching between the headend and site cable.
 - 5. Patching between the building analog speaker cable and site cable.
 - 6. Category 5e patch panels at the IDF and MDF rack for IP speakers.
 - 7. Wiring within the headend and interface to distributed cable shall be new.

3.04 GROUNDING

- A. Provide equipment-grounding connections for the intercom system. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- B. Ground equipment, conductor and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pick-up, cross talk and other impairments. Provide 5-ohm ground at main equipment location. Measure, record and report ground resistance.
- C. Provide a #6 insulated ground wire from the system ground bus in the equipment cabinets and racks to the nearest cold water pipe.

3.05 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, pretesting and adjustment of the intercom system.
- B. At least three weeks prior to any testing, notify the Engineer so that arrangements can be made for witnessing tests, if deemed necessary. All pretesting shall have been tested satisfactorily prior to the Engineer's witnessed test.
- C. Pre-functional testing:
 - 1. Visual and mechanical inspection:
 - a. Inspect for physical damage, defects alignment and fit.
 - b. Perform mechanical operational tests in accordance with Manufacturer's instructions.
 - c. Compare nameplate information and connections to Contract Documents.
 - d. Check tightness of all connections.
 - e. Check that all covers, barriers and doors are secure.
 - 2. Electrical tests:
 - a. Perform complete testing to determine conformance with the requirements of the Contract Documents.
 - b. Operational test: Perform an operational test to verify conformance of system performance and conditions to Contract Document within Manufacturer's tolerances. Perform tests that include originating program

- and page material at microphone outlets, all preamplifier program inputs and all other inputs. Observe sound reproduction for proper volume levels and freedom from noise.
- c. Power output test: Measure the electrical power output of each power amplifier at normal gain setting at 50, 1,000 and 12,000 Hz. The maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.
 - d. Provide a list of final tap settings of speaker line matching transformers.
3. Test report:
- a. Provide a complete report listing every device, the date it was tested, the results and the date retested (if failure occurred during the previous test). The test report shall indicate that every device tested successfully.
 - b. Submit two typed copies of the test report in a neatly bound folder for review and approval. Failure to comply with this will result in a delay of final testing and acceptance.
- D. 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 Engineer's hourly rate.
- E. Contractor shall replace at no cost to the Owner all devices which are found defective or do not operate within factory specified tolerances.
- F. Contractor shall submit the testing final report to the Engineer for review prior to Project closeout and final acceptance by the Owner. Test report shall indicate test dates, devices tested, results, observations, deficiencies and remedies. Include a copy of the test report in the Owner's operation and maintenance manuals.

3.06 CLEANING

- A. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean the PA system components per Manufacturer's approved methods and materials. Remove all paint splatters spots, dirt and debris.

3.07 TRAINING

- A. Factory authorized service representative shall conduct an 8 hour training seminar for Owner's representative upon completion and acceptance of system. Instructions shall include, operation of system, accessing the system from a telephone, safe operation, maintenance and testing of equipment.
- B. Contractor shall schedule training with a minimum of 7 days advance notice.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 27 51 23**EDUCATIONAL INTERCOMMUNICATIONS AND PROGRAM SYSTEMS****PART 1 – GENERAL****1.01 GENERAL REQUIREMENTS**

- A. The intercommunications and program systems designed is based on the equipment as specified herein. The Atlas Sound. This is the manufacturer standard product of choice of the Center Joint Unified School District (CJUSD). No other system will be considered without prior approval by CJUSD.
- B. To establish continuity in manufacturer, system components shall be the standard product of one manufacturer. Further, an effort shall be made to establish common sources for equipment of all systems.
- C. The work to be provided under this Section consists of furnishing and installing all equipment, cabling, and labor required for complete, operable, new life safety communication system for Center Joint Unified School District (CJUSD). These systems shall be referred to as the LIFE SAFETY SYSTEM and their supplier as the LIFE SAFETY CONTRACTOR.
- D. The LIFE SAFETY CONTRACTOR must be a factory-authorized representative or distributor of all equipment used in the low voltage systems. Further, this contractor must have a minimum of three years of experience in the specific application of the equipment proposed for these systems. Provide a letter signed by an officer of the manufacturer attesting to the contractor's direct affiliation with the manufacturer.
- E. CABLING PLANT
 - 1. The LIFE SAFETY SYSTEM shall be capable of using CAT-5(e), CAT-6, CAT-6A and CAT-3 unshielded cabling. LIFE SAFETY SYSTEMS not capable of using all of the above wire types shall not be considered.
 - 2. The LIFE SAFETY SYSTEM shall be capable of using two wire conductors for a speaker and call button referred from herein as a 2-wire circuit. It shall be possible to mix 2-wire and standard 4-wire circuits on the same switching/line card. LIFE SAFETY SYSTEMS that can-not mix 2-wire and 4-wire circuits on the same switching/line card shall not be considered. LIFE SAFETY SYSTEMS that require more than two conductors or require shielded cable shall not be considered.
 - 3. It shall be possible to distribute the switching/line cards of the LIFE SAFETY SYSTEM up to 2700 feet using a single home run, eight conductor cable. LIFE SAFETY SYSTEMS that re-quire networking of multiple central systems to be distributed shall not be considered. LIFE SAFETY SYSTEMS that require the use of Ethernet components to bridge the 2700 foot distance shall not be considered.
 - 4. It shall be possible to network the LIFE SAFETY SYSTEM with additional systems using copper wire, single mode fiber optic and multimode fiber optic cables. LIFE SAFETY SYSTEMS that do not allow for the use of fiber optic cable shall not be considered.
- F. LIFE SAFETY SYSTEM DESIGN
 - 1. Only systems designed primarily as a LIFE SAFETY SYSTEM shall be considered. Life safe-ty features shall include but not be limited to; priority based access to voice functions, emergency paging, emergency call-in, covert PC based call-in, pre-recorded emergency an-announcements, external and internal telephone access, integrated video surveillance, and optional district wide

- communication functions. Paging systems, traditional school intercom systems, or any system that does not include the above minimum features shall not be considered.
2. The LIFE SAFETY SYSTEM shall be of a core design vintage dating from the year 2000 or later. LIFE SAFETY SYSTEMS that use designs dating from before the year 2000 shall not be considered.
 3. The LIFE SAFETY SYSTEM shall be an event driven design. LIFE SAFETY SYSTEMS using a polling method design shall not be considered.
 4. Microcontroller
 - a. The LIFE SAFETY SYSTEM shall contain a central microcontroller capable of a minimum of 500 MHz processing speed to allow for the addition of future features. LIFE SAFETY SYSTEMS with microcontrollers that run less than 500 MHz shall not be considered.
 - b. The LIFE SAFETY SYSTEM shall have flash based removable storage media of a size no smaller than 1 gigabyte. It shall be possible to remove the storage media from one system to another like system with no need to adjust the configuration files. LIFE SAFETY SYSTEMS that do not use removable flash based media or do not have at least 1 gigabyte of storage shall not be considered.
 - c. The LIFE SAFETY SYSTEM shall have at least 512 Megabytes of system ram. Said RAM shall be removable and upgradable. LIFE SAFETY SYSTEMS that do not use removable RAM or cannot be upgraded shall not be considered.
 5. Central Cabinet
 - a. The LIFE SAFETY SYSTEM shall contain natively RS232, RS485, USB, and Ethernet ports for communication to any third party system. LIFE SAFETY SYSTEMS that do not contain all of the above communication ports or require additional equipment shall not be considered.
 - b. The LIFE SAFETY SYSTEM shall contain five open collectors, three dry contacts, and six general purpose inputs for third party system integration or for general panic buttons. It shall be possible to expand inputs or outputs to any number needed. LIFE SAFETY SYSTEMS not supporting the minimum inputs and outputs or able to expand to any number shall not be considered.
 - c. The LIFE SAFETY SYSTEM central cabinet shall be a wall mounted. Total weight of the central cabinet shall not exceed 35 lbs. LIFE SAFETY SYSTEMS requiring floor racks or that weigh more than 35 lbs shall not be considered.
 - d. The LIFE SAFETY SYSTEM shall contain no moving parts that suffer from wear or that require maintenance. LIFE SAFETY SYSTEMS that contain moving parts shall not be considered.
 - e. The LIFE SAFETY SYSTEM shall draw no more than 3.5A of current at full load including all system accessories. LIFE SAFETY SYSTEMS that draw more than 3.5A of current at full load shall not be considered.
 - f. The LIFE SAFETY SYSTEM shall have integrated surge protection for all audio ports and switching/line card ports. Said surge protection shall be replaceable in the field with no need to return parts for repair. LIFE SAFETY SYSTEMS that require external surge protection shall not be considered.
 6. Amplifiers
 - a. The LIFE SAFETY SYSTEM shall use Class D digital amplifier with at least 250 Watts RMS and 300 Watts peak output. Amplifier distortion shall not exceed 0.2% at 90% load. LIFE SAFETY SYSTEMS using Class B amplifiers or amplifiers not capable of 0.2% maximum distortion shall not be considered.
 - b. The Class D amplifier shall be direct drive 25V constant voltage type. LIFE SAFETY SYSTEMS using transformer based amplifiers shall not be

- considered.
- c. The LIFE SAFETY SYSTEM shall filter all voice signals through a Digital Signal Processor (DSP) to maximize voice intelligibility. LIFE SAFETY SYSTEMS not using a DSP shall not be considered.
 - d. The LIFE SAFETY SYSTEM shall have 45 Ohm conversion modules available on a switching/line cards basis to convert the 25V audio signal to 45 Ohm for use with 45 Ohm speakers. LIFE SAFETY SYSTEMS not capable of conversion to 45 Ohm audio on a switching/line card basis shall not be considered.
 - e. The LIFE SAFETY SYSTEM amplifiers shall go to sleep thus reducing their current draw when not in use. LIFE SAFETY SYSTEMS that use amplifiers that do not reduce their current draw when not in use shall not be considered.
 - f. The LIFE SAFETY SYSTEM amplifiers shall have a built in pink noise generator for testing speaker quality and audio levels. LIFE SAFETY SYSTEMS that do not contain a pink noise generator shall not be considered.
7. Tones
- a. The LIFE SAFETY SYSTEM shall have at least 25 tones available for bells, reminders, and other events. LIFE SAFETY SYSTEMS with less than 25 tones shall not be considered.
 - b. The LIFE SAFETY SYSTEM shall support WAV type audio files. The user shall be able to add 60+ custom WAV files for use as pre-recorded announcements, bells, reminders, pre-announce tones, or any other system tone. LIFE SAFETY SYSTEMS not allowing users to add WAV files or do not allow for the use of WAV files for any system tone shall not be considered.
8. Switching/Line Cards
- a. The LIFE SAFETY SYSTEM shall support remote switching/line cards with 16 and 32 audio ports sizes available. A single central cabinet shall support up to eight 32 port cards. The switching/line card shall be powered from the central cabinet out to 2700 feet away from the central cabinet. LIFE SAFETY SYSTEMS that do not use remote switching/line cards or require additional power supplies shall not be considered.
9. Telephone Integration
- a. The LIFE SAFETY SYSTEM shall support up to eight FXS Caller-ID enabled telephone ports. FXS ports shall be added as needed in single port configurations. FXS ports shall be used to interface with system Administrative phones, standard telephones, and PBX/KSU/iPBX/VoIP telephone systems. LIFE SAFETY SYSTEMS that use proprietary telephone ports for Administrative phones or cannot provide eight FXS ports for PBX/KSU/iPBX/VoIP telephone system integration shall not be considered.
10. Master Clock
- a. The LIFE SAFETY SYSTEM shall contain an integral master clock. LIFE SAFETY SYSTEMS that do not have an integral master clock shall not be considered.
 - b. The LIFE SAFETY SYSTEM master clock shall correct Sapling, Dukane, Rauland, National time & Signal, American Time & Signal, Simplex, and Latham secondary clocks, analog or digital or both. LIFE SAFETY SYSTEM that do not correct all of the above clock systems shall not be considered.
 - c. The LIFE SAFETY SYSTEM master clock shall be capable of being synchronized by a Network Time Server (NTP). LIFE SAFETY SYSTEMS that do not synchronize to a NTP server shall not be considered.
 - d. The LIFE SAFETY SYSTEM master clock shall provide for automatic daylight saving time adjustment with leap year programming. LIFE

- SAFETY SYSTEMS that require user intervention for daylight savings events shall not be considered.
- e. The LIFE SAFETY SYSTEM master clock shall support unlimited schedules with unlimited events on said schedules. LIFE SAFETY SYSTEMS that do not support unlimited schedules and events shall not be considered.
 - f. The LIFE SAFETY SYSTEM master clock shall be calendar based capable of future event programming at least 30 years in the future. LIFE SAFETY SYSTEMS not using a calendar shall not be considered.
 - g. The LIFE SAFETY SYSTEM master clock shall allow for scheduling tone events, output events, program source events, and video camera events. LIFE SAFETY SYSTEMS not capable of scheduling all of the above event types shall not be considered.
11. Secondary Clock (IP Speaker with LED Display and Flashers)
- a. The secondary clock shall be an Atlas # I8SC+ Audio/Visual messaging device.
 - 1) The IP Speaker shall be a Power over Ethernet (PoE, PoE+) synchronized clock and intercom that requires only an RJ-45 connector to connect to existing data networks. Simultaneously, broadcast to both phones and speakers. The clock shall have auto synchronization and can be used as a scrolling text display. Standard built in microphone and speaker for two-way communication.
12. Outdoor IP Speaker shall be an Atlas
- a. # IHVP+.
 - 1) The Outdoor IP Speaker shall be a durable, weather-resistant mount PoE device that extends the reach of communication, via existing data networks, to outdoor environments. The device consists of a compression horn speaker with dimensions of 11.5" x 4" x 11.5".
13. Administrative Telephones
- a. The LIFE SAFETY SYSTEM shall not require an Administrative console to operate. All system functions shall be accessible via telephone codes from any internal or external telephone. LIFE SAFETY SYSTEMS requiring the use of Administrative telephones shall not be considered.
 - b. The LIFE SAFETY SYSTEM optional Administrative telephone shall have the following features. LIFE SAFETY SYSTEM Administrative telephones not containing the features below shall not be considered.
 - 1) Desk & wall mountable
 - 2) 128 X 240 LCD Display
 - 3) Minimum 14 line by 16 character backlit display
 - 4) Wizard driven menu system for ease of use
 - 5) 40 User commands stored in a visual directory
 - 6) 9 custom speed dials and one-touch emergency paging
 - 7) Head set compatible
 - 8) Integrated speaker phone for hands free use
14. Call Button
- a. The LIFE SAFETY SYSTEM shall allow for the use of normally open, normally closed, wireless, and virtual call buttons. LIFE SAFETY SYSTEMS not capable of using all of the above call button types shall not be considered.
 - b. The LIFE SAFETY SYSTEM shall allow for the use of virtual call buttons installed on local PC computers. LIFE SAFETY SYSTEMS that do not support virtual call buttons shall not be considered.
15. Security Integration
- a. The LIFE SAFETY SYSTEM shall allow for the integration of motion sensors, and door contacts in parallel with call buttons. Events from

these sensors shall be capable of being programmed to activate pre-recorded WAV files, outputs, and cameras. LIFE SAFETY SYSTEMS that do not support integration of security sensors shall not be considered.

16. Video Surveillance
 - a. The LIFE SAFETY SYSTEM shall provide eight transmission paths and control of closed-circuit television (CCTV) UTP type cameras. LIFE SAFETY SYSTEMS that do not provide camera transmission paths shall not be considered.
 - b. The LIFE SAFETY SYSTEM shall support cameras connected on the same cable as speaker/call button ports. LIFE SAFETY SYSTEMS that require additional cabling for cameras shall not be considered.

G. LIFE SAFETY SYSTEM OPERATION

1. The LIFE SAFETY SYSTEM shall allow for user-programmable room number assignment in the form of 3, 4, 5 or 6-digit alphanumeric format for architectural room numbering and a 60-character alpha-numeric caller ID description associated with each audio port. LIFE SAFETY SYSTEMS that do not support caller-ID on all ports or require additional equipment to support caller-ID shall not be considered.
2. The LIFE SAFETY SYSTEM shall allow for a minimum of 64 page/time/program zones that can be assigned and configured as desired. LIFE SAFETY SYSTEMS with less than 64 zones shall not be considered.
3. The LIFE SAFETY SYSTEM shall allow for the assigning of each call-in button to one or more of 32 distinct call-in destination groups. LIFE SAFETY SYSTEMS with less than 32 call-in groups shall not be considered.
4. The LIFE SAFETY SYSTEM administrative telephone shall allow for the user to view the alphanumeric room address and the caller-ID information of the calling station and the call priority (e.g., emergency, normal) on the display. The administrative telephone shall use distinctive ringing patterns to annunciate the type of call. LIFE SAFETY SYSTEMS that do not support caller-ID or call priority shall not be considered.
5. The LIFE SAFETY SYSTEM shall be capable of receiving 2048 call-ins simultaneously without data collisions or loss of any call-ins. Call-ins shall remain in the system call queue until answered. Emergency Call-ins shall automatically move to the top of the call-in queue and annunciated in the in-use telephone earpiece to notify the user of an emergency call. LIFE SAFETY SYSTEMS that do not maintain a system call queue or do not prioritize call-ins shall not be considered.
6. The LIFE SAFETY SYSTEM shall communicate with each classroom loudspeaker hands-free. The staff member or occupant in the classroom need not operate any buttons to reply to a call. The Administrative telephone operator shall be able to use the hands-free speaker phone or handset on an Administrative telephone. LIFE SAFETY SYSTEMS requiring "push to talk" shall not be considered.
7. The LIFE SAFETY SYSTEM shall be capable of classroom phones that can dial emergency personnel in case of an emergency. The classroom phone shall have an integrated dial pad. LIFE SAFETY SYSTEMS that do not support classroom phones with dial pads shall not be considered.
8. The LIFE SAFETY SYSTEM shall operate under the following audio priority scheme. LIFE SAFETY SYSTEMS not following the audio priority scheme listed below shall not be considered.
 - a. An emergency page suspends all other audio
 - b. An emergency tone suspends all other audio except the above
 - c. A normal page suspends all other audio except the above
 - d. A tone suspends all other audio except the above
 - e. A program source audio event suspends nothing

- f. Interrupted lower priority functions shall be restored after conclusion of the higher priority function.
9. The LIFE SAFETY SYSTEM shall allow a call-in to be escalated from a normal call-in to an emergency call-in at any time by pressing the call button twice within 2 seconds. LIFE SAFETY SYSTEMS that do not allow for call escalation shall not be considered.
10. The LIFE SAFETY SYSTEM shall allow for any connected telephone to place an emergency voice paging announcement. LIFE SAFETY SYSTEM that restricts access to emergency paging shall not be considered.
11. The LIFE SAFETY SYSTEM shall allow the activation of connected dormant cameras based on an emergency call-in, security sensor activation, or telephone code. LIFE SAFETY SYSTEMS not allowing for integrated emergency camera functions shall not be considered.
12. The LIFE SAFETY SYSTEM shall allow for operation via a GUI based PC based application. The PC application shall allow for emergency paging, normal paging, intercom, activation of any system/user tone, schedule changes, program distribution, call-in management, and on the fly room exclusion. LIFE SAFETY SYSTEMS that do not support PC based control shall not be considered.
13. The LIFE SAFETY SYSTEM shall use a PC based GUI scheduling tool for schedules and tone management. This tool shall not allow access to any system configuration controls. This tool shall not prevent the LIFE SAFETY SYSTEM from operating when being used. This tool shall allow the user to schedule events and manage tones over the local LAN/WAN and the Internet. It shall not be required to be directly connected to the central system to use this tool. LIFE SAFETY SYSTEMS that do not separate scheduling and tone functions from any other configuration functions or cannot be used over LAN/WANs or the Internet shall not be considered.
14. The LIFE SAFETY SYSTEM shall have a built in 30-day log of every system function and access. LIFE SAFETY SYSTEMS not having a 30-day log shall not be considered.
15. The LIFE SAFETY SYSTEM shall have a built in real time system diagnostics application. LIFE SAFETY SYSTEMS that do not have any real time system diagnostics shall not be considered.
16. The LIFE SLIFE SAFETY SYSTEM shall allow for system diagnostics, system log access firmware updates, and programming over the local LAN/WAN or over the Internet. LIFE SAFETY SYSTEMS not providing all of the above functions shall not be considered.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

- A. Section Includes: Manually switched intercommunications and program systems with the following components:
 1. Master stations.
 2. Call control console.
 3. Speaker-microphone stations.
 4. Call-switch unit.
 5. All-call amplifier.
 6. Intercommunication amplifier.
 7. Paging amplifier.
 8. Loudspeakers/speaker microphones.
 9. Clock and Bell
 10. Conductors and cables.
 11. Raceways.

1.04 REGULATORY REQUIREMENTS

- A. The entire installation shall comply with all applicable electrical and safety codes. The LIFE SAFETY SYSTEM and additional applicable equipment shall be tested and certified to UL/CSA 60065. Certifications shall be completed by a Nationally Recognized Testing Laboratory, (UL, CSA, TUV, etc.).
- B. All equipment with digital apparatus (microprocessors) that generate and use timing signals at a rate in excess of 9,000 pulses per second to compute and operate must meet FCC, Industry Canada regulations, and DOC CSA standards C108.8 (Electromagnetic Emissions). Any non-compliant equipment supplied or installed shall not be accepted and shall nullify the contract.

1.05 SUBMITTAL

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For educational intercommunications and program systems. Include plans, elevations, sections, details, and attachments to other work, manufacturer's specification sheets, including all component parts.
 - 1. Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Retain first subparagraph below for systems with built-in equipment.
 - 3. Include scaled drawings for station arrangement of built-in equipment.
 - 4. Wiring Diagrams: For power, signal, and control wiring.
 - a. Identify terminals to facilitate installation, operation, and maintenance.
 - b. Single-line diagram showing interconnection of components.
 - c. Cabling diagram showing cable routing.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings are shown and coordinated with each other, using input from installers of the items involved.
- D. All material and/or equipment necessary for the proper operation of the system, even though not specifically mentioned in the contract documents, shall be deemed part of this contract.
- E. Qualification Data: For qualified Installer and testing agency.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For educational intercommunications and program systems to include in operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. A record of final matching transformer-tap settings and signal ground-resistance measurement certified by Installer.
 - 2. A record of Owner's equipment-programming option decisions.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in California Electrical Code, by a qualified testing agency, and marked for intended location and application.

- C. Comply with NFPA 70.

1.07 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted speaker microphones with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Western Placer Unified School District standard product of choice:
 - 1. Atlas Life Safety Communication solution.

2.02 FUNCTIONAL DESCRIPTION OF MANUALLY SWITCHED SYSTEMS

- A. Master Station:
 - 1. Communicating selectively with other master and speaker-microphone stations by actuating selector switches.
 - 2. Communicating simultaneously with all other stations by actuating a single all-call switch.
 - 3. Communicating with individual stations in privacy.
 - 4. Including other master-station connections in a multiple-station conference call.
 - 5. Accessing separate paging speakers or groups of paging speakers by actuating selector switches.
 - 6. Overriding any conversation by a designated master station.
- B. Speaker-Microphone Station:
 - 1. Having privacy from remote monitoring without a warning tone signal at monitored station. Designated speaker-microphone stations have a privacy switch to prevent another station from listening and to permit incoming calls.
 - 2. Communicating hands free.
 - 3. Calling master station by actuating call switch.
 - 4. Returning a busy signal to indicate that station is already in use.
 - 5. Being free of noise and distortion during operation and when in standby mode.
- C. Speakers: Free of noise and distortion during operation and when in standby mode.

2.03 FUNCTIONAL DESCRIPTION OF MICROPROCESSOR-SWITCHED SYSTEMS

- A. Master Station:
 - 1. Communicating selectively with other master and speaker-microphone stations by dialing station's number on a 12-digit keypad.
 - 2. Communicating simultaneously with all other stations by dialing a designated number on a 12-digit keypad.
 - 3. Communicating with individual stations in privacy.
 - 4. Including other master-station connections in a multiple-station conference call.
 - 5. Accessing separate paging speakers or groups of paging speakers by dialing designated numbers on a 12-digit keypad.
 - 6. Overriding any conversation by a designated master station.
 - 7. Displaying selected station.
- B. Speaker-Microphone Station:
 - 1. Having privacy from remote monitoring without a warning tone signal at monitored station. Designated speaker-microphone stations have a privacy switch to prevent another station from listening and to permit incoming calls.
 - 2. Communicating hands free.

3. Calling master station by actuating call switch.
4. Returning a busy signal to indicate that station is already in use.
5. Being free of noise and distortion during operation and when in standby mode.

C. Speakers: Free of noise and distortion during operation and when in standby mode.

2.04 GENERAL REQUIREMENTS FOR EQUIPMENT AND MATERIALS

- A. Coordinate features and select components to form an integrated system. Match components and interconnections for optimum performance of specified functions.
- B. Expansion Capability: Increase number of stations in the future by 6.25 percent (1 spare per 16-ports) above those indicated without adding any internal or external components or main trunk cable conductors.
- C. Equipment: Modular type using solid-state components, fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.
- D. Weather-Resistant Equipment: Listed and labeled by an NRTL for duty outdoors or in damp locations.

2.05 MASTER STATION FOR MANUALLY SWITCHED SYSTEMS

- A. Station-Selector and Talk-Listen Switches: Heavy-duty type with gold-plated contacts rated for five million operations.
- B. Volume Control: Regulates incoming-call volume.
- C. LED Annunciation: Identifies calling stations and stations in use. LED remains on until call is answered.
- D. Tone Annunciation: Momentary audible tone signal announces incoming calls.
- E. Speaker Microphone: Transmits and receives calls.
- F. Handset with Hook Switch: Telephone type with 18-inch long, permanently coiled cord. Arrange to disconnect speaker when handset is lifted.
- G. Equipment Cabinet: Comply with TIA/EIA-310-D. Lockable, ventilated metal cabinet houses power supplies, amplifiers, system volume control, and auxiliary equipment required for conversation channels and control functions.

2.06 MASTER STATION FOR MICROPROCESSOR-SWITCHED SYSTEMS

- A. 12-Digit Keypad Selector: Transmits calls to other stations and initiates commands for programming and operation.
- B. Volume Control: Regulates incoming-call volume.
- C. LED Annunciation: Identifies calling stations and stations in use. LED remains on until call is answered.
- D. Tone Annunciation: Momentary audible tone signal announces incoming calls.
- E. Handset with Hook Switch: Telephone type with 18-inch long, permanently coiled cord. Arrange to disconnect speaker when handset is lifted.
- F. Reset Control: Cancels call and resets system for next call.

- G. Equipment Cabinet: Comply with TIA/EIA-310-D. Lockable, ventilated metal cabinet houses power supplies, amplifiers, and system volume control required for conversation channels and control functions.

2.07 CALL-SWITCH UNIT

- A. Enclosure: Single-gang box with stainless-steel faceplate.
- B. Call Switch: Momentary contact signals system that a call has been placed.
- C. Volume Control: Operated by screwdriver blade through a hole in faceplate to adjust output level of associated speaker.

2.08 ALL-CALL AMPLIFIER

- A. Output Power: 70-V balanced line. 80 percent of the sum of wattage settings for each station and speaker connected in all-call mode of operation, plus an allowance for future stations.
- B. Total Harmonic Distortion: Less than 5 percent at rated output power with load equivalent to quantity of stations connected in all-call mode of operation.
- C. Minimum Signal-to-Noise Ratio: 45 dB, at rated output.
- D. Frequency Response: Within plus or minus 3 dB from 70 to 12,000 Hz.
- E. Output Regulation: Maintains output level within 2 dB from full to no load.
- F. Input Sensitivity: Compatible with master stations and central equipment so amplifier delivers full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on master stations, speaker microphones, or handset transmitters.
- G. Amplifier Protection: Prevents damage from shorted or open output.

2.09 INTERCOMMUNICATION AMPLIFIER

- A. Minimum Output Power: 10 W; adequate for all functions.
- B. Total Harmonic Distortion: Less than 5 percent at rated output power with load equivalent to one station connected to output terminals.
- C. Minimum Signal-to-Noise Ratio: 45 dB, at rated output.
- D. Frequency Response: Within plus or minus 3 dB from 70 to 10,000 Hz.
- E. Output Regulation: Maintains output level within 2 dB from full to no load.
- F. Input Sensitivity: Matched to input circuit and to provide full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on master stations, speaker microphones, or handset transmitters.
- G. Amplifier Protection: Prevents damage from shorted or open output.

2.10 PAGING AMPLIFIER

- A. Input Voltage: 120-V ac, 60 Hz.
- B. Frequency Response: Within plus or minus 3 dB from 60 to 10,000 Hz.

- C. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.
- D. Total Harmonic Distortion: Less than 3 percent at rated power output from 70 to 12,000 Hz.
- E. Output Regulation: Less than 2 dB from full to no load.
- F. Controls: On-off, input levels, and low-cut filter.
- G. Input Sensitivity: Matched to input circuit and to provide full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on speaker microphones or handset transmitters.
- H. Amplifier Protection: Prevents damage from shorted or open output.
- I. Output Circuit: 70-V line.

2.11 CONE-TYPE LOUDSPEAKERS/SPEAKER MICROPHONES

- A. Minimum Axial Sensitivity: 91 dB at one meter, with 1-W input.
- B. Frequency Response: Within plus or minus 3 dB from 70 to 15,000 Hz.
- C. Minimum Dispersion Angle: 100 degrees.
- D. Line Transformer: Maximum insertion loss of 0.5 dB, power rating equal to speaker's, and at least four level taps.
- E. Volume Control: Operated by screwdriver blade through a hole in faceplate to adjust output level of associated speaker.
- F. Enclosures: Steel housings or back boxes, acoustically dampened, with front face of at least 0.0478-inch steel and whole assembly rust proofed and factory primed; complete with mounting assembly and suitable for surface ceiling, flush ceiling, pendant or wall mounting; with relief of back pressure.
- G. Baffle: For flush speakers, minimum thickness of 0.032-inch with textured white finish.
- H. Size: 8 inches (200 mm) with 1-inch (25-mm) voice coil and minimum 5-oz. (140-g) ceramic magnet.
- I. Interior wall mount speakers shall be Lowell DSL-805-72K

2.12 HORN-TYPE LOUDSPEAKERS/SPEAKER MICROPHONES

- A. Speakers shall be horn type and weatherproof.
- B. Interior speakers shall have a standard metal baffle.
- C. Exterior speakers shall have a vandal resistant baffle.
- D. Frequency Response: Within plus or minus 3 dB from 600 to 12,000 Hz.
- E. Minimum Power Rating of Driver: 15 W, continuous.
- F. Minimum Dispersion Angle: 80 degrees.
- G. Line Transformer: Maximum insertion loss of 0.5 dB, power rating equal to speaker's, and at least four level taps.

- H. Speakers shall be Lowell LUH-15Ti with CB86-6 back box and SQLK8L vandal resistant baffle.

2.13 CONDUCTORS AND CABLES

- A. Conductors: Jacketed, twisted pair and twisted multi-pair, untinned solid copper. Sizes as recommended by system manufacturer, but no smaller than No. 22 AWG.
- B. Insulation: Thermoplastic, not less than 1/32 inch (0.8 mm) thick.
- C. Shielding: For speaker-microphone leads and elsewhere where recommended by manufacturer; No. 34 AWG, tinned, soft-copper strands formed into a braid or equivalent foil.
 - 1. Minimum Shielding Coverage on Conductors: 60 percent.
- D. Plenum Cable: Listed and labeled for plenum installation.

2.14 RACEWAYS

- A. Intercommunication and Program System Raceways and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Intercommunication and Program System Raceways and Boxes: Same as required for electrical branch circuits specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- C. Intercommunication and Program System Raceways and Boxes: EMT and Surface metal raceways.
- D. Outlet boxes shall be not less than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.
- E. Flexible metal conduit is prohibited.

PART 3 – EXECUTION

3.01 WIRING METHODS

- A. Wiring Method: Install cables in raceways within consoles, cabinets, desks, and counters, and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.02 INSTALLATION OF RACEWAYS

- A. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

- B. Install manufactured conduit sweeps and long-radius elbows whenever possible.

3.03 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements:
 - 1. Make terminations only at outlets and terminals.
 - 2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
 - 3. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
 - 5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.
- C. Open-Cable Installation:
 - 1. Install cabling with horizontal and vertical cable guides in telecommunication spaces with terminating hardware and interconnection equipment.
 - 2. Suspend speaker cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceiling by cable supports not more than [60 inches (1524 mm)] <Insert dimension> apart.
 - 3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.
- D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches (300 mm) apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

3.04 INSTALLATION

- A. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.
- B. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.
- C. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.
- D. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.05 GROUNDING

- A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.
- C. Install grounding electrodes as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.06 SYSTEM PROGRAMMING

- A. Programming: Fully brief Owner on available programming options. Record Owner's decisions and set up initial system program. Prepare a written record of decisions, implementation methodology, and final results.

3.07 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Schedule tests with at least seven days' advance notice of test performance.
 - 2. After installing intercommunications and program systems and after electrical circuitry has been energized, test for compliance with requirements.
 - 3. Operational Test: Test originating station-to-station, all-call, and page messages at each intercommunication station. Verify proper routing and volume levels and that system is free of noise and distortion. Test each available message path from each station on system.
- D. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.
- E. Intercommunications and program systems will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.08 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service and initial system programming.
 - 1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
 - 2. Complete installation and startup checks according to manufacturer's written instructions.

3.09 ADJUSTING

- A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to 2 visits to Project during other-than-normal occupancy hours for this purpose.

3.10 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the intercommunications and program systems.
 - 1. Train Owner's maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining the system and equipment.

3.11 AS-BUILT DRAWINGS

- A. Provide as-built drawings to include up-to-date drawings including any changes made to the system during installation. Circuit diagrams and other information necessary for the proper operation and maintenance of the system shall be included

3.12 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data to include operator instructions for each required mode of operation, routine troubleshooting procedures, manufacturer's operation and maintenance manual for each item of equipment and accessory, and routine cleaning methods and materials.

3.13 WARRANTY

- A. The manufacturer shall provide a five-year warranty against defects in material and workmanship. The warranty period shall begin on the date of acceptance by the owner/engineer. Any warranty less than five years shall not be considered.
- B. Software service packs released from time to time shall be available to the user for the life of the product at no additional cost.
- C. The LIFE SAFETY CONTRACTOR supplying the equipment shall show satisfactory evidence, upon request, that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to the system, including replacement parts. The vendor shall be prepared to offer a service contract for the maintenance of the system after the guarantee period. The bidder shall produce evidence that they have a fully experienced and established service organization for at least three years and proven satisfactory installations during that time.

3.14 USER TRAINING & SUPPORT

- A. Engage a factory-authorized service representative to supply up to 8 hours of onsite training to District's (Owner) maintenance personnel to adjust, operate, and maintain the educational intercommunications and program systems.
- B. Train District (Owner) maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing and maintaining the system and equipment.
- C. The District (Owner) shall have access to telephone support from the manufacturer at no additional cost for the life of the product.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 27 51 26

ASSISTIVE LISTENING SYSTEM

PART 1 - GENERAL

1.01 CONTRACT PROVISIONS

- A. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.02 SECTION INCLUDES

- A. Furnish and install an Assistive Listening System in accordance with 2022 CBC, Chapter 11B, Section 11B-219 and Section 11B-219.5.

1.03 RELATED SECTIONS

- A. Section 26 01 10 Basic Electrical Requirements

1.04 INCORPORATED DOCUMENTS

- A. Published specifications, standard, tests or recommended methods of trade, industry or governmental organizations apply to work in this Section when cited by abbreviation noted below.
 - 1. (CEC) California Electrical Code
 - 2. (CBC) California Building Code - 2022
 - 3. (CMC) California Mechanical Code - 2022
 - 4. (ANSI) American National Standard Institute.
 - 5. (UL) Underwriters' Laboratories.
- B. When this Section or parts thereof are copies for use by subcontractors or supplier, applicable paragraphs of Section 26 01 10 Basic Electrical Requirements shall also be copied and attached to those copies.

1.05 QUALITY ASSURANCE

- A. Acceptable Manufacturers: Firms regularly engaged in manufacturer of Assistive Listening Systems and accessory equipment of type and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years. All materials shall comply with applicable standards of the Underwriter's Laboratories, Inc.

1.06 SUBMITTALS

- A. Product Data: Submit manufacturer's data and accessory equipment specifications, installation and start up instructions, and capacity and ratings, with selection points clearly indicated.
- B. Maintenance Data: Submit maintenance data and parts lists for each item and accessory equipment. Include "troubleshooting" maintenance guides. Include this data in maintenance manual.

1.07 DESCRIPTION

- A. Work under this section includes all equipment, labor and materials necessary to furnish and install a complete assistive listening system.
- B. The Assistive Listening System shall be an FM wireless system.

- C. Each system shall be complete consisting of transmitter, receivers, earphones, microphone, etc. as required.
- D. Features:
 - 1. No seating restrictions, 300 to 500 ft. system range
 - 2. Single channel receivers are pre-tuned, users control their own volume.
 - 3. Easily expanded, no limit to number of users.
 - 4. Excellent sound quality, inherently free from interference.
 - 5. Automatic Gain Control for stable listening level.
 - 6. High performance frequency synthesized, phase-locked-loop tuning.
 - 7. 8 channels available
 - 8. Can be powered by a 12 V battery for portable operation.
 - 9. Choice of balance or unbalanced inputs
 - 10. Input attenuator and low frequency attenuator control switches.
 - 11. LED Power and Audio Level Indicators.
 - 12. RF frequency range that meets ADA conformance guidelines.

PART 2 - PRODUCTS

- A. All equipment shall be the standard cataloged products of a single manufacturer. The catalog numbers of the following equipment are those manufactured by Williams or approved equal.
- 2.01 BASE TRANSMITTER (provide 1 for each permanent sound system).
- A. Synthesized 16-channel base transmitter, ¼ wave antenna, with rack mount kit. Locate adjacent to the sound system equipment and get power from the equipment. Where space is available in the sound equipment rack, install in rack. Co-ordinate with District low voltage consultant and contractor responsible for installation of equipment rack.
 - B. Antenna: HGA-1 1/2 –wave gain antenna for Base Transmitter
- 2.02 PORTABLE TRANSMITTER
- A. Belt pack transmitter with lapel microphone, adjustable 16 channel, 2 audio inputs.
- 2.03 RECEIVERS
- A. Single fixed channel receivers. Number of receivers required on plan shall be in compliance with ADA public facility guidelines at time of installation. Current ADA guidelines require total number of receivers to be no less than 4% of total seating capacity.
 - B. 16-channel adjustable frequency receivers.
- 2.04 EARPHONES
- A. Dual earbud with cord for normal to moderate hearing loss. (Provide 1 for each receiver)
- 2.05 BATTERIES
- A. Provide with long life alkaline batteries, “Energizer”, “Duracell” or equal, for each device requiring batteries such as portable transmitters and receivers.

2.06 WALL PLAQUE

- A. Provide sound reinforcement wall plaque per ADA requirements to indicate equipment available for the hearing impaired. Verify location with the architect prior to installation. Submit sample for approval. Use the "international symbol of access for hearing impaired."

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The contractor shall supply all equipment, wire, conduit, etc., required for the installation, and needed to provide a complete and usable assistive listening system.

3.02 TESTS AND ADJUSTMENTS

- A. Under completion of the installation of all equipment, and when same is in full operating condition, the Contractor shall perform the initial post completion tests and adjustments as specified hereinafter. Except as otherwise specified, this Contractor shall provide all instruments, equipment, labor and materials necessary to complete the tests.

3.03 WARRANTY

- A. The manufacturer shall guarantee the system and components against defective material and workmanship for a period of one year from the date of final acceptance by the District (owner).

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 28 20 00**DIGITAL VIDEO SECURITY SYSTEM****PART 1 – GENERAL****1.01 SYSTEM DESCRIPTION****A. General Requirements**

1. Scope of work:
 - a. IP video security cameras shall be owner furnished, contractor installed.
 - b. Provide a complete system as shown and noted on plan to include all accessories, cabling, raceways and connections for system continuity.
2. The specified unit shall be of manufacturer's official product line, designed for commercial and/or industrial 24/7/365 use.
3. The specified unit shall be based upon standard components and proven technology using open and published protocols.
4. IP video security cameras shall be connected to school district's network and storage is cloud based.

B. Sustainability

1. The specified unit shall be manufactured in accordance with ISO 14001.
2. The specified unit shall be compliant with the EU directives 2011/65/EU (RoHS) and 2012/19/EU (WEEE).
3. The specified unit shall be compliant with the EU regulation 1907/2006 (REACH).
4. The specified unit shall be PVC-free in accordance with IEC 61249-2-21.

1.02 CERTIFICATIONS AND STANDARDS**A. The specified unit shall meet the following product safety standards:**

1. IEC/EN/UL 60950-1
2. IEC/EN/UL 60950-22

B. The specified unit shall meet relevant parts of the following video standards:

1. SMPTE 296M (HDTV 720p)
2. SMPTE 274M (HDTV 1080p)

C. The specified unit shall meet the following standards

1. MPEG-4:
 - a. ISO/IEC 14496-10 Advanced Video Coding (H.264)
2. Networking:
 - a. IEEE 802.3af/802.3at (Power over Ethernet)
 - b. IEEE 802.1X (Authentication)
 - c. IPv4 (RFC 791)
 - d. IPv6 (RFC 2460)
 - e. QoS – DiffServ (RFC 2475)
3. Network video
 - a. Relevant ONVIF profile as defined by the ONVIF Organization.
4. Mechanical Environment:
 - a. IEC/EN 60529 IP66 (Ingress protection)
 - b. NEMA 250 Type 4X
 - c. IEC 60068-2-1
 - d. IEC 60068-2-2

- e. IEC 60068-2-6
- f. IEC 60068-2-27

1.03 QUALITY ASSURANCE

- A. The Contractor or security sub-contractor shall be a licensed security Contractor with a minimum of five (5) years' experience installing and servicing systems of similar scope and complexity and evidence that is completed at least three (3) projects of similar design and is currently engaged in the installation and maintenance of systems herein described.
- B. All installation, configuration, setup, program and related work shall be performed by electronic technicians thoroughly trained by the manufacturer in the installation and service of the equipment provided.
- C. The contractor or designated sub-contractor shall submit credentials of completed VERKADA manufacturer certification, verified by a third party organization, as proof of the knowledge.
- D. The Contractor shall provide four (4) current references from clients with systems of similar scope and complexity that became operational in the past three (3) years. At least three (3) of the references shall be utilizing the same system components, in a similar configuration as the proposed system
- E. The specified unit shall be manufactured in accordance with ISO9001.

1.04 WARRANTY

- A. All digital video security system components and labor furnished by the contractor including wiring, software, hardware and custom parts shall be fully warranted for parts, materials, labor and travel expenses for a minimum of two (2) years unconditionally from date of the final acceptance of the Digital Video Security System.
- B. The manufacturer shall provide warranty and optional extended warranty for the camera for a total period of maximum five years. If enacted as part of the contract, the contractor will repair or replace parts and/or labor per the warranty for the length of this warranty at no cost to the client.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Cameras shall be IP-based and comply with established network and video standards.
- B. Any required VERKADA software licenses required to add new cameras to the VMS shall be provided by the contractor.
- C. Cameras shall be powered by the switch utilizing the network cable. Power injectors (midspans) shall be provided by the contractor when required for proper operation.
- D. Cameras shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.
- E. Cameras shall comply with relevant ONVIF profile as defined by the ONVIF Organization.

- F. Each camera's bit rate, frame rate, and resolution shall be set independently from other cameras in the system, and altering these settings shall not affect the recording and display settings of other camera.

2.02 MANUFACTURER

- A. VERKADA. Center Joint Unified School District standard product of choice.

2.03 VIDEO SURVEILLANCE CAMERAS

- A. Video camera types shall be outdoor dome type 5.0 MP with 1/2.8" progressive CMOS.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The Contractors or subcontractor's main resources within the project shall carry proper professional certification issued by the manufacturer and verified by a third party organization to confirm sufficient product and technology knowledge.
- B. The Contractor shall carefully follow instructions in documentation provided by the manufacturer to ensure all steps have been taken to provide a reliable, easy-to-operate system.
- C. The electrical contractor shall make all necessary connections to LAN and test system prior to occupancy. Coordinate all network requirements and connection with the District IT department prior to any procurement or installation.
- D. Security system requires a minimum of 21 days of back up storage of all video images that are recorded.
- E. All equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to installation.
- F. All firmware found in products shall be the latest and most up-to-date provided by the manufacturer.
- G. All equipment requiring users to log on using a password shall be configured with user/site-specific password/passwords. No system/product default passwords shall be allowed.
- H. A proper installation shall meet CEC (California Electrical Code). When properly installed equipment meets Low voltage, Class 2 classification of the CEC.

3.02 WARRANTY

- A. The product shall perform in all material respects in accordance with the accompanying user manual, and the media on which the Software Product resides will be free from defects in materials and workmanship under normal use. Software defects are covered through Service Releases and Cumulative Updates which are available for a period of 1 year from the date of the software purchase.
- B. Extended warranty, up to 5 years, shall be available through the purchase of a software maintenance agreement (SMA) which includes the following additional services over the standard warranty:
 - 1. Access to phone support and online chat for technical assistance.

2. Online case management.
3. Online system availability monitor.
4. Access to Major and Minor Release Upgrades.
5. 24/7 pager support and dedicated support specialist. (Specifier, additional cost)

3.03 DEPLOYMENT SERVICES AND SYSTEM COMMISSIONING

A. General Requirements

1. The contractor shall engage the services of the USP vendor to assist in the management of the deployment of this UPS at the end user site on projects that involve:
 - a. Multiple contractors or subcontractors that will be responsible for deploying the USP at multiple client sites in different geographical regions.
 - b. Complex enterprise installations involving advanced functionality (e.g. The Federation feature, failover, plugins) and/or multiple systems (e.g. access control, video, ALPR) and/or third party integrations.
 - c. Extensive use of customized solutions/plugins developed by the vendor that will be integrated into the USP.
2. The USP vendor services shall include Deployment Management and System Configuration and Commissioning.

B. Deployment Management Service

1. The Deployment Management service from the vendor shall include a Project Manager acting as the single point of contact for all communications between the contractor and the vendor organization and who will be responsible for:
 - a. Conducting a Risk Assessment of the impact of potential risk factors on the operation of the vendor's USP.
 - b. Providing a project plan for the deployment of the vendor's USP.
 - c. Managing the development and deployment of the custom solution components that will be integrated into the vendor's USP (if applicable).
 - d. Providing a scope of work detailing the services to be provided by the vendor to assist in the deployment of the vendor's USP.
 - e. Coordinating and scheduling the vendor field services with the contractor to assist with the deployment of the vendor's USP.
 - f. Providing regular project status updates to the contractor regarding the development of custom solutions (if applicable) and the deployment of the vendor's USP.

C. System Configuration and Commissioning Service

1. The System Configuration and Commissioning service from the vendor shall include a Field Engineer who will be responsible for:
 - a. Assisting the contractor's or subcontractor's onsite/remote technicians with the configuration and commissioning of the vendor's USP at the client site.
 - b. Conducting a test of the USP following the deployment of the system using real-world operator scenarios to ensure optimal system performance.
 - c. Providing the contractor with a Service Report detailing the tasks completed during the deployment of the USP at the client site, as well as any recommendations for improving the performance of the USP that must be implemented by the contractor.
 - d. Providing a knowledge transfer of the vendor's USP to the contractor following the deployment of the USP at the client site.

3.04 MANUFACTURER END USER OPERATOR TRAINING

- A. The contractor shall engage the services of the USP vendor to assist in the end user training of the USP at the end-user site.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 28 31 20

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The requirements of this section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.
- B. Related work specified elsewhere
 - 1. Section 26 01 10, BASIC ELECTRICAL REQUIREMENTS
 - 2. Section 26 05 34, RACEWAY
 - 3. Section 26 05 19, LOW VOLTAGE POWER CONDUCTORS AND CABLES
 - 4. Section 26 05 37, BOXES
 - 5. Section 26 05 26, GROUNDING AND BONDING

1.02 DESCRIPTION:

- A. This section of the specification includes the furnishing, installation, and connection of a microprocessor controlled, analog addressable, intelligent fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein.
- B. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- C. The system shall be an active/interrogative type system where each transponder and/or addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.
- D. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001
- E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).
- F. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- G. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

1.03 SUMMARY

- A. Scope: Provide all new system equipment, material and labor required for the installation of an addressable fire alarm system, complete and fully operational, as described in this

Specification and as shown on the Drawings. Provide and install all components required for proper system operation whether specifically specified or not and all items of equipment, support structure, devices, etc., incidental to the installation.

- B. Provide and install all required zone cards, power supplies and audio and visual alarm appliance control cards as required for the alarm signaling appliances indicated on the Drawings.
- C. Coordinate all work on the fire alarm system with school personnel to minimize impact on concurrent school operations.
- D. Work included:
 - 1. The system shall include, but not be limited to, all control equipment, power supply, initiating devices, audible and visual notification appliances as appropriate, raceway, wiring, fittings, and all other accessories necessary to provide a complete and operable addressable system.
 - 2. All equipment shall be labeled with the manufacturer's name and logotype to assure the integrity of the complete system. "Hybridized" systems (containing equipment from several different manufacturers) shall not be considered acceptable.
- E. Requirements:
 - 1. Review the Drawings and Specifications for work and material provided by others that will affect work specified under this Section. Carefully coordinate with other trades, equipment suppliers, contractors, etc. as required to provide a high quality reliable installation with a minimum of construction delays. All work required to be re-accomplished due to lack of coordination shall be done at the Contractor's expense.
 - 2. Work and materials shall meet or exceed the requirements of the latest published rules and regulations of the State of California, local authority, NFPA, CAL-OSHA, CSFM, and NECA- Standard of Installation".
 - 3. Listings
- F. All fire alarm system equipment shall be listed for its intended purpose and be compatibility listed to assure the integrity of the complete system.
- G. Standards:
 - 1. The fire alarm equipment and installation shall comply with the current provisions of the following standards and shall be listed for its intended purpose and be compatibility listed to insure integrity of the complete system.
 - a. California Electric Code, Article 760
 - b. National Fire Protection Association Standards:
 - 1) NFPA 70 National Electric Code (California Electrical Code)
 - 2) NFPA 72 National Fire Alarm Code
 - 3) NFPA 90A Air Conditioning Systems
 - 4) NFPA 92A Smoke-Control Systems
 - 5) NFPA 92B Smoke Management Systems in Malls, Atria, and Large Areas
 - 6) NFPA 101 Life Safety Code
 - 7) Local and State Building Codes
- H. California Building Code, Mechanical Code, Fire Prevention Code

- I. Local Authorities Having Jurisdiction
- J. Underwriters Laboratories Inc.
- K. All equipment shall be approved by Underwriters Laboratories, Inc. for its intended purpose, listed as power limited by Underwriters Laboratories, Inc., for the following standards as applicable:
 - 1. UL 864 UOJZ Control units for Fire Protective Signaling Systems
 - 2. Local Signaling Unit
 - 3. Central Station Signaling Protected Premises Unit
 - 4. Remote Signaling Protected Premises Unit.
 - 5. Water Deluge Releasing Unit
 - 6. UL 268 Smoke Detectors for Fire Protective Signaling systems.
 - 7. UL 268A Smoke Detectors for duct applications
 - 8. UL 217 Smoke Detectors for Single Stations
 - 9. UL 521 Heat Detectors for Fire Protective Signaling systems.
 - 10. UL 228 Door Holders for Fire Protective Signaling systems.
 - 11. UL 464 Audible Signaling appliances
 - 12. UL 1638 Visual Signaling appliances
 - 13. UL 38 Manually Activated Signaling Boxes
 - 14. UL 346 Waterflow indicators for Fire Protective Signaling systems.
 - 15. UL 1481 Power Supplies for Fire Protective Signaling systems.
 - 16. Americans with Disabilities Act (ADA).
- L. All visual Notification appliances and manual pull stations shall comply with the requirements of the Americans with Disabilities Act.

1.04 QUALITY ASSURANCE

- A. The fire alarm system shall conform to Section 809 of the California Building Code, Article 760 of the California Electrical Code, and Article 14 of the California Fire Code.
- B. Work and materials shall meet or exceed the requirements of the rules and regulations of the State of California, NFPA, CAL-OSHA, CSFM, AND NECA - "Standard of Installation".

1.05 FIRE ALARM SYSTEM CONTRACTOR REQUIREMENTS

- A. The Contractor shall hold a valid California State Contractor's license (C7, C10).
- B. The Contractor must be the factory authorized sales and service representative for all equipment being submitted.
- C. The Contractor shall provide documentations to show the fire alarm contractor have been in the electronics contracting business for a minimum of six years under the same name. He must maintain a full-time sales and service staff at an established business location having the appropriate parts and service facilities. An individual operating out of residential facilities or without the required facilities, staff, or tenure will not be considered as an acceptable contractor for this project.
- D. Contractor shall use NICET Level II Fire Alarm Certified Technicians for field installation.

1.06 SUBMITTALS FOR EQUIPMENT AS SPECIFIED

- A. Submittals are required for all items. The list of material prefacing the submittal data sheets shall include the State Fire Marshal listing number for each item. Prepare submittal and arrange material as described in Specification Section 16010 and as noted within this section. Incomplete submittals without the State Fire Marshall listing numbers sheets will not be considered.
- B. The fire alarm Contractor shall prepare all material required for the "Construction Submittal", to be submitted to the Architect for acceptance. The submittal package shall include but not limited to product sheets, CSFM listing sheets with the current expiration date, drawings with site and floor plans showing all components and/or devices locations to be installed, riser diagrams, battery and wire voltage drop calculations.

1.07 SUBMITTALS FOR SUBSTITUTE EQUIPMENT AND INSTALLATION

- A. Complete submittal packages are to be prepared for all material as described above to be submitted to the Architect for acceptance. In additions, the list of material prefacing the submittal data sheets must clearly indicate which items aere being proposed for substitution.
- B. Where the system installation is proposed to differ from that shown on the Drawings, the submittal information for proposed substitute equipment must be sufficient to demonstrate that the requirements of this Specification will be met.
 - 1. The Fire Alarm Contractor shall prepare all material required for the "Submittal" to the California Division of State Architect / Office of Regulation Services (This agency shall hereafter be referred to as "DSA/ORS"). Obtain a "check list" from the DSA/ORS to aid in preparation of this submittal material.
 - 2. Prepare catalog cuts of all equipment proposed for use including California State Fire Marshal listing numbers listing sheet with the current expiration date for all components. Arrange submittal material as described in Specification Section 16010, General Requirements.
 - 3. Prepare detailed AutoCAD (version 2000 or higher) drawing(s) showing all work to be accomplished and all items to be furnished. The AutoCAD drawing(s) shall be produced on sheets of the same size and in the same scale as the project Drawings. The submittal drawings shall augment and clarify the Contract Drawings. Coordinate all additional requirements with others as required. Floor plans on electronic media may be purchased from the Architect.
 - 4. Where the substitute equipment will have power requirements that are different in any way from the specified equipment, new calculations for wire Voltage Drop and Battery Capacity must be prepared by the Contractor and submitted with the Material Submittal Data Sheets or on the Submittal drawings as applicable.
- C. Upon satisfactory review by the Architect, the entire submittal (Drawings and Catalog Data) will be submitted to the DSA/ORS for final approval.
- D. Reproducible prints of the approved submittal Drawings are to be provided upon completion of this project for inclusion in the AS-BUILT set as required in Specification Section 260110, Basic Electrical Requirements.

1.08 GUARANTEE

- A. The equipment supplier/installer shall assume all responsibility for the proper operation of the entire system installed under this Section, and the entire system shall be guaranteed free from defects in material or workmanship for a period of one year after filing of the "Notice of Completion". Provide on-site service for this system for the duration of the

guarantee period at no additional cost to the District. Where system trouble is caused by misuse, abuse, or accident current labor rates shall be chargeable for the service call - otherwise, the service shall be free. Service shall normally be available from a factory authorized service center during normal working hours and within 24 hours of receiving a call.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All material and equipment shall be first quality, new, free from defects and rated for used in public institutions by the manufacturer. Except as specified herein, all system equipment and components shall be products compatible to the fire alarm control panel. System equipment shall be all the product of the same manufacturer and listed by the California State Fire Marshal.
- B. The fire alarm system components and wires are listed in the drawing respective Fire Alarm System Component Schedule and Fire Alarm Wiring Schedule and as described in this specification

2.02 SYSTEM DESCRIPTION AND OPERATION

- A. All new initiating devices shall be addressable, unless noted otherwise.
- B. The alarm initiating circuits and signal circuits shall be 24 Volt DC, two wire, supervised, Class "B" systems with end of line devices located as shown on the Drawings and as required for proper system operation.
- C. Actuation of any alarm-initiating device shall cause all system audio and visual signaling devices to operate. Alarm audible shall sound in California standard "march time" and alarm strobes shall flash at the required rate until the alarm is acknowledged at the control panel or the system is reset. All audio and visual signaling devices shall be synchronized.
- D. The alarm system shall be silenced by authorized personnel only, by opening the locked control cabinet and operating the proper switch. Operation of this switch shall be indicated by a trouble light and audible signal at the control panel. The zone in alarm shall continue to provide visual LED indication of alarm condition until that zone is restored to normal operation
- E. System Software:
 - 1. The system shall be capable of self-programming upon initialization.
 - 2. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation.
 - 3. All software operations shall be stored in a nonvolatile programmable memory within the FACP.
 - 4. Loss of primary and secondary power shall not erase the instructions stored in memory.
 - 5. System programming shall be password protected and shall include full upload and download capability.
 - 6. The system shall feature full flexibility for selective input/output control functions based on ANDing, Oring; NOTing, timing, and special coded operations shall also be incorporated in the resident software programming of the system.
 - 7. Resident software shall allow for full configuration of initiating circuits. The

system shall require no additional hardware to change from sensing normally open contact devices to sensing normally closed contacted devices or vice versa. Nor shall the system require additional hardware to change from sensing normally open contact devices to sensing-and distinguishing between-a combination of current limited and non-current limited devices on the same circuit. Nor shall the system require additional hardware for changing from a non-verification circuit to a verification circuit or vice-versa.

8. There shall be no limit, other than maximum system capacity, to the number of intelligent/analog devices, which may be in alarm simultaneously.
9. The system shall have the capability of recalling alarm and trouble conditions in chronological order for the purpose of recreating an event history.

F. Alarm Operation:

1. The actuation of any approved alarm initiating device shall automatically initiate the following operations where furnished as part of the system:
 - a. All audible alarm indicating appliances within corresponding building shall sound a fire alarm signal until the System Acknowledge key or the Signal Silence key is depressed.
 - b. All visible alarm indicating appliances shall flash continuously until the System Acknowledge key or the Signal Silence key is depressed.
 - c. The off-site central monitoring station shall be notified automatically until the System Acknowledge key or the Signal Silence key is depressed.
 - d. Shutdown of the corresponding HVAC system equipment shall occur until the System Acknowledge key or the Signal Silence key is depressed, if applicable.
 - e. Recall of elevator(s) system equipment within corresponding building shall occur until the System Acknowledge key or the Signal Silence key is depressed, if applicable.
 - f. Activation of all programmed outputs assigned to the initiating device shall occur until the System Acknowledge key or the Signal Silence key is depressed.
 - g. Any subsequent zone alarm shall reactivate the alarm indicating appliances.

G. Alarm Verification:

1. The activation of any system smoke detector, heat detector or sensor shall initiate an alarm verification operation whereby the panel will reset the activated detector and wait for a second alarm activation.
2. If, within one (1) minute after resetting, a second alarm is reported from the same or any other smoke detector, heat detector or sensor, the system shall process the alarm as described previously. If no second alarm occurs within one minute the system shall resume normal operation.
3. The alarm verification shall operate only on smoke detector, heat detector or sensor alarms. Other activated initiating devices shall be processed immediately.
4. The alarm verification operation shall be selectable by zone.

H. Alarm Indication:

1. The alarm shall be displayed on the local Fire Alarm Control Panel, and where applicable, the remote annunciator. At the minimum, it shall display the point label and the device type identifier.
2. The system alarm LED shall flash on the control panel and the remote annunciator until the alarm has been acknowledged. Once acknowledged, this

- same LED shall latch on.
3. A subsequent alarm received from another zone shall flash the system alarm LED on the control panel and remote annunciator. The LCD display shall indicate the new alarm information.
 4. A pulsing alarm tone shall occur within the local building control panel, and where applicable, the remote annunciator until the event has been acknowledged.
 5. A manual evacuation (drill) switch shall be provided to operate the alarm indicating appliances without causing other control circuits to be activated. However, should a true alarm occur, all alarm functions would occur as described previously.
 6. The system shall have a single key that will allow the operator to display all alarms, troubles, and supervisory service conditions including the time of each occurrence.
 7. Any momentary opening of an initiating or indicating appliance circuit wiring shall cause an audible signal to sound at the Fire Alarm Control Panel, and where applicable, the remote annunciator for four seconds indicating a trouble condition.
- I. Alarm Walk Test:
1. The actuation of the "enable walk test" program at the Fire Alarm Control Panel shall activate the "Walk Test" mode of the system, which shall initiate the following events:
 2. The off-site central monitoring station connection shall be bypassed.
 3. Control relay functions shall be bypassed.
 4. Walk test shall be selectable by circuit.
 5. Alarms received on normal circuits shall cause the control panel to go into alarm and override the walk test mode.
 6. The control panel shall show a trouble condition.
 7. The alarm activation of any initiation device shall cause the audible signals to activate for two seconds.
 8. The panel shall automatically reset itself after signaling is complete.
 9. The control panel shall automatically return to normal condition if there is no activity on a walk test circuit for a period of 30 minutes.
- J. Supervision:
1. The system shall contain Class "A" or "B" (Style "B, C, D, or E") independently supervised initiating device circuits. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.
 2. Each independently supervised circuit shall include a discrete LED readout to indicate disarrangement conditions per circuit.
 3. The incoming power to the system shall be supervised so that any power failure must be audible and visually indicated at the Fire Alarm Control Panel and where applicable, the remote annunciator. A green "power on" LED shall be displayed continuously while incoming power is present.
 4. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the Fire Alarm Control Panel and where applicable, the remote annunciator.
 5. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.
- K. Power Requirements:
1. Each Fire Alarm Control Panel and remote power supply extender, fire alarm terminal cabinet or console shall be provided with a dedicated 120 VAC power

circuit and connected to 20A/1P circuit breaker in the nearest panelboard within the building or as noted on the plans). The circuit breaker shall be painted color "Red".

2. The fire alarm system shall operate from the line side of commercial service (120 VAC) rectified to 24 VOLT DC. A means of system disconnect and overcurrent protection shall be provided
 - a. Lead Calcium standby batteries shall be provided with sufficient capacity to power alarm signaling devices for not less than 5 minutes following a primary power interruption of at least 24 hours duration. The control panel shall contain battery charging and control equipment to maintain the batteries in "ready" condition at all times.

2.03 COMPONENTS (SEE DRAWINGS FOR THE FIRE ALARM SYSTEMS COMPONENT SCHEDULE)

- A. SILENT KNIGHT with Wheelock devices is the District's standard for the fire alarm manufacturer.
- B. Equipment and part numbers are specified on the Drawings FIRE ALARM SYSTEM COMPONENT SCHEDULE as a standard of quality.
 1. All material and equipment shall be rated for use in public institutions by the manufacturer, new, and free from defects. Except as specified herein, all system equipment and components shall be products compatible to the fire alarm control panel. Components not listed by the California State Fire Marshal and/or not having a CSFM listing number will not be accepted for installation.
 2. The Fire Alarm Control Panel (FACP) shall be modular construction, solid state and microprocessor based with non-volatile EEPROM memory. The control panel shall have "on-board" provisions to allow for loading or editing any special instructions or modifying system programming as needed. No special tools, modems, or "off-board" programmer shall be required to program the system however, the system may be field programmed by computer running the fire alarm system setup and maintenance program. Two registered copies of this system maintenance program shall be provided to the District with this system. All system instructions shall be stored in a resident non-volatile programmable memory.
 3. The fire alarm control panel shall support "hard wired" Style D (Class A) or B (Class B) initiating zone circuits and Style Z (Class A) or Y (Class B) individually programmable notification appliance circuits. Two notification appliance (alarm) circuits are to be provided standard as a part of the basic System Control Unit.
 4. The fire alarm control panel shall be provided with an Analog Loop Unit (ALU) Card for the system shown on the Drawings and described in these Specifications. The Analog Loop Unit card shall provide the system with capability to communicate with analog addressable initiating devices and control points. The ALU shall provide (2) signaling line circuits, each of which can be wired similar to NFPA Style 6 or 7 (Class A) or Style 4 (Class B). Each of these circuits can address up to 197 points, (99 analog sensors/modules and 98 monitor/control points) for a maximum of 394 points per ALU card. The card shall communicate with the sensors, modules or control point devices on either circuit over two #18 twisted copper pairs data cable. These data loops may be "branch tapped" as needed.
 5. The fire alarm control panel and the backup power batteries shall be housed in a single semi-flush mounted steel cabinet with a hinged door and keyed lock.
 6. The Fire Alarm Control Panel system shall be provided with all power supplies,

control modules, and auxiliary equipment required to meet the requirements described in this Specification and shown on the Drawings. The following system features shall be active (minimum):

- a. 2 Signaling Line Circuits
 - 1) 2 loops - Data net addressable circuits capable of a minimum 500 addresses.
- b. 2 Notification (Horn) Circuits: End of line devices to be installed as shown on drawings or in control panel or building terminal cabinet.
- c. Disconnect each "hard wired" initiation zone via software.
- d. City tie.
- e. The audible alarms shall be switch off manually at the control panel.
- f. Provisions for "drill" with automatic city tie disconnect.
- g. Each zone in alarm shall be annunciated at the control panel and at a serially connected remote annunciator.
- h. Standard trouble alarms and indicators shall be provided.
7. The following optional system equipment shall be provided:
8. AMM-2 Addressable Monitor Module: Provide one for each zone listed above and additional modules in each terminal cabinet as needed.
- a. 24VDC power supply for beam smoke detectors as shown on drawings.
9. The Remote Annunciator (ANN) shall be a LCD. The unit shall connect with the fire alarm control panel per manufacture recommendations.
 - a. Remote system controls – The remote annunciator shall provide all the functions as main fire alarm control panel.
10. Manual stations shall be addressable non-coded devices of cast metal construction, double action. A spare glass rod shall be provided stored in each station and 12 additional spare rods shall be provided to the District upon project completion. Reset keys for the new devices shall all be identical.
11. Photoelectric/Ionization type smoke detectors shall be addressable with two-wire base.
12. Room heat detectors shall be 135° F rate of rise addressable heat detector.
13. Attic Heat Detectors shall be <addressable> combination fixed temperature and rate-of-rise. Operation of the fixed temperature element shall be 200° F or as indicated at the device on the Drawing. Provide with standard outlet box adaptor.
14. Xenon strobe units shall be ADA compliant, candela (cd) as indicated, 24 VOLT DC, wall mounted @ +80" and as indicated on the Drawings. Visible only or Audible/Visible Appliances shall be appropriate as indicated on the Drawings. Wire guards shall be provided for visual alarm appliances in the multi-use room, in exit corridors, and as shown on the Drawings. Strobes in same room to be synchronize.
15. Fire alarm horns shall be 24VDC, electronic devices rated 96 dBA (minimum) mounted as noted. Exterior horns shall be weatherproof (WP) surface type mounted as noted. Horns shall be provided with strobe units where indicated on the Drawings. Provide Code 3 temporal as required.

2.4 WIRING (SEE DRAWING FOR FIRE ALARM CABLE SCHEDULE):

- A. Wire and cable shall be U.L. Listed for fire alarm use and shall be a minimum of 16 AWG or as required by local codes and Authority Having Jurisdiction.

PART 3 - EXECUTION**3.01 INSTALLATION**

- A. The installation shall be accomplished by and under the direction of skilled craftsmen, factory trained by the equipment manufacturer, and experienced in the installation of fire alarm systems of this type in the State of California. Workmanship shall be of the highest quality.
- B. The fire alarm system installation contractor must be the accepted system manufacturer's authorized dealer, with factory trained installation personnel and a normally maintained inventory of spare parts.
- C. Installation showing evidence of poor workmanship or not in accordance with these Specifications and the Drawings shall be re-accomplished or repaired to the satisfaction of the Architect at the Contractor's expense.
- D. Avoid splicing of conductors wherever possible; but where splices must be made, use Scotchlok or Wirenut type connectors in interior DRY locations only. Connections in wet locations and below grade will not be allowed. NO EXCEPTION!
- E. The conductors of the fire alarm system are required to be installed in RACEWAY. Raceway and conductors shall be installed under Sections 16110 and 16120 as required for proper system operation. Raceways containing conductors identified as "Fire Protective Control Panel" conductors shall not contain any other conductors. No AC current carrying conductors shall be allowed in the same raceway with the DC fire alarm detection and signaling conductors. A minimum of 18" of free wire shall be left at each outlet for device connection under this Division. Wire installed within terminal and equipment cabinets and at outlets must be neat and orderly. LABEL ALL WIRES at each accessible raceway opening with Brady "Omni-Grip" devices or the equivalent.
- F. Wire installed within terminal and equipment cabinets and at outlets must be neat and orderly. LABEL ALL WIRES at each accessible raceway opening with Brady "Omni-Grip" devices or the equivalent.
- G. Identify by "red" color paint, all fire alarm outlet boxes and raceways. Raceways may be painted color "red" every 10'-0" increments.

3.02 CONNECTIONS AND CIRCUIT

- A. The fire alarm system connections to the panelboard shall be on a dedicated branch circuit in accordance with California Electrical Code (CEC). The circuit and connections shall be mechanically protected. The circuit disconnecting means (circuit breaker) shall be "RED" in color and accessible only to authorized personnel and shall be clearly marked "FIRE ALARM".

3.03 CENTRAL STATION MONITORING

- A. The fire alarm system shall be connected via leased telephone lines to a central station or remote station as selected by the District (owner).
- B. The fire alarm system shall transmit both alarm and trouble signals with the alarm having priority over the trouble signal.

- C. The contractor shall be responsible for all installation charges, while the District shall be responsible for the line lease charges.
- D. TESTS, INSTRUCTION, AND DOCUMENTATION
- E. The entire system shall be tested, programmed, and adjusted under the supervision of a factory trained representative of the manufacturer. Coordinate all operational options with the District prior to setup. The system shall be tested to demonstrate that:
 - 1. All alarm initiating and signal systems and all supervisory equipment is performing properly.
 - 2. The entire system is free from grounded or open circuits.
 - 3. The alarm control equipment will indicate when a ground or open circuit that would affect operation occurs.
 - 4. All features of the remote annunciator are fully operational.
 - 5. Operate every building fire alarm device to ensure proper operation and correct annunciation at the fire alarm control panel and remote annunciator (where applicable).
 - 6. The signaling line circuits and notification appliance circuits shall be opened in at least two (2) locations to check for the presence of supervision.
 - 7. At least one half of all tests shall be performed on battery standby power.
 - 8. Where application of heat would destroy any detector, it may be manually activated.
- F. Any defects noted shall be corrected at once and the test re-conducted to demonstrate proper operation.
- G. Prior to final test, the fire department must be notified in accordance with the local requirements.
- H. Upon completion of system testing described above, a satisfactory final test of the entire system shall be made in the presence of the enforcing fire agency, the District and the manufacturer representative. Provide sufficient support staff to demonstrate the system completed as required by the enforcing agency. A notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the District, the local Fire Department, the Architect and the Engineer.
- I. The equipment supplier/installer shall instruct the District or his designated representative(s) in the proper operation, programming, and maintenance of the system. Allow a minimum of eight (8) hours on-site for this "hands-on" instruction and program training. Approximately 30 days after final acceptance of the system, or as requested by the Owner, a follow up training session shall be scheduled at the site. Any special operating problems shall be resolved and the system shall be fully checked out and "fine-tuned" as required. Allow a minimum of four (4) hours on site for the instruction portion of this requirement.
- J. Three bound manuals shall be provided to the District containing at least a service directory, a description of system operation, all system operation and maintenance instructions, complete data sheets, and approved system Drawings folded and placed in plastic pouches in the back. The manuals shall be composed of original material (not photocopies) and each section shall be clearly identified. Registered copies of the system maintenance program shall be provided to the District as described elsewhere in this Specification.
- K. The Contractor shall leave the fire alarm system in proper working order, and without

additional expense to the District, shall replace any defective materials or equipment provided under this contract within one year (365 days) from the date of final acceptance by the District.

END OF SECTION

SECTION 28 32 00

INTRUSION ALARM SYSTEM

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The General Conditions, Supplementary General Conditions, Special Conditions and Division 1 General Requirements apply to the work of this section.
- B. The work included in this section: Installation of complete addressable intrusion alarm system including but not limited to the following:
 - 1. Keypads.
 - 2. Motion Detectors.
 - 3. Additional interface devices
 - 4. Wiring for equipment and final connection of equipment and devices.
 - 5. Test, operational check and demonstration of system operation.

1.02 RELATED REQUIREMENTS

- A. Section 26 01 10: Electrical General Requirements.
- B. Section 26 05 29: Supporting Devices.
- C. Section 26 05 37: Boxes.
- D. Section 26 05 34: Raceways.

1.03 SUBMITTALS

- A. Manufacturer's literature describing the product.
- B. Wiring diagrams clearly showing the interconnections of all major components. This includes point to point wiring diagrams, device locations, conduit or wiring layout, mounting details, which shall be prepared using Autocad R14 or previous version. The contractor shall submit electronic files and six(6) copies of blueline sheets.
- C. Maintenance manuals and part lists. Six(6) sets of Operating Manual which shall include schematic drawings and service instructions. All parts shall be identified with standard part numbers and electrical characteristics which can be recognized by Owner's maintenance technicians.
- D. Record As-built drawings to be submitted upon request during construction period and after final completion of work.

1.04 QUALITY ASSURANCE

Codes and Standards: All equipment, systems and materials furnished and installed under this section shall be installed in accordance with the latest version of the applicable standards of:

- A. National Fire Protection Association (NFPA)
- B. Titles 19 and 24 of the California Administrative Code of Regulations
- C. Underwriter's Laboratories, Inc. (UL)
- D. Uniform Building Code

- E. California Electrical Code (CEC)
- F. Americans with Disabilities Act (ADA) requirements

1.05 WARRANTY, SERVICE AND TRAINING

- A. Warranty: All components, parts, and assemblies supplied by the Manufacturer and installed by the Contractor shall be warranted against defects in material and workmanship for a period of one(1) year parts and labor commencing upon the date of acceptance by the Owners. Warranty service shall be provided by a qualified factory-trained service representative.
- B. Service and maintenance: The Contractor shall provide the services required and equipment to maintain all security systems in a fully operational state for the entire duration of the warranty period. These services shall include adjustments and repair of computer equipment, software updates, signal transmission equipment, control equipment, interface and support equipment, visual inspections, operational tests, cleaning, performing diagnostic tests, and calibration of sensors. These services shall be performed twice during the warranty period; once after six (6) months of system acceptance and once a week prior to expiration of the warranty coverage. Service during the warranty period shall follow the same guidelines listed for extended service and maintenance detailed below.
- C. Extended Service and Maintenance Warranty:
 - 1. The term of the warranty shall begin on the system acceptance date and shall continue for one (1) year. The extended service and maintenance warranty will begin following this first year. The term shall be automatically renewed for successive one-year periods unless canceled by the Owner. The service and maintenance agreement shall hold Contractor responsible for providing the following basic services to the Owner, including all necessary parts, labor, and service equipment.
 - a. The Contractor shall repair or replace any security equipment item that fails to perform as initially installed, as specified, or as determined per the manufacturer's performance criteria.
 - b. The Contractor shall perform semiannual preventive maintenance on the security equipment. This preventive maintenance shall include, but is not limited to, cleaning, re-alignment, inspection, and testing of security devices. The Owner shall receive a written report of these inspections that identifies the security device's status and, if required, a list of all necessary repairs or replacements.
 - c. The Contractor shall be responsible for providing software maintenance on the security system. The Contractor shall install and configure any software updates that the manufacturer provides at no cost. Any additional software options, updates, or enhancements purchased by the Owner shall be installed by the Contractor. The Contractor shall not be responsible for the purchase of additional software packages or the maintenance of Owner data.
 - 2. The Contractor shall be compensated for any repairs or maintenance provided as a result of Owner abuse, misuse, intentional damage, accidental damage, or power fluctuations exceeding specified equipment tolerances.
 - 3. System defects or failures shall be corrected within six (6) hours on the same business day if the Owner makes a service request before 11:00 a.m., or before 12:00 noon the next business day if the Owner makes the request after 11:00 a.m. If requested by the Owner, the Contractor shall respond or remain at the site after normal business hours, and the Owner shall reimburse the Contractor for the incremental cost difference between premium labor rates and standard labor rates. This reimbursement applies to premium labor rates that do not

exceed time-and-a-half rates after normal business hours and double-time rates for Sundays and holidays. The Contractor's services shall be performed in a good and workmanlike manner and remain free from defects for a period of one (1) year.

- D. Training: Training in the complete operation of all systems shall be furnished by the Contractor upon completion of installation. Minimum time required: four (4) hours. Individuals requiring training shall be selected by the Owner.

1.06 SYSTEM FUNCTIONAL DESCRIPTION

- A. Building Security Alarm: The Contractor shall provide new alarm sensors to detect unauthorized entry to premises under remodelling. These sensors shall report their status to the new intrusion alarm control panel "IACP" being installed in the building administration. The new alarm panel shall report its status to the alarm receiver via a dial-up telephone line to the commercial alarm monitoring station as designated by the school district.
- B. Actuation of any motion detector shall:
1. Light supervised initiating circuit lamp at the master controller and sound alarm buzzer.
 2. Initiate the printout of the time and place of intrusion.
 3. Display on a visual display terminal in English where intrusion occurs.
 4. Sound audible alarm at the master controller.
 5. The audible alarm shall be capable of silencing by an acknowledge button at the guard station.
 6. Loss of power input shall:
Sound "trouble" alarm and light "trouble" lamp at control panel and at the remote annunciators. The system shall automatically and without interruption transfer to battery operation during power outages.
- C. System open or short circuit and ground fault shall: Sound "trouble" alarm and light "trouble" lamp at control panel and at remote annunciators.
- D. Sound "trouble" alarm and light "trouble" lamp at control panel and at remote annunciators.
- E. Perform other optional functions as indicated on drawings.

1.07 OPERATIONAL TEST

- A. Perform an operational test to assure that the installation complies with all requirements of the Specifications. Test shall be made in the presence of the Owner's representative.
- B. If any part of the system fails the test, it must be corrected and the test repeated until it satisfactorily passes the test.
1. Audible signal control quantity as needed for number of signals and signal zones involved. The wiring for the audible signals, up to and including the individual circuit breakers shall be supervised both against an open circuit and a short circuit fault condition.
 2. Audible signal shall be undulating type.
 3. Either fault condition shall immediately cause all trouble signals to sound without causing the signal breaker to open, while the panel is in the normal supervisory state.
 4. An individual zoned amber trouble lamp shall be provided for each signal circuit to indicate the location of any faults in the wiring to the audible signals or signal circuit breaker open condition.
 5. Lamp Test: The control unit alarm and trouble lamps may be tested to locate a lamp failure by depressing the lamp test pushbutton.

6. When the alarm initiating devices have been restored the system control shall be reset by depressing a single reset pushbutton.
7. A green "power on" indication on the panel for each separate source of 120V AC input power.
8. Trouble Indication: An amber trouble lamp and distinctive audible signal which shall operate when any of the specified supervised trouble conditions exist. The audible portion of the trouble signal shall be silenced with a "trouble silence" pushbutton. The trouble signal and indication shall automatically reset to normal when a trouble condition is corrected. To eliminate any confusion all visual and audible trouble signals at the fire alarm control panel shall remain off during the progress of a true alarm.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All system components shall be new and with the exception of custom designed control panels shall be listed by Underwriters Laboratories and shall be the product of one manufacturer. The system shall be of modular design to facilitate both expansion and service and shall be completely solid state except for priority and zone control relays. All equipment and installation material required for a completely operational system shall be furnished whether or not specifically enumerated herein or on the drawings.

2.02 MASTER CONTROLLER

- A. The new intrusion alarm master controller shall be Honeywell Vista 125BPT/Vista Turbo Series: It shall accept up to 60 user codes and 60 input points. The points can consist of nine(9) hardwired zones plus 127 wireless zones multiplex points connected to multiple four(4) wire bus. The bus must accept a minimum of 5000 feet of gauge # 18 AWG wire or a minimum of 2000 feet on #22AWG wires. The included parts are as follows:
 1. Expansion Module: Provide a two(2) wire bus for connection of up to 120 remote points. It shall handle up to fifteen (15) DS 7432 8-Input Remote Modules.
 2. 8-Input Remote Module: Provide eight (8) supervised input points for connection of additional normally closed inputs. Connects directly to the bus.
 3. Alpha Numeric Keypad: Displays up to two(2) lines of 16 characters. The alpha information is remotely downloadable and can be programmed by the installer at the keypad.

2.03 DEVICES

- A. Infrared Motion Detectors:
 1. Ceiling Mounted: Ademco 997, passive infrared detector, 360 degrees x 60' dia. Coverage, 18mA, at 12 VDC
- B. Key Pad:
 1. Wall mounted: Honeywell/ademco #6160 Alpha display keypad.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install and connect equipment in accordance with manufacturer's recommendations unless where more stringent requirement is specified.
- B. Final connections shall be done under supervision of equipment manufacturer's field representative.

3.02 WIRING

- A. All wiring shall be installed in conduit. The system shall be free from grounds, open and short circuits.
- B. All wires shall be identified at each terminal, splice and/or in each outlet.
- C. The final system connections and the installation of all electronic equipment shall be performed by representatives of the manufacturer of the equipment, and they shall also place the system into operation and perform system checkout. The technicians shall be particularly skilled in performing intrusion alarm installations.
- D. All wiring shall be installed in conformance with standard telephone company practice. Each equipment cabinet is to be provided with Western Electric Company, Siemons, or approved equal, type GB-31D terminal blocks with attached type 102D fanning strips for conductors smaller than #16 AWG. All interconnecting conductors shall be #18 AWG or larger and shall run through the fanning strip to the screw terminal cabinets with equipment layout.
- E. All truck cables shall be connected to solder lugs of terminal block. All station cable to run through fanning strip to screw terminal of terminal block.
- F. All cables within terminal cabinets shall be bound with lacing cord so that cables are in tight contact for their entire length.
- G. All cables entering a terminal cabinet shall be identified with Brady E-Z code wire markers, or approved equal. Upon completion of installation, six (6) copies of a one line "as-built" wiring diagram shall be furnished to the Owner. Identify all cable runs on wiring diagrams with exact wire marker code (numerical or alphabetical) as appear in terminal cabinets.

END OF SECTION

THIS PAGE INTENTIONALLY BLANK

SECTION 31 0000

EARTHWORK

PART 1 – GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 50 00, Construction Facilities and Temporary Controls.
- B. Section 01 57 13, Erosion Control
- C. Section 31 23 33, Trenching and Backfilling.
- D. Section 32 12 00, Asphalt Concrete Paving.
- E. Section 32 16 00, Site Concrete.
- F. Section 32 80 00, Irrigation.
- G. Section 32 90 00, Landscaping.
- H. Section 33 40 00, Site Drainage.
- I. Section 31 32 00, Soil Stabilization

1.03 QUALITY ASSURANCE

- A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- B. 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.
- C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting of inadequate compaction or moisture content is the sole responsibility of the contractor.
- D. Tests (See Part 3 for Compaction Testing).
- E. Contractor shall be solely responsible for all subgrades built. Failures resulting from inadequate compaction or moisture content are the responsibility of the contractor. Contractor shall be solely responsible for any and all repairs.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00.
- B. 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.

1.05 WARRANTY

- A. Refer to General Conditions and Section 01 78 36.

1.06 REFERENCES AND STANDARDS

- A. General: Site survey, included in the drawings, was prepared by Warren Consulting Engineers, dated August 2018, and is the basis for data regarding current conditions. While the survey is deemed generally accurate, there exists discrepancies and variations due to elapsed time, weather, etc. Existing dirt grades may vary 0.2 ft. from that shown.
- B. Site Visitation: All bidders interfacing with existing conditions shall visit the site prior to bid to verify general conditions of improvements. Discrepancies must be reported prior to the bid for clarification.
- C. ANSI/ASTM D698-e1 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
- D. ANSI/ASTM D1556-e1 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- E. ANSI/ASTM 698-12e2 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- F. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
- G. ANSI/ASTM D 4318-10e1 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.
- H. CALTRANS Standard Specifications Section 17.
- I. CAL-OSHA, Title 8, Section 1590 (e).
- J. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Transport, store and handle in strict accord with the local jurisdiction.
- B. 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.

1.08 PROJECT CONDITIONS

- A. Existing civil, mechanical and electrical improvements are shown on respective site plans to the

extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

- B. Excavation dewatering may be necessary. Contractor shall provide any and all tools, equipment and labor necessary for excavation dewatering no matter what the source. Dewatering shall be continuous until all site utilities are installed and backfilled.

1.09 EXISTING SITE 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.

1.10 [Use following if working on existing site] ON SITE UTILITY VERIFICATION AND REPAIR PROCEDURES

- A. Ground-breaking requirements:
 - 1. All underground work performed by a Contractor must be authorized by the District's Construction Manager or the Low Voltage Consultant prior to start of construction.
 - 2. The Contractor is to obtain and keep the original School's construction utility site plans on site during all excavation operations. Contractor can contact the District's Construction Manager, Facilities Manager, or the Low Voltage Consultant to procure the drawings.
- B. Underground Utility Locating:
 - 1. The contractor shall hire an Underground Utility Locating Service to locate existing underground utility pathways in areas affected by the scope of work for excavation.
 - 2. Contractor must use an underground utility locator service with a minimum of 3 years' experience. The equipment operator must have demonstrated experience.
 - 3. The Underground Utility Locator Service must have the use of equipment with the ability to locate by means of inductive clamping, induction, inductive metal detection, conductive coupling, or TransOnde (Radio detection) to generate signals, passive locating (free scoping) for "hot" electric, and metal detector.
 - 4. The Underground Utility Locator Service must be able to locate existing utilities at a depth of at least 72".
 - 5. The Underground Utility Locator Service must be able to locate but are not limited to locating the following types of utility pathways:
 - a) All conduit pathways containing 110 volt or greater 50-60Hz electrical wire.
 - b) All conduit pathways containing an active cable TV system.
 - c) All conduit pathways containing wire or conductor in which a signal can be attached and generated without damaging or triggering the existing systems.
 - d) All empty conduit pathways or pipe in which a signal probe or sonde (miniature transmitter) can be inserted.
 - e) All conduit pathways containing non-conductive cables or wires in which a signal probe or sonde (miniature transmitter) can be inserted.
 - f) All plastic and other nonconductive water lines in which a TransOnde Radio detection) or other "transmitter" can be applied to create a low frequency pressure wave (signal) without damaging or triggering the existing systems.
 - g) All copper or steel waterlines and plastic or steel gas lines
 - 6. All markings made by the Underground Utility Locator Service or other shall be clear and visible.
 - 7. The contractor shall maintain all markings made by Underground Utility Locator Service or

- other throughout the entire length of the project.
8. The Underground Utility Locator Service shall provide the contractor with two sets of maps showing the location of utilities and average depth. They will be referenced to permanent buildings. Contractor will deliver one copy to the district at no additional charge.
 9. Contractor is responsible to contact Underground Service Alert (U.S.A. 800/227-2600) and receive clearance prior to any excavation operations.
 10. Contractor shall inform the (District's Construction Manager) (Architect) (Owner) no later than five (5) days prior to the date scheduled for the utility locator service to be on site.

1.11 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, the Contractor shall be solely and completely responsible for working conditions at the job site, 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. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullyng of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The 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.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. 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.

1.12 SEASONAL LIMITS

- A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.
- B. Excessively wet fill material shall be bladed and aerated per section 3.08, B.

1.13 TESTING

- A. General: Refer to Section 01 45 00 – Quality Requirements.
- B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will

be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and back charged to Contractor.

1. If Contractor elects to process or mine onsite materials for use as Suitable Fill, Aggregate Sub Base, Aggregate Base, Rock, Crushed Rock or sand the cost of all testing of this material shall be paid for by the Contractor.
2. Testing of import fill for compliance with Department of Toxic Substance Control (DTSC) shall be paid for by the Contractor.

1.14 ARCHEOLOGICAL AND CULTURAL RESOURCES

- A. If archeological or cultural resources are discovered during the Work, the Contractor must cease all construction operations in the vicinity of the discovery until a qualified archeologist can assess the value of these resources and make recommendations to the State Historic Preservation Officer. Archeological and cultural resources include artifacts, large amounts of bone, shell, or flaked stone, and other evidence of human activity. If the State Historic Preservation Officer or the Owner directs that work be temporarily ceased at the location of an archeological or cultural find, the Contractor must temporarily suspend work at the location.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Engineered Fill Materials: All fill shall be of approved local materials supplemented by imported fill if necessary. "Approved" local materials are defined as local soils tested and approved by Geotechnical Engineer free from debris, and concentrations of clay and organics; and contain rocks no larger than 3-inches in greatest dimension. The soil and rock should be thoroughly blended so that all rock is surrounded by soil. This may require mixing of the soil and rock with a dozer prior to placement and compaction. Clods, rocks, hard lumps or cobbles exceeding 3-inches in final size shall not be allowed in the upper 12 inches of any fill. Native clay or clayey soils will not be permitted within the upper 12 inches of building pad areas or paved areas.
- B. Imported Engineered Fill Material: Imported fill may be required to complete work. Proposed import fill material shall meet the above requirements; shall be similar to the native soils. Import fill shall meet the above requirements; shall have plasticity index of 12 or less; an Expansion Index of 20 or less; be free of particles greater than 3-inches in largest dimension; be free of contaminants and have corrosion characteristics within the acceptable limits. All import fill material shall be tested and approved by Soils Engineer prior to transportation to the site. Proposed fill material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.
 1. DTSC TESTING: Site work contractor is to coordinate testing with an analytical lab, hired by the owner, licensed by the State of California for the DTSC testing. The costs associated with the testing will be paid by the contractor.
 2. DTSC testing shall include documentation as to the previous land use, location, and history. Soils shall be analyzed for all compounds of concern to ensure the imported soil is uncontaminated and acceptable. Testing shall be performed per the recommendations included in DTSC Imported Fill Advisory http://www.dtsc.ca.gov/Schools/upload/SMP_FS_Cleanfill-Schools.pdf). Soils shall be tested prior to import to the project site. Lab shall determine geographically which tests and analysis comparison will be appropriate for the testing. (CAM 17 / Title 22); (RWQCB) Regional Water Quality Control Board; or (OEHHA) Office of Environmental Health Hazard Assessment.

3. Frequency of testing shall be conducted in accordance with DTSC's Imported Fill Advisory as follows;

Fill Material Sampling Schedule

Area of Individual Borrow Area	Sampling Requirements
2 Acres or less	Minimum of 4 samples
2 to 4 Acres	Minimum of 1 sample every ½ Acre
4 to 10 Acres	Minimum of 8 Samples
Greater than 10 Acres	Minimum of 8 locations with 4 subsamples per location

Volume of Borrow Area Stockpile

Up to 1,000 Cubic Yards	1 sample per 250 cubic yards
1,000 to 5,000 Cubic Yards	4 samples for the first 1000 cubic Yards + 1 sample per each additional 500 cubic yards
Greater than 5,000 Cubic Yards	12 samples for the first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

4. Reports/ Documentation
- a. Results of the testing analysis shall be sent to the Owner; Architect; Project Inspector, Project Civil Engineer, DTSC, and DSA. Letter shall reference DSA file and application numbers.

C. Landscape Backfill Material:

1. The top ____" of native topsoil stripped from the site may be used for landscape backfill material provided it meets the requirements as specified in Section 329000.
2. Imported Topsoil may be required to complete work. See Section 329000 for requirements. Proposed Topsoil material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.

- D. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.
- E. Aggregate Base: Provide Class 2 3/4" Aggregate Base conforming to standard gradation as specified in Cal Trans Standard Specifications, Section 26,-1.02A.
- F. Decomposed Granite: Decomposed Granite shall be well graded mixture of fine to 1/8" particles in size with no clods. The material shall be free of vegetation, other soils, debris and rock. The material shall be reddish-tan to tan in color.
- G. Decomposed Granite Solidifier: PolyPavement or equal.

PART 3 – EXECUTION

3.01 INSPECTION LAYOUT AND PREPARATION

- A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point where this installation may properly commence
- B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a licensed Land Surveyor or Professional Civil Engineer.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 PERFORMANCE

- A. GENERAL:
 - 1. General: Do all grading, excavating and cutting necessary to conform finish grade and contours as shown. All cuts shall be made to true surface of subgrade.
 - 2. Archaeological Artifacts: Should any artifacts of possible historic interest be encountered during earthwork operations, halt all work in area of discovery and immediately contact the Architect for notification of appropriate authorities.
 - 3. Degree of Compaction: Percentage of maximum density, hereinafter specified as degree of compaction required, means density equivalent to that percentage of maximum dry density determined by ASTM D1557 Compaction Test method, and such expressed percentage thereof will be minimum acceptable compaction for specified work.
 - 4. Moisture Content: Moisture content shall be as noted below and as called for on the plans. Moisture content shall be maintained until subgrade is covered by surfacing materials.

3.03 DEMOLITION, DISPOSAL AND DISPOSITION OF UNDESIRABLE MAN-MADE FEATURES

- A. All other obstructions, such as abandoned utility lines, septic tanks, concrete foundations, and the like shall be removed from site. Excavations resulting from these removal activities shall be cleaned of all loose materials, dish shaped, and widened as necessary to permit access for compaction equipment. Areas exposed by any required over-excavation should be scarified to a depth of 8", moisture-conditioned to the optimum moisture content, and recompacted to at least 90% of the maximum dry density.

3.04 TESTING AND OBSERVATION

- A. All grading and earthwork operations shall be observed by the Geotechnical Engineer or his representative, serving as the representative of the Owner.
- B. Field compaction tests shall be made by the Geotechnical Engineer or his representative. If moisture content and/or compaction are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified moisture or compaction. Notify Geotechnical Engineer at least 48 hours in advance of any filling operation.
- C. Earthwork shall not be performed without the notification or approval of the Geotechnical Engineer or his representative. The Contractor shall notify the Geotechnical Engineer at least two (2) working days prior to commencement of any aspect of the site earthwork.
- D. If the Contractor should fail to meet the compaction or design requirements embodied in this

document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory, as determined by the Geotechnical Engineer or Architect/Engineer.

- E. After each rain event Geotechnical Engineer shall test fill material for optimum moisture. Do not place any fill material until desired moisture is achieved.

3.05 CLEARING AND GRUBBING

- A. Prior to grading, remove all debris off-site. Remove trees and brush including the root systems. Holes resulting from tree and brush removal should be prepared and backfilled in accordance with paragraphs 3.07, 3.08, 3.09, and 3.10. This may require deepening and/or widening the holes to adequately remove disturbed soil and provide room for compaction equipment. Strip the surface of all organics. Stripping's meeting the requirements of Section 32 90 00 may be used in landscape areas only.

3.06 CUTTING

- A. Building pads that are located within a cut/fill transition area will have to be overexcavated to provide a semi-uniform fill beneath the building pad. The portions of building pads located in cut areas shall be overexcavated to provide no more than 1 foot difference in fill placed in the same building pad.
- B. Do all cutting necessary to bring finish grade to elevations shown on Drawings.
- C. When excavation through roots is necessary, cut roots by hand.
- D. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.

3.07 STRUCTURAL EXCAVATION

- A. General: Excavate to bear on firm material at contract depth shown on Structural Drawings.
- B. Footings: All footing excavations shall be of sufficient width for installation of formwork, unless earth will retain its position during concreting. All portions of footings above grade must be formed.
- C. Unsuitable Ground: Any errors in structural excavation, soft ground, or clay soils found when excavating shall be reported to Architect. In no case shall work be built on any such soft or clayey unsuitable surface without direction from the Architect. Restore excavations to proper elevation with engineered fill material compacted to 90% of dry density.

3.08 SUBGRADE PREPARATION

- A. Grade compact and finish all subgrades within a tolerance of 0.10' of grades as indicated on Drawings and so as not to pool water. Subgrade within building pads and concrete walks shall be within 0.05' of grades indicated.
- B. After clearing, grubbing and cutting, subsurface shall be plowed or scarified to a depth of at least 12", until surface is free from ruts, hummocks or other uneven features and uniform and free from large clods. Moisture condition to the optimum moisture content and recompact to at least 90% of the maximum dry density as determined by ASTM Test Method D1557. If the existing soils are at a water content higher than specified, the contractor shall provide multiple daily aerations by ripping, blading, and/or disking to dry the soils to a moisture content where the specified degree of compaction can be achieved. After seven consecutive working days of daily aerations, and the moisture content of the soil remains higher than specified, the contractor shall notify the architect. If

the existing soils have a moisture content lower than specified, the contractor shall scarify, rip, water and blade existing soil to achieve specified moisture content. The contractor shall make proper allowance in schedule and methods to complete this work.

- C. Subgrade in areas to receive landscaping shall be compacted to 90%.
- D. Where Contractor over-excavates building pads through error, resulting excavation shall be recompacted as engineered fill at Contractor's expense.

3.09 PLACING, SPREADING AND COMPACTING FILL MATERIAL IN BUILDING PAD AND PAVEMENT AREAS

- A. Selected fill material shall be placed in layers which, when compacted, shall not exceed 6 inches in compacted thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity in moisture content.
- B. Selected fill material shall be moisture-conditioned to specified moisture content. Selected fill material shall be unfrozen. When moisture content of fill material is below that specified, add water until proper moisture content is achieved. When moisture content is above that specified, aerate by blading or other methods mentioned in 3.08 B until moisture content is satisfactory.
- C. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to a minimum of 90% as determined by the ASTM D1557 Compaction Test. Compact each layer over its entire area until desired density has been obtained.
- D. Recomposition of Fill in Trenches and Compaction of Fill Adjacent to Walls: Where trenches must be excavated, backfill with material excavated. Place in lifts that when compacted do not exceed 6", moisture conditioned to (optimum)(2% above optimum) moisture content, and compact to a minimum of 90% relative compaction in building pad and paved areas, and to 90% relative compaction in landscape areas.
- E. Jetting of fill materials will not be allowed.

3.10 FINAL SUBGRADE COMPACTION

- A. Building Pads: Upper 12" of all final building pad subgrades (including future buildings) shall be uniformly compacted at specified moisture content to at least 90% of maximum dry density, as determined by ASTM D1557 Compaction Test, regardless of whether final subgrade elevation is attained by filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until concrete flatwork is placed.
- B. Paved Areas: Upper 12" of all final subgrades supporting pavement sections and all other flatwork shall be brought to specified moisture content and shall be uniformly compacted to not less than 90% of maximum dry density, regardless of whether final subgrade elevation is attained by filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until concrete flatwork is placed.
- C. Other Fill and Backfill: Upper 12" of all other final subgrades or finish grades shall be compacted to 90% of maximum dry density.
- D. Gravel Fill: Do not place compacted gravel fill until after underground work and foundations are in

place. Compact gravel fill with vibratory plate or similar equipment to preclude settlement.

3.11 PLACING, SPREADING, AND COMPACTION OF LANDSCAPE BACKFILL MATERIALS

- A. All landscaped areas shall receive topsoil. After subgrade under landscape area has been scarified and brought to 90% maximum dry density, top soil shall be placed evenly to depth of 12" at 85% of maximum dry density.
- B. Project Inspector must verify that materials are uniformly spread to minimum depth specified.

3.12 DECOMPOSED GRANITE COMPACTION AND STABILIZATION

- A. Decomposed granite paving, paths or track shall be placed uniformly to the required depth and treated with PolyPavement or approved equal. Apply PolyPavement using Application Method 1 or a mixed application method.

3.13 SLOPE CONSTRUCTION

- A. Cut slopes shall be constructed to no steeper than 2H:1V (horizontal:vertical). Fill slopes shall be constructed to no steeper than 3H:1V (horizontal:vertical). Prior to placement of fill on an existing slope the existing slope shall be benched. The benches shall be in a ratio of 10 horizontal to 1 vertical. The face of the fill slopes shall be compacted as the fill is placed, or the slope may be overbuilt and then cut back to the design grade. Compaction by track walking will not be allowed.

3.14 FINISH GRADING

- A. At completion of project, site shall be finished graded, as indicated on Drawings. Finish grades shall be "flat graded" to grades shown on the drawing. Mounding of finish grades will not be allowed unless otherwise directed on the landscape drawings. Tolerances for finish grades in drainage swales shall be $\pm 0.05'$. Tie in new and existing finish grades. Leave all landscaped areas in finish condition for lawn seeding. Landscaped planters shall be graded uniformly from edge of planter to inlets. If sod is used for turf areas the finish grade on which it is placed shall be lowered to allow for sod thickness.
- B. All landscape areas shall be left free of rock or foreign material as specified in Section 32 90 00.
- C. All landscape areas shall be approved by Architect prior to any planting.

3.15 SURPLUS MATERIAL

- A. Excavated material not required for grading or backfill shall be removed from site at contractor's expense.

3.16 CLEANING

- A. Refer to Section 01 74 00.
- B. Remove from fill all vegetation, wood, form lumber, casual lumber, and shavings, in contact with ground; buried wood will not be permitted in any fill.

END OF SECTION

SECTION 31 2333

TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

- A. The general conditions, supplementary conditions and Division 1 are fully applicable to this section as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 50 00, Construction Facilities and Temporary Controls.
- B. Section 31 00 00, Earthwork.
- C. Section 31 32 00 Soil Stabilization
- D. Section 33 40 00, Site Drainage.
- E. Section 33 00 00, Site Utilities.
- F. Section 32 80 00, Irrigation.
- G. Section 32 12 00, Asphalt Concrete Paving

1.03 QUALITY ASSURANCE

- A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- B. 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.
- C. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00.
- B. Submit Manufacturers data and shop drawings.

1.05 WARRANTY

- A. Submit fully executed warranty for work and materials in this section per 01 78 36.

1.06 REFERENCES AND STANDARDS

- A. California Building Code current edition.
- B. California Plumbing Code current edition.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Transport, store and handle in strict accord with the local jurisdiction.
- B. 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.

1.08 PROJECT CONDITIONS

- A. Contractor shall acquaint himself with all existing 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. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.
- C. Trench dewatering may be necessary. Contractor shall provide any and all tools, equipment and labor necessary for trench dewatering no matter what the source. Dewatering shall be continuous until all site utilities are installed and backfilled.

1.09 PROTECTION

- A. Adequate protection measures shall be provided to protect workers 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. Repair all trenches in grass areas with new sod (seeding not permitted) and "stake-off" for protection.
- B. Contractor shall be solely and completely responsible for working conditions at the job site, 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. Any construction review of the Contractor's performance conducted by the Architect or Owner is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.
- D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gulying of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. Keep all excavations free from water during entire progress of work, regardless of cause, source or nature of water.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance.

- H. Trees: Carefully protect existing trees which are to remain.

1.10 TRENCH SAFETY PROVISIONS

- A. General Contractor shall be solely responsible for safety design, construction and coordination with agencies having jurisdiction. If such plan varies from shoring system standards established by Construction Safety Orders, plan shall be prepared by registered civil or structural engineer.
- B. Nothing herein shall be deemed to allow use of shoring, sloping or protective system less effective than that required by Construction Safety Orders of California State Division of Industrial Safety.
- C. When trenching through paved surface, provide steel trench plates to cover open trenches daily until trenches are backfilled.

1.11 SEASONAL LIMITS

- A. No backfill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, full operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.
- B. Material above optimum moisture shall be processed per section 310000, 3.08, B.

1.12 TESTING

- A. General: Refer to Section 01 45 00 – Quality Requirements.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Backfill materials: Pipeline and conduit trench backfill as shown on the plans and as specified below.
1. ¾ inch crush rock.
 2. Native Materials: Soil native to Project Site, free of wood, organics, and other deleterious substances. Rocks shall not be greater than ___-inches.
 3. Sand: Fine granular material, free of organic matter, mica, loam or clay.
 4. Lean Mix Concrete/Controlled Density Backfill: 2 sacks cement slurry.
 5. Class 2 aggregate base, ¾" rock, per Caltrans section 26-1.02B
- B. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.
- C. Provide other bedding and backfill materials as described and specified in Section 31 00 00, Section 33 40 00 and Divisions 15 and 16.

PART 3 – EXECUTION

3.01 INSPECTION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.
2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.

3.02 COORDINATION

- A. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.03 INSTALLATION

- A. Perform work in accordance with pipe manufacturer's recommendations, as herein specified and in accordance with drawings.

3.04 TRENCHING

- A. Make all trenches open vertical construction with sufficient width to provide free working space at both sides of trench around installed item as required for caulking, joining, backfilling and compacting; not less than 12 inches wider than pipe or conduit diameter, unless otherwise noted.
- B. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.
- C. Trench straight and true to line and grade with bottom smooth and free of edges or rock points.
- D. Where depths are not shown on the plans, trench to sufficient depth to give minimum fill above top of installed item measured from finish grade above the utility as follows:
1. Sewer pipe: depth to vary
 2. Storm drain pipe: depth to vary
 3. Water pipe - Fire Supply: 36 inches
 4. Water pipe – Domestic Supply: 30 inches
- E. Where trench through existing pavement saw cut existing pavement in straight lines. Grind existing asphalt on each side of trench 3" wide x ½ the depth of the section. Apply tack coat to vertical surfaces before installing new asphalt. Replace asphalt and concrete pavement sections to matched existing conditions. In concrete pavement provide expansion and control joints to match existing joint layout.

3.05 BACKFILL

- A. Pipe Trench Backfill is divided into two zones:
1. Bedding: Layer of material directly under the pipe upon which the pipe is laid.
 2. Initial Backfill: Backfill from the top of the bedding to 12 inches (compacted) over the top of the pipe.
- B. Bedding and Initial Backfill:

1. Type of material for Bedding and Pipe Zone shall be as required by Drawings.
2. Compaction of Bedding and Initial Backfill shall be achieved by vibratory plate as necessary to consolidate material.
3. Backfill shall be brought up at substantially the same rate on both sides of the pipe and care shall be taken so that the pipe is not floated or displaced. Material shall not be dropped directly on pipe.

C. Backfill Compaction:

1. Backfill shall be placed in layers which, when compacted shall not exceed 6 inches in thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity. Do not backfill over, wet, frozen or soft subgrade surfaces. Employ a placement method that does not disturb or damage foundation walls, perimeter drainage, foundation damp-proofing, waterproofing or protective cover.
2. When moisture content of fill material is below that required to achieve specified density, add water until proper moisture content is achieved. When moisture content is above that required, aerate by blading or other methods until specified moisture content is met, see section 310000, 3.08, B.
3. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to 90% of maximum dry density while at specified moisture content. Compact each layer over its entire area until desired density has been obtained.
4. The top 12 inches of subgrade compaction under pavement or building shall be per Earthwork section 31 00 00.
5. Compaction: All backfill operations shall be observed by the Inspector of Record and/or Geotechnical Engineer. Field density tests shall be made to check compaction of fill material. If densities are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified densities. Notify Inspector and Architect at least 24 hours in advance of any operation.

3.06 TRENCH AND SITE RESTORATION

- A. Finished surface of trenches shall be restored to a condition equal to, or better than the condition as existed prior to excavation work.

3.07 PROTECTION

- A. Protect existing surfaces, structures, and utilities from damage. Protect work by others from damage. In the event of damage, immediately repair or replace to satisfaction of Owner.
- B. Repair existing landscaped areas to as new condition. Replant trees, shrubs or groundcover with existing materials if not damaged or with new materials if required. Replace damaged lawn areas with sod, no seeding will be permitted.
- C. Replace damaged pavement with new compatible matching materials. Concrete walks to be removed to nearest expansion joint and entire panel replaced. Asphalt to be cut neatly and replaced with new materials.

- D. Any existing materials removed or damaged due to trenching to be returned to new condition.

3.08 SURPLUS MATERIAL

- A. Remove excess excavated material, unused materials, damaged or unsuitable materials from site.

3.09 CLEANING

- A. Refer to Section 01 74 00.
- B. Contractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others throughout the project and at the completion of work.
- C. After completion of work in this section, remove all equipment, materials, and debris. Leave entire area in a neat, clean, acceptable condition.

END OF SECTION

SECTION 32 1200

ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 50 00, Construction Facilities and Temporary Controls.
- B. Section 31 00 00, Earthwork.
- C. Section 31 23 33, Trenching and Backfilling.
- D. Section 32 80 00, Irrigation
- E. Section 33 40 00, Site Drainage.

1.03 QUALITY ASSURANCE

- A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- B. 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.
- C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.
- D. Contractor shall provide verification that asphalt mix temperature meets the requirements of this specification at time of application.
- E. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction are the responsibility of the contractor.
- F. Sieve analysis from testing laboratories identifying rock/sand percentages within the asphalt mix shall have a testing date within 90 days of contract signing.
- G. Sieve analysis from a testing laboratory identifying rock/sand percentages within the class 2 aggregate base rock shall have a testing date within 90 days of contract signing.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00.
- B. 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.

1.05 WARRANTY

- A. Refer to General Conditions and Section 017836.

1.06 REFERENCES AND STANDARDS

- A. ANSI/ASTM D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- B. ANSI/ASTM D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ANSI/ASTM D1557-02 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- D. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
- E. ANSI/ASTM D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.
- F. CALTRANS Standard Specifications.
- G. CAL-OSHA, Title 8, Section 1590 (e).
- H. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Transport, store and handle in strict accord with the local jurisdiction.
- B. 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.

1.08 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Base Course: Do not lay base course on muddy subgrade, during wet weather, or when atmospheric temperature is below 40 degrees F.
 - 2. Asphalt Surfacing: Do not apply asphaltic surfacing on wet base, during wet weather, or when atmospheric temperature is below 50 degrees F.

1.09 EXISTING SITE 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.

1.10 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, the Contractor shall be solely and completely responsible for working conditions at the job site, 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. Any construction review of the Contractor's performance conducted by the owner's representative is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- D. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The 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.
- E. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- F. 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.

1.11 SEASONAL LIMITS

- A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

1.12 TESTING

- A. General: Refer to Section 01 40 00 – Quality Requirements.
- B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Sterilant: Soil sterilizer shall be CIBA GEIGY's Pramitol 25-E or Thompson-Hayward Casoron.
 - 1. Soil sterilizer shall be applied in strict accordance with manufacturer's instructions.
- B. Base Course Aggregate: State Specifications, Section 26, Class 2 aggregate base (3/4" max.).

- C. Asphalt Binder: Steam-refined paving asphalt conforming to State Specifications, Section 92, viscosity grade PG 64-10. Asphalt binder additives for HMA per Caltrans approved list of manufacturer's.
- D. Liquid Asphalt Tack Coat: Per CALTRANS section 94.
- E. Surface Course Aggregate: Mineral aggregates for Type "B" asphalt concrete, conforming to State Specifications 39-2.02, Type B, ½" maximum, medium gradient. 3/8" maximum gradient at Playcourt.
- F. Seal Coat: shall be a pre-mixed asphalt emulsion blended with select fillers and fibers such as:
 - 1. "Park-Top No. 302", Western Colloid Products.
 - 2. "OverKote", Reed and Gram.
 - 3. "Drivewalk", Conoco Oil.
- G. Wood Headers and Stakes: Pressure treated.
- H. Pavement Marking: Colors as directed by Architect. Colors of painted traffic stripes and pavement markings must comply with ASTM D 6628.
 - 1. Waterborne traffic line - colors white, yellow and red, State specification PTWB-01R3.
 - 2. Waterborne traffic line for the international symbol of accessibility and other curb markings – blue, red and green, Federal specification TT-P-1952F.
- I. Precast Concrete Bumpers: 3000 psi at 28 day minimum strength; 48" length unless otherwise indicated; provide with steel dowel anchors and concrete epoxy.
- J. Pavement Epoxy; K-Lite; Ktep-x-590; Ennis Epoxy HPS2 or an approved equal.
- K. Crack Filler;
 - 1. Cracks up to ½": QPR model CAR08, 10oz asphalt crack filler; Star STA-FLEX Trowel Grade crack filler or approved equal.
 - 2. Cracks ¼" – 1": "Docal 1100 Viscolastic, distributed by Conoco, Inc., Elk Grove, CA, (916) 685-9253, or approved equal.
 - 3. Cracks greater than 1": Hot Mix, Topeka.
- L. Reclaimed Asphalt Paugment (RAP). HMA Type A or Type B may be produced using RAP providing it does not exceed 15% of the aggregate blend.

2.02 MIXES

- A. General: Plant mixed conforming to State Specifications, Section 39, Type B, ½" maximum, medium grading. 3/8" maximum grading shall be used at hardcourt.
- B. Temperature of Hot Mix Asphalt: Not less than 275 degrees F nor more than 325 degrees F when added to aggregate.
- C. Temperature of Hot Mix Aggregate: Not less than 250 degrees F nor more than 325 degrees F when asphalt is added.
- D. Temperature of Hot Mix Asphalt Concrete: Asphalt shall be not less than 285 degrees at time of

application, nor more than 350 degrees. Asphalt not meeting the required temperature shall not be used.

- E. Temperature of Warm Mix Asphalt: Mixing and placement; Per the approved manufactures heat range recommendations for mixing and placement.

PART 3 - EXECUTION

3.01 EXAMINATION OF CONDITIONS

- A. Conditions of Work in Place: Subsurfaces which are to receive materials specified under this Section shall be carefully examined before beginning work hereunder, and any defects therein shall be reported, in writing, to the Architect. Work shall not be started until such defects have been corrected. Starting of work shall imply acceptance of conditions as they exist.

3.02 PREPARATION

- A. Sub-Grade: Clean, shape and compact to hard surface free from elevations or depressions exceeding 0.05' in 10' from true plan. Compact per Section 31 00 00. Compaction and moisture content shall be verified immediately prior to placement of aggregate base. Proof roll subbase in presence of geotechnical engineer prior to placement of aggregate base.
- B. Cleaning: Existing surfaces and new surface shall be clean of all dirt, sand, oil or grease. All cracks shall be cleaned and free of all debris and vegetation. Hose down entire area with a strong jet of water to remove all debris.

3.03 INSTALLATION

- A. Headers:
 - 1. General: Install as edging to asphalt paving, except where adjoining existing pavement, concrete curbs, walks or building.
 - 2. Existing Headers: Remove existing headers where new paving will join existing. Saw cut existing asphalt to provide clean edge.
 - 3. Lines and Levels: Install true to line and grade. Cut off tops of stakes 2-inches below top of header so they will not be visible on completion of job.
- B. Asphalt Paving:
 - 1. Base Course: Install in accord with State Specifications, Section 26. Compact to relative compaction of not less than 95%, ASTM D1557. The material shall be deposited on the subgrade in such a manner as to provide a uniform section of material within five percent tolerance of the predetermined required depth. Deposition will be by spreader box or bottom dump truck to prevent segregation of the material. The material so deposited on the subgrade shall have sufficient moisture which, in the opinion of the project inspector is adequate to prevent excessive segregation. It shall then be immediately spread to its planned grade and cross section. Undue segregation of material, excessive drifting or spotting of material will not be permitted. If in the opinion of the site geotechnical engineer, the material is unsuitably segregated, it shall be removed or completely reworked to provide the desired uniformity of the material.
 - a. Moisture content and compaction of base material shall be tested immediately prior

to placement of asphalt paving.

2. Sterilant: Apply specified material at manufacturer's recommended rate. Applicator of sterilant material shall be responsible for determining location of all planter areas. Apply specified material over entire base course area just prior to application of asphalt. Follow manufacturer's printed directions.
 3. Liquid Asphalt Tack Coat: Apply as "tack coat" to all vertical surfaces of existing paving, curbs, walks, and construction joints in surfacing against which paving is to be placed.
 4. Asphalt Concrete Surface Course:
 - a. Comply with State Specifications, 39-6 except as modified below.
 - 1) Final gradation shall be smooth, uniform and free of ruts, humps, depressions or irregularities, with a minimum density of 91% of the theoretical maximum specific gravity determined by California Test Method #309. Maximum variation 1/8 inch in 10' when measured with steel straightedge in any one direction. Test paved areas for proper drainage by applying water to cover area. Correct portions that do not drain properly by patching with plant mix. In no case shall accessible parking spaces or loading and unloading areas exceed 2% slope in any direction.
 - 2) Asphalt material shall be delivered to the project site in a covered condition to maintain acceptable temperature. Onsite inspector shall verify temperature of asphalt upon truck arrival to the site.
 5. Placement and adjustment of Frames, Covers, Boxes and Grates: The Contractor shall set and adjust to finish grade all proposed and existing frames, covers, boxes, and grates of all manholes, drop inlets, drain boxes, valves, cleanouts, electrical boxes and other appurtenant structures prior to placement of asphaltic concrete.
 6. Water Testing: All paved areas shall be water tested, to check drainage, in the presence of the project inspector prior to placement of seal coat. The surface of asphalt paving shall not vary more than 1/8 inch above or below the grade established on the plans. If variations in grade are present, they will be corrected by overlaying paving and/or pavement removal and replacement as directed by the Architect.
 7. Patching: Cut existing paving square and plumb at all edges to be joined by new paving. In trenches; grind existing asphalt on each side of trench 3" wide x 1/2 the depth of the section. Apply tack coat to vertical surfaces before installing new work. Warp carefully to flush surface, with seal over joints, and feather edge. Sawcut, remove and patch existing paving where cutting is necessary for installation of piping or conduits under Divisions 2, 15 and 16.
- C. Seal Coat:
1. Seal coat shall be applied no sooner than 30 days from time of asphalt placement, no exceptions.
 2. Surface Preparation: surface and cracks shall be clean of all dirt, sand, oil or grease. All cracks shall be filled to a level condition after curing. Make multiple fill applications until a level condition is achieved. Failure to do so will be the reason for rejection. Hose down entire area with a strong jet of water to remove all debris. Remove soft, loose, or otherwise damaged areas of asphalt concrete to full depth of damage and replace with compacted hot mix asphalt concrete as specified herein. Minor holes and imperfections may be patched using hot mix asphalt or mastic using sand/SS-1-H. Use wire brush for removal of oil and grease; prime with shellac or synthetic resin as recommended by manufacturer of pavement

sealer material.

3. Seal Coat Seal Application: Thoroughly mix materials and apply in the presence of the onsite inspector. Failure to do so will be cause for rejection. Apply in accordance with manufacturer's written instructions.
 - a. The minimum application rate for each applied coat shall be 30gals per 1000 sq. ft. Two coats of sealcoat will be required.
 - b. Clean-Up and Precautions: As recommended by pavement sealer material manufacturer.

D. Asphalt Concrete Overlay Paving:

1. Comply with State Specifications, 39-6 except as modified below.
2. Grind or remove existing asphalt concrete paving at limits of overlay paving to provide a minimum 1 1/2" overlay thickness. Limits of grinding or removal shall be field verified to insure that finished paving surface will have a one percent minimum slope.
3. Thoroughly clean surface to remove vegetation, dirt, sand, gravel and water from surface and from cracks. Vegetation shall be treated 7 days prior to removal with an herbicide.
4. Cracks greater than 1 inch shall be filled with hot mix asphalt and rolled and compacted. Cracks less than one inch shall be filled with crack filler. Potholes shall be filled with hot-mix rolled and compacted. Contractor shall have Engineer approve crack and pothole repair prior to overlay. Provide leveling courses of hot mix asphalt as required to achieve finish grades shown on the drawings.
 - a. Cracks less than one inch in width shall be level after curing. Contractor shall make multiple filling applications as necessary to achieve a level condition.
5. Place overlay when ambient air temperature is 40 degrees F. and rising, and when pavement is dry.
6. An asphalt tack coat shall be applied to existing surface area at a rate of 0.20 gallons per square yard. Application width shall be width of fabric plus 2 to 6 inches.
7. Place, spread and compact asphalt overlay to provide a minimum density of 95% of maximum theoretical unit weight as determined by California Test Method #304. Maximum variation 1/8" in 10' when measured with steel straight edge in any one direction. Test paved areas for proper drainage by applying water to cover area. Correct portions that do not drain properly by patching with plant mix. Minimum compacted overlay thickness 1 1/2 inches.

E. Pavement Marking: pavement markings shall be done only after the seal coat has thoroughly dried. Existing surfaces to be striped with traffic paint shall be cleaned of dust, dirt, grime, oil, rust or other contaminants which will impair the quality of work or interfere with proper bond of paint coats. Surfaces shall be thoroughly cleaned by whatever means necessary that will satisfactorily accomplish the purpose without damage to asphalt concrete. Provide measured layouts, temporary markings, templates, and other means necessary to provide required marking. Prepare and apply paint in accordance with manufacturer's instructions; paint shall be applied by spray and shall achieve complete coverage free from voids and thin spots. Where indicated on the Drawings, paint parking stall strips, lettering, arrows, accessible symbols, playfield markings, etc. on asphalt concrete paving. Paint strips shall be 4 inches wide (except otherwise indicated) and applied with two (2) coats of herein specified Traffic Line Paint; white (except as otherwise specified or indicated).

1. Paints shall be delivered to the site in unopened containers.
 - a. Paint shall not be diluted, or watered down.

- b. Paint shall be applied in 10-12 wet mil thickness (4-6 mil dried). Each coat thickness shall be verified by the project inspector.
- 2. International Accessible Symbol: Symbol shall be white figures on a blue background. Blue shall be equal to PMS 293C. Lines and symbols shall be accurately formed and true to line and form; lines shall be straight and uniform in width. Painted edges shall be clean cut and free from raggedness, and corners shall be cut sharp and square. Tolerances: Apply striping within a tolerance 1/2 inch in 50 feet. Apply markings and striping to widths indicated with a tolerance of 1/4 inch on straight sections and 1/2 inch on curved sections.
- F. Colors: As directed by Architect
- G. Precast Concrete Bumpers: Install in location where shown, using steel rebar dowels, and epoxy.

3.04 DEFECTIVE ASPHALT;

Defective asphalt is as described below.

- A. Exposed rock pockets on the finished surface that lack the # 8- #200 fines that is required per the sieve analysis.
- B. Asphalt not placed to the design grades.
- C. Asphalt that ponds water.
- D. Asphalt that was compacted below the minimum required temperature and is cracked.
- E. Asphalt that fails to meet the minimum compaction requirements.
- F. Asphalt that lacks the minimum thickness required per plan.
- G. New asphalt contaminated by a petroleum product, or spilled paint.
- H. Asphalt that has depressions, cracks, scored divits from dumpster wheels, heavy equipment use, heavy construction products,
- I. Asphalt placed on pumping, unstable sub-grades.

3.05 CLEANING

- A. Refer to Section 01 74 00.
- B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.
- C. Clean excess material from surface of all concrete walks and utility structures.

END OF SECTION

SECTION 32 1600**SITE CONCRETE****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. The Section describes the requirements for providing portland cement concrete paving, including accessibility ramps, sidewalks, accessible routes of travel, vehicular travel, drain structures, sewer structures, thrust blocks and for other non-structural or non-vehicular applications.

1.02 INCLUSION OF OTHER CONTRACT DOCUMENTS

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 45 00, Testing Lab Services.
- B. Section 31 00 00, Earthwork.

1.04 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

1.05 SUBMITTALS

- A. Refer to Section 13 33 00.
- B. 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.
- C. 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.

- D. With concrete submittal, provide documented history of mix design performance.

1.06 WARRANTY

- A. Refer to General Conditions and Section 01 78 36.

1.07 REFERENCES AND STANDARDS

- A. California Building Code, latest edition.
- B. ACI Standards, ACI 211.1, ACI 318-14, ACI 302, IR-04, ACI 301-16, ACI 305R-10, ACI 306R-16, ACI 308-16.
- C. ASTM C-94, Specification for Ready-Mixed Concrete.
- D. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice (latest edition).
- E. ASTM – American Society for Testing and Materials.

1.08 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.

1.09 TESTING

- A. General: Refer to Section 01 40 00 – Quality Requirements.

1.10 ADEQUACY AND INSPECTION

- A. 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.

- B. Notify Inspector, Architect and DSA at least 48 hours prior to placing of concrete.

1.11 PROTECTION

- A. 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.

1.12 FIELD MEASUREMENTS

- A. Make and be responsible for all field dimensions necessary for proper fitting, slopes and completion of work. Report discrepancies to Architect before proceeding.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement: Portland cement, ASTM C150, Type II, per ACI 318-14 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 318-14 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 318-14 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 318-14, section 26.4.1.4.
- G. Surface Retarder (for exposed aggregate finishes): Rugasol-S by Sika Corporation or approved equal.
- H. Form Coating: Material which will leave no residue on concrete surface that will interfere with surface coating, as approved by the Architect.
- I. 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.

- J. Wire Mesh: 6"x6" #10 W.W.F. in 5'x10' flat sheets. 6"x6" #10 wire rolls will not be accepted. Wire mesh is only acceptable as reinforcing in selection locations to be specifically noted on plans. It shall not be used for general pavement reinforcing.
- K. 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.
- H. Truncated Domes: 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 (dome spacing shall be 2.35"). Install tiles as recommended by manufacturer. Detectable warning surface shall be yellow and approximate 33538 of SAE AMS-STD-595A.
- L. 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 C 309 and C1315.
- M. Concrete Bonding Agent: Weld-Crete by Larson Products Corp., Daraweld C by Grace Construction Products or accepted equal.
- N. 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.
- O. 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 C 1107, Grades B and C.
- P. Aggregate Base: Class 2 AB per Caltrans specification section 26-1.02A.
- Q. 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.
- R. Joint sealant for expansion joints: Single component silicone sealant, Type S, ASTM D5893.
 - 1. Reference Standard: ASTM C920, Grade P, Class 25, Use T.
 - 2. Dow Corning 890-SL (self-leveling) Silicone, or accepted equal.
 - 3. Dow Corning 888-NS (non-sagging) Silicone, at slopes exceeding 5%. May not be used at asphalt surfaces.

- 4. Color: Custom color as selected by Architect.
- S. Pre- Formed plastic Expansion Joint; W.R. Meadows 3/8" "Snap Cap", Tex-Trude expansion joint cap, or an approved equal.
- T. Adhesive Anchoring (Epoxy): Hilty HIT-HY 200 Safe Set, or approved equal.

2.02 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 ASI 318-14 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.

2.03 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. 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.
 - 2. 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.

2.04 MATERIALS TESTING

- A. Testing of concrete shall be performed per article 3.12 of this specification.

2.05 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

3.01 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 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 W.W.F. (if specified) 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. If specified, W.W.F. shall be lapped a minimum of 6" on each side of sheets and 12" on each end. Laps shall be wired together 2ft on center maximum spacing. End laps shall be staggered 2'-0" minimum from adjacent reinforcement.
- E. 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.
- F. 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.

3.02 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 Section 31 00 00. 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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: 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:
 - a. 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.

- b. All splices shall be staggered at 5 feet minimum.

3.07 INSPECTION

- A. Slope of concrete forms and finish condition shall be checked with a two foot (2') digital level.

3.08 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. 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. Concrete vibrator shall be used to assist concrete placement. Contractor shall have spare concrete vibrator on site during concrete placement.
- I. Placing in hot weather: Comply with ACI 305R-10. Concrete shall not exceed 95

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.

- J. Placing in cold weather: Comply with ACI 306R-16. 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.
- K. 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.

3.09 CONCRETE FINISHES

- A. Concrete Slab Finishing: Finish slab as required by ACI 302.1R. Use manual screeds, vibrating screeds to place concrete level and smooth. Use tools designed for the purpose of forcing the coarse 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:
 - 1. Flatwork, medium broom finish: Typical finish to be used at all exterior walks and stairs.
 - 2. 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
 - 3. Under no circumstances can water be added to the top surface of freshly placed concrete.
- B. Curb Finishing: Steel trowel.
- C. Joints and Edges: Mark-off exposed joints, where indicated, with 1/4" 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.
 - 1. 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. Flatwork/Variable Height Curbs, Curb and gutter, Valley Gutter: 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.
 - 1. 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.
- B. 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, Cracking, 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. Refer to Section 01 74 00.
- B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.
- C. Clean excess material from surface of all concrete walks and utility structures.
- D. Power wash all concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 32 1723**PAVEMENT MARKINGS****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Pavement markings, including driveways, firelanes, parking areas, crosswalks, and play areas.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Pavement Markings: Fuller-O'Brien 382-XX, Dunn-Edwards W-801, or approved equal. Paint to be slip resistant and provide a minimum of 0.6 static coefficient of friction. Use white color unless otherwise noted.
- B. Colors shall conform to Federal Specification 595C except where noted as RAL:
 - 1. Traffic White: RAL 9016.
 - 2. Traffic Yellow: 33538.
 - 3. Traffic Blue: 15090.
 - 4. Red: 11086.
- C. Parking spaces for the disabled shall be marked according to CBC Section 11B-502.
- D. Playground marking stencils as selected by owner. Configurations as shown on drawings.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Pavement Markings shall be done only after the seal coat has thoroughly dried. Existing surfaces to be striped with traffic paint shall be cleaned of dust, dirt, grime, oil, rust or other contaminants which will impair the quality of work or interfere with proper bond of paint coats. Surfaces shall be thoroughly cleaned by whatever means necessary that will satisfactorily accomplish the purpose without damage to asphalt concrete.

3.02 PREPARATION

- A. Provide measured layouts, temporary markings, templates, and other means necessary to provide required marking.
- B. Layout: Accurately lay out and align markings as per Drawing requirements.

3.03 APPLICATION

- A. Markings: Make parking stripe widths 4" and game line stripe width 2" unless otherwise noted. Apply paint by brush or spray. Use marking templates unless approved mobile device is used. Markings, regardless of application method shall have clearly defined edges with no spatter on adjacent surfaces. Prepare and apply paint in accordance with manufacturer's instructions. Apply paint at manufacturer's recommended rate so as to fully cover in one operation.

1. Paints shall be delivered to the site in unopened containers.
 - a. Paint shall not be diluted, or watered down.
 - b. Paint shall be applied in 10-12 wet mil thickness (4-6 mil dried). Each coat thickness shall be verified by the project inspector.
 2. Tolerances: Apply striping within a tolerance 1/2 inch in 50 feet. Apply markings and striping to widths indicated with a tolerance of 1/4 inch on straight sections and 1/2 inch on curved sections.
- B. International Symbol of Accessibility (ISA): Symbol shall be white figures on a blue background. Lines and symbols shall be accurately formed and true to line and form; lines shall be straight and uniform in width. Painted edges shall be clean cut and free from raggedness, and corners shall be cut sharp and square.
- C. Color Locations: Paint colors shall be used in the following locations:
1. Stall Striping and Traffic Markings: [Traffic White](#).
 2. Handicap Markings: [Traffic Blue and Traffic White](#).
 3. Access Aisles, Drop Offs and Path of Travel: Traffic Blue border with Traffic White striping.
 4. Fire Lanes: [Red](#).
- D. Do not apply pavement markings until after final seal coat or just prior to acceptance of project in asphalt areas.
- E. Parking spaces for the disabled shall be marked according to CBC Section 11B-502.

END OF SECTION

SECTION 32 1726

TACTILE WARNING SURFACING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies furnishing and installing Tactile Warning Tiles where indicated.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.
- B. Samples for Verification Purposes: Submit 2 tile samples, minimum 6 inches square of the kind proposed for use.
- C. Shop Drawings: Required for products specified showing fabrication details, composite structural system, tile surface profile, sound on cane contact amplification feature, plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.
- D. Material Test Reports: Submit complete test reports from qualified accredited independent testing laboratory's to qualify that materials proposed for use are in compliance with requirements and meet or exceed the properties indicated on the specifications. Tests shall be conducted on a Tactile Warning Tile system as certified by a qualified independent testing laboratory and be current within a 24 month period.
- E. Maintenance Instructions: Submit copies of manufacturer's specified installation and maintenance practices for each type of Tactile Warning Tile and accessory as required.

1.03 QUALITY ASSURANCE

- A. Provide Tactile Warning Tiles and accessories as produced by a single manufacturer with a minimum of three years experience in the manufacture of Tactile Warning Tiles.
- B. Installer's Qualifications: Engage an experienced Installer certified in writing by Tactile Warning Tile manufacturer as qualified for installation, who has successfully completed installations similar in material, design, and extent to that indicated for Project.
- C. California Code of Regulations (CCR): Provide only approved DSAAC detectable warning products as provided in the California Code of Regulations (CCR) Title 24, Part 2:
 - 1. Section 205: Definition of Detectable Warning.
 - 2. Section 11B-406 and 11B-705 for Curb Ramps.
 - 3. Section 11B-705 for Detectable Warnings at Hazardous Vehicular Areas.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to project site packaged or crated to prevent damage in shipment or handling. Protect finished surfaces by sturdy plastic wrappings to protect tile from concrete residue during installation. Identify tile type by part number.
- B. Deliver to building site for storage prior to installation.

1.05 PROJECT CONDITIONS

- A. Environmental Conditions and Protection: Maintain minimum temperature of 40 degrees Fahrenheit in spaces to receive Tactile Warning Tiles for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.
- B. The use of water for work, cleaning or dust control, etc. must be contained and controlled and not allowed to come into contact with the general public. Provide barricades or screens to protect the general public.

1.06 WARRANTY

- A. Warranty Tactile Warning Tiles in writing for a period of 5 years from date of final completion. Warranty to include defective work, breakage, deformation, fading and loosening of tiles.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Tactile Warning Tile shall be as manufactured by Engineered Plastics Inc. (800-682-2525), or equal.

2.02 MANUFACTURED UNITS

- A. Tactile Warning Tiles: Armor-Tile manufactured by Engineered Plastics Inc. Vitrified Polymer Composite (VPC) epoxy polymer composition with an ultra violet stabilized coating employing aluminum oxide particles in the truncated domes. Tile to incorporate an in-line pattern of truncated domes measuring nominal 0.2 inch height, 0.9 inch base diameter, and 0.45 inch top diameter, spaced center-to-center 2.35 inches as measured on a square grid. For wheelchair safety the field area shall consist of a non-slip surface with a minimum of 40 - 90° raised points.
 - 1. Dimensions: Tactile Warning Tiles shall be held within the following dimensions and tolerances:
 - a. Length and Width: [24x36] nominal
 - b. Depth: 1.375 (1-3/8") (+/-) 5% max.
 - c. Face Thickness: 0.1875 (3/16") (+/-) 5% max.
 - d. Warpage of Edge: 0.5% max.
 - e. Embedment Flange Spacing: No greater than 3.1 inches.
 - 2. Water Absorption: Not to exceed 0.05% per ASTM D 570-98.
 - 3. Slip Resistance: Not less than 0.80 per ASTM C 1028-96.
 - 4. Compressive Strength: Not less than 28,000 psi per ASTM D 695-02a.
 - 5. Tensile Strength: Not less than 19,000 psi per ASTM D 638-03.
 - 6. Flexural Strength: Not less than 25,000 psi per ASTM D 790-03.
 - 7. Chemical Stain Resistance: Withstand without discoloration or staining per ASTM D 543-95: 10% hydrochloric acid, urine, saturated calcium chloride, black stamp pad ink, chewing gum, red aerosol paint, 10% ammonium hydroxide, 1% soap solution, turpentine, Urea 5%, diesel fuel and motor oil.
 - 8. Fire Resistance: Flame spread less than 15 per ASTM E 84-05.
 - 9. Accelerated Weathering of Tile: $\Delta E < 4.5$, as well as no deterioration, fading or chalking of surface of tile color No 33538, per ASTM G 155-05a for 3000 hours.
 - 10. Accelerated Aging and Freeze Thaw Test of Tile and Adhesive System: No evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other detrimental defects per ASTM D 1037-99.
 - 11. Salt and Spray Performance of Tile: Show no deterioration or other defects after 200 hours of exposure, per ASTM B 117-03.

12. AASHTO HB-17 single wheel HS20-44 Loading "Standard Specifications for Highways and Bridges": Tile to exhibit no visible damage at the maximum load of 10,400 lbs..
 13. Embedment flange spacing shall be no greater than 3.1 inches center to center spacing as illustrated on the product Cast In Place drawing.
- B. Color: Yellow conforming to Federal Color No. 33538. Color shall be homogeneous throughout the tile.

2.02 ACCESSORIES

- A. Fasteners: Color matched, corrosion resistant, flat head drive anchor: 1/4 inch diameter by 1-1/2 inch long as supplied by Engineered Plastics Inc.
- B. Adhesive: Armor-Bond as supplied by Engineered Plastics Inc.
- C. Sealant: Armor-Seal as supplied by Engineered Plastics Inc.

PART 3 EXECUTION

3.01 INSTALLATION - CAST-IN-PLACE TILES

- A. During installation procedures, ensure safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
- B. Prior to placement of Tactile Warning Surface, review manufacturer and contract drawings. Refer discrepancies to the Architect/Engineer.
- C. The specifications of the structural embedment flange system and related materials shall be in strict accordance with the contract documents and the guidelines set by the manufacturer.
- D. The physical characteristics of the concrete must be consistent with specification requirements while maintaining a slump range of 4 - 7 to permit solid placement of the Cast In Place Tactile Warning Surface Tile system. An overly wet mix will cause the tile to float. Under these conditions, place suitable weights such as 2 concrete block or sandbags, approximately 25 pounds, on each tile.
- E. The concrete pouring and finishing operations require typical mason's tools, however, a 4 foot long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast In Place Detectable/Tactile Warning Surface Tile system. A vibrating mechanism such as that manufactured by Vibco may be employed, if desired. Fix the vibrating unit to a soft base such as wood, at least 1 foot square.
- F. Maintain the factory-installed plastic sheeting in place during the entire installation process to prevent the splashing of concrete onto the finished surface of the tile.
- G. When preparing to set the tile, it is important that no concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates air voids under the tile. Holes in the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each embedment flange on the underside of the tile. This will lock the tile solidly into the cured concrete.

- H. Pour concrete and finish true and smooth to the required dimensions and slope prior to tile placement. Immediately after finishing concrete, check that the required slope is achieved. Place the tile true and square to the curb edge. Tamp or vibrate tiles into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. Do not step on tiles to embed.
- I. Immediately after placement check the tile elevation to adjacent concrete. Elevation and slope must be set to permit water drainage. Ensure that the field surface of the tile is flush with the surrounding concrete and back of curb.
- J. While concrete is workable, use a 3/8 inch radius edging tool to create a finished edge of concrete, then use a steel trowel to finish the concrete around the tile perimeter, flush to the field level of the tile.
- K. During and after tile installation and concrete curing allow no walking on the tile or external forces placed on the tile.
- L. Following tile placement adjust tile before the concrete sets. Two suitable weights of 25 pounds each may be required to be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.
- M. Following concrete curing remove the protective plastic wrap from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, clean the surface with a soft brass wire brush. Avoid damaging surface.
- N. Consult manufacturer's written information for additional installation instructions.
- O. Cut or grind tiles to custom sizes or curves in conformance with manufacturer's written instructions.
- P. Sound-amplifying plates on the underside of the tile, which are dislodged during handling or cutting, must be replaced and secured with construction adhesive.

3.02 INSTALLATION - SURFACE APPLIED TILES

- A. During surface preparation and Surface Applied Tactile Warning Surface Tile installation, ensure safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
- B. The application of tiles, adhesives, mechanical fasteners, and caulking shall be in strict accordance with the guidelines set by their respective manufacturers.
- C. Ensure that the surfaces being prepared and fabricated to receive the tiles are constructed correctly and adequately for tile installation. Review drawings prior to construction. Refer discrepancies to the Architect/Engineer.
- D. Set tile true and square to the curb ramp and mark its location. Remove tile when done marking its location.
- E. Mechanically clean the surface to receive the Surface Applied Tactile Warning Surface Tile with a diamond cup grinder or shot blaster to remove dirt or foreign material. Include surfaces a minimum of 4 inches around the perimeter of the area to receive the tile, and also along the cross pattern established by the corresponding areas on the backside of the tile. Afterward clean those areas with a clean rag soaked in Acetone.

- F. Immediately prior to installing the Surface Applied Tactile Warning Surface Tile, inspect the concrete surfaces to ensure that they are clean, dry, free of voids, curing compounds, projections, loose material, dust, oil, grease, sealers and determined to be structurally sound and cured for a minimum of 30 days.
- G. Using Acetone, wipe the backside of the tile around the perimeter and along the internal cross pattern, to remove dirt or dust particles from the area to receive the adhesive.
- H. Apply Armor-Bond adhesive to the backside of the tile, following the perimeter and internal cross pattern established by the tile manufacturer. Sufficient adhesive must be placed on the prescribed areas to have full coverage across the width of the adhesive locator. Apply to within 1/4" continuously around the perimeter edge of the tile.
- I. Set the tile true and square to the curb ramp.
- J. Working from the center of the tile outwards, proceed to drill and install fasteners in the tile's molded recesses.
- K. Standing with both feet applying pressure around the molded recess provided in the tile, drill a hole true and straight to a depth of 3 1/2" using a 1/4" masonry drill bit. Drill through the tile without hammer option (on the drill) until the tile has been successfully penetrated, then with hammer option (on the drill) to drill into the concrete. Maintaining foot pressure on both sides of the hole while drilling prevents concrete dust from accumulating between the tile and concrete which can affect the tile being installed flush and may compromise installation integrity.
- L. Immediately after drilling each hole, before moving on to the next, and while still applying foot pressure, mechanically fasten tiles to the concrete substrate using a leather bound or hard plastic mallet to set the fasteners. Ensure the fastener has been placed to full depth in the dome, straight, and flush to the top of dome. Drive the pin of the fastener with the mallet, taking care to avoid any inadvertent blows to the truncated dome or tile surface.
- M. Following the installation of the fasteners, remove the concrete dust from the tile surface and adjacent concrete. Using Acetone on a rag, wipe the concrete around the tile perimeter to ensure a clean, dry surface to receive perimeter sealant.
- N. Apply perimeter caulking sealant following the sealant manufacturer's recommendations. Tape perimeter edges of the tile back 1/16" from the tile's perimeter edge and tape the adjacent concrete back 1/2" from the tile's perimeter edge to maintain a straight and even caulking line. Apply sealant around tile perimeter using care to work sealant into voids between the tile and concrete interface. Tool the perimeter caulking with a rounded plastic applicator or spatula to create a cove profile between the tile and adjacent concrete. Remove tape immediately after tooling perimeter caulking sealant.
- O. Do not allow foot traffic on installed tiles until the perimeter caulking sealant has cured sufficiently to avoid tracking.
- Q. In order to maintain proper spacing between truncated domes on adjacent tiles, trim off the tapered edge.
- R. See manufacturer's written information for additional installation instructions.

3.03 CLEANING AND PROTECTION

- A. Protect tiles against damage during construction period to comply with Tactile Tile manufacturer's specification.

- B. Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood.
- C. Clean Tactile Tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean Tactile Tile by method specified by Tactile Tile manufacturer.

END OF SECTION

SECTION 32 3113**CHAIN LINK FENCES AND GATES****PART 1 GENERAL****1.01 SUMMARY**

- A. Galvanized coated chain link fencing and gates, enclosure tops and supports and accessories.
- B. Related Sections:
 - 1. Section 03 3300, Cast-In-Place Concrete.
 - 2. Section 32 1216, Asphalt Paving.
 - 3. Section 32 1313, Concrete Paving.

1.02 SUBMITTALS

- A. Shop Drawings: Layout of fences and gates with dimensions, details, and finishes of components, accessories, and post foundations.
- B. Product Data: Manufacturer's catalog cuts indicating material compliance and specified options.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Products from qualified manufacturers having a minimum of 5 years experience manufacturing galvanized coated chain link fencing will be acceptable by the Architect as equal, if approved by the Architect 10 days prior to bidding, and if they meet the following specifications for design, size gauge of metal parts and fabrication.

2.02 MATERIAL

- A. Chain Link Fence Fabric:
 - 1. Polymer Coated Steel Fabric: ASTM F668, 9 gauge core with 8 gauge Class 2b finish fused and adhered.
 - 2. Galvanized Wire: Zinc coated Wire, ASTM A392 – 1.2 oz/sf. Wire Spec-A817-83, Class 1.
 - 3. Size: Helically wound and woven to height as indicated on drawings, with diamond mesh to match existing.
 - 4. Selvage of fabric twisted at top and knuckled bottom.
- B. Steel Fence Framing:
 - 1. Steel Pipe – Type 1: ASTM F 1083, standard weight schedule 40; minimum yield strength of 25,000 psi (170 Mpa); sizes as indicated. Hot-dipped galvanized with minimum average 1.8 oz/ft (550 g/m) of coated surface area. Provide posts with tops to exclude moisture.
 - 2. End, Corner and Pull Posts: 2.875 inch outside diameter pipe. At 4 foot high fences posts shall be 2 inch outside diameter pipe.
 - 3. Line Posts: 2.375 inch outside diameter pipe. At 8 foot high fences posts shall be 2.875 inch outside diameter pipe. At 4 foot high fences posts shall be 2 inch outside diameter pipe.
 - 4. Top Rails: 1.66 inch outside diameter pipe.

- C. Steel Fence Framing – Polymer Coated Finish:
1. Steel Pipe: Polymer coated pipe shall have a PVC or Polyolefin coating fused and adhered to the exterior zinc coating of the galvanized pipe in accordance with ASTM F1043. The minimum thickness of the PVC or Polyolefin coating shall be 10-mils, for polyester 3 mils. Color to match fabric per ASTM F934.
- C. Chain Link Swing Gates:
1. Gate Frames: Fabricate chain link swing gates in accordance with ASTM F 900 using galvanized steel tubular members, 2 inch square, weighing 2.60 lb/ft. Fusion or stainless steel welded connections forming rigid one-piece unit.
 - a. For gates over 8 feet high or 15 feet wide, provide minimum 1-1/2 inch square additional horizontal and vertical interior members to ensure proper strength.
 2. Chain Link Fence Fabric: Same as Fencing Material. Install fabric with hook bolts and tension bars at each side. Attach to gate frame at not more than 15 inches on center.
 3. Hardware Materials: Hot dipped galvanized steel or malleable iron shapes to suit gate size.
 4. 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°.
 5. Latch: Forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
 6. Keeper: Provide keeper for each gate leaf over 5 feet wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
 7. Double Gates: Provide drop rod 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 padlock for locking both gate leaves.
 8. Gate posts: Steel square sections, ASTM A 500, Grade B, having minimum yield strength of 40,000 psi (275 Mpa) size as indicated. Hot-dipped galvanized with minimum 1.8 oz/ft (550 kg/m) of zinc [or respective material finished in accordance with ASTM F 1043].
- | Gate Leaf Single Width | Post Size (Round) | Weight |
|------------------------|-------------------|-------------------------|
| 6 feet or less | 2.875 in | 5.79 lb/ft (8.6 kg/m) |
| 6 feet to 12 feet | 4.00 in | 9.11 lb/ft (13.6 kg/m) |
| 12 feet to 19 feet | 6.625 in | 18.97 lb/ft (28.3 kg/m) |
| 19 feet to 23 feet | 8.625 in | 28.55 lb/ft (42.5 kg/m) |
- D. Pedestrian Gate Hardware: See gate hardware sets in Section 08 7100, Door Hardware.
1. Keying: Master key cylinders per Section 08 7100 Door Hardware.

2.03 ACCESSORIES

- A. Chain link fence accessories: ASTM F 626. Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.
- B. Post Caps: Formed steel, cast malleable iron, or aluminum alloy weathertight closure cap for tubular posts. Provide one cap for each post. Where top rail is used, provide tops to permit passage of top rail.
1. Polymer coated fittings: In compliance with ASTM F626, PVC or Polyolefin coating minimum thickness 0.006 inch, fused and adhered to the zinc coated fittings. Match color to fence fabric.
- C. Top rail and brace rail ends: Formed steel, malleable or cast iron, for connection of rail and brace to terminal posts.

- D. Top rail Sleeves: 6 inch sleeve allowing for expansion and contraction of top rail.
- E. Wire ties: 9 gauge (0.148 inch) galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge (0.092 inch) for rails and braces. Hog ring ties of 12-1/2 gauge (0.0985 inch) for attachment of fabric to tension wire.
- F. Brace and tension, stretcher bar, bands: Pressed steel. At square post provide tension bar clips.
- G. 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 by 3/4 inch or equivalent fiber glass rod. Provide tension stretcher bars where chain link fabric meets terminal posts.
- H. Tension wire: Galvanized coated steel wire, 7 gauge, (0.177 inch) diameter wire with tensile strength of 75,000 psi (517 Mpa).
 - 1. Polymer coated steel wire: 7 gauge (0.177 inch) diameter wire complying with ASTM F1664. Wire gauge specified is the core wire gauge. Match coating class and color to the chain link fabric.
- I. Truss rods: Steel rods with minimum diameter of 5/16 inch.
- J. Nuts and bolts are galvanized.
- K. Setting Materials: Concrete: Minimum 28 day compressive strength of 3,000 psi (20 Mpa).

PART 3 EXECUTION

3.01 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.

3.02 INSTALLATION

- A. Fence Framing Installation: Install chain link fence in accordance with ASTM F 567 and manufacturer's written instructions.
 - 1. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30 inches or more.
 - 2. Space line posts uniformly at 10 feet on center maximum and 6 feet on center maximum at 4 foot high fences.
 - 3. Concrete set terminal and gate posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post, and depths approximately 6 inches deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36" below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post. Slope to direct water away from posts.
 - 4. Drive Anchor posts: With protective cap, drive post 36 inches into ground. Slightly below ground level install drive anchor shoe fitting. Install 2 diagonal drive anchors and tighten in the shoe.
 - 5. Check each post for vertical and top alignment and maintain in position during placement and finishing operations.
 - 6. Bracing: Install horizontal pipe brace at mid-height for fences 6 feet 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.

7. Tension wire: Provide tension wire at bottom of fabric [and at top, if top rail is not specified]. Install tension wire before stretching fabric and attach to each post with ties. Secure tension wire to fabric with 12-1/2 gauge (0.0985 inch) hog rings 24 inches oc.
 8. Top Rail: Install lengths, 21 feet. Connect joints with sleeves for rigid connections for expansion and contraction.
 9. Center Rails: For fabric height of 12 feet and over. Install mid rails between posts with fittings and accessories.
- B. Chain Link Fabric Installation:
1. 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 24 inches on center.
 2. 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.
- C. Installation of Accessories:
1. Tie wires: Bend ends of wire to minimize hazard to persons and clothing.
 2. Fasteners: Install nuts on side of fence opposite fabric side for added security.
- D. Chain Link Swing Gate Post Installation:
1. Install gate posts in accordance with manufacturer's instructions:
 2. Concrete set gate posts. Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post, and depths approximately 6 inches deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36 inches below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post and slope to direct water away from posts.
 - a. 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.
- E. Gate Installation:
1. Install gates plumb, level and secure for full opening without interference.
 2. Attach hardware by means which will prevent unauthorized removal.
 3. Adjust hardware for smooth operation.
 4. Touch up hardware.

3.03 CLEANING

- A. Clean debris and unused material and remove from the site.

END OF SECTION

SECTION 32 3119**DECORATIVE METAL FENCES AND GATES****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Labor, materials and appurtenances necessary to provide decorative metal fences and gates specified herein. Provide components necessary for a complete installation, i.e. pickets, rails, posts, gates and hardware.
- B. Related Sections:
 - 1. Section 32 1313, Concrete Paving.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A653/A653M: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM B117: Practice for Operating Salt-Spray (Fog) Apparatus.
 - 3. ASTM D523: Test Method for Specular Glass.
 - 4. ASTM D822: Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
 - 5. ASTM D1654: Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
 - 6. ASTM D2244: Test Method for Calculations of Color Differences from Instrumentally Measured Color Coordinates.
 - 7. ASTM D2794: Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
 - 8. ASTM D3359: Test Method for Measuring Adhesion by Tape Test.
 - 9. A924/924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 10. A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

1.03 QUALITY ASSURANCE

- A. Provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.04 SUBMITTALS

- A. Shop Drawings:
- B. Manufacturer's literature showing fence system .

1.05 DELIVERY, STORAGE AND HANDLING

- A. Upon receipt at the project site, check materials to ensure that no damages occurred during shipping or handling.
- B. Store materials in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

PART 2 MATERIALS**2.01 MATERIALS**

- A. Steel Material: Minimum yield strength of 50,000 psi (344 MPa). Hot-dip galvanize prior to forming in accordance with the requirements of ASTM A653/A653M. Minimum zinc coating weight of 0.90 oz/ft² (276 g/m²), Coating Designation G-90.
- B. Fence and Gate Components:
 - 1. Fence Posts: 3 inches square by 12 gauge.
 - 2. Gate Uprights: 2 inches square by 14 gauge.
 - 3. Rails: 2 inches square by 14 gauge.
 - 4. Pickets: 3/4 inch square by 14 gauge tubing.
- C. Perforated Metal Screen: 20 gauge galvanized sheet metal with 1/16 inch diameter holes at 3/32 inch staggered spacing, as manufactured by McNichols or equal. Provide single width metal sheet between top and bottom horizontal rails.
 - 1. McNichols Co.: 19226 Cabot Boulevard, Hayward, California, 1-800-237-3820, www.mcnichols.com
 - 2. Weld edges of screen to frame with 1"x1" angle, galvanized by 14 gauge.

2.02 FABRICATION

- A. Precut pickets, rails and posts to specified lengths.
- B. Fabricate gates using panel material and gate ends having the same outside cross-section dimensions as the horizontal rail. Join each upright and rail intersection by welding. Joint each picket and rail intersection by welding. Grind welds smooth. Completely prime and paint.
- C. Completed fence panel and gate sections shall be capable of supporting a 600 lb. load applied at midspan without permanent deformation.
- D. Gates in the path of travel must comply with exit door requirements of CBC Section 1010. See Section 08 7100 for Door Hardware.
 - 1. Hardware shall not require pinching, grasping, or twisting motion to operate.
 - 2. Provide a solid kick plate 10 inches high minimum and 3 inches maximum from the paving on both sides of the gates.
 - 3. Maximum 5 pounds opening pressure and door maneuvering clearances.
- E. Insulate contact joints between dissimilar materials to prevent electrolytic or corrosive action.

2.03 FINISHES

- A. Finish for Fence Panels:
 - 1. Base Coat: Zinc-rich thermosetting epoxy powder coating, gray in color, with a minimum thickness of 2-4 mils.
 - 2. Topcoat: No-mar TGIC polyester powder coat finish with a minimum thickness of 2-4 mils.
 - 3. Color: As selected.
 - 4. The stratification coated framework shall meet the following performance requirements.
 - a. Adhesion: ASTM D3359, Method B: Retention of coating over 90 percent of test area, tape and knife test.

- b. Corrosion Resistance: ASTM B117 and D1654. Scribed per D1654 Resistance over 3500 hours. Failure is considered to have occurred when there is either 1/8" coating loss from the scribed mark or an accumulation of medium #8 blisters.
 - c. Impact Resistance: ASTM D2794, Over 60 inch pounds. Forward impact using 0.625 inch ball.
 - d. Weathering Resistance: ASTM D822, D2244, D523, 60 degree method:
- B. Finish for Gates and Gate Posts:
 - 1. Base Coat: Thermosetting epoxy powder coating, gray in color, with a minimum thickness of 2-4 mils.
 - 2. Topcoat: No-mar TGIC polyester powder coat finish with a minimum thickness of 2-4 mils.
 - 3. Color: Match fence panels.
 - 4. Coated gates and posts shall be capable of salt spray resistance for 3,500 hours without loss of adhesion on parts scribed per ASTM D1654 and tested in accordance with ASTM Test Method B117. Failure is considered to have occurred when there is either 1/8" coating loss from the scribed mark or an accumulation of medium #8 blisters.

PART 3 EXECUTION

3.01 PREPARATION

- A. Lay out new installation in accordance with the construction Drawings.

3.02 INSTALLATION

- A. Space gate posts according to the gate openings shown on Drawings.
- B. See Earthwork and Concrete sections of this specification for post base material requirements.

3.03 CLEANING

- A. Clean the project site of excess materials. Scatter post hole excavations uniformly away from posts.

END OF SECTION

SECTION 32 80 00**IRRIGATION****PART 1 - GENERAL**

Construction Documents and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section.

1.01 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, tools, equipment, and transportation required to perform and complete the installation of an automatic sprinkler irrigation system, including all piping, sprinkler heads, controls, connections, testing, etc. as shown on the Drawings and as specified herein. The water source for this project is potable water.
- B. Utilize and accept as standards manufacturer's recommendations and/or installation details for any information not specifically detailed on the Drawings.

1.02 RELATED SECTIONS

- A. SUBMITTAL PROCEDURES: Section 01 33 00.
- B. CLOSEOUT PROCEDURES: Section 01 77 00.
- C. EARTHWORK: Section 31 00 00.
- D. LANDSCAPING: Section 32 90 00.

1.03 GUARANTEE

- A. Guarantee all workmanship and materials hereunder against defective workmanship and materials, including damage by leaks and settlement of irrigation trenches, for the duration specified in Division 01 of these Specifications. (The Contractor is not responsible for vandalism or theft after date of final acceptance.)

1.04 QUALITY CONTROL

- A. Qualifications of Contractor: Work must be completed by a licensed Landscape Contractor. Provide proof of five years of continuous experience in landscaping and irrigation of projects of similar size (+/- 20% of the construction cost) and scope for education campuses. Contractor to have a minimum of two projects either completed or in construction in the last five years.
- B. Work Force: Ensure that an experienced foreman is present at all times during installation. Keep the same foreman and workers on the job from commencement to completion.
- C. Reviews: Specifically request reviews of all items listed below in "Inspection Requirements" prior to progressing to the next level of work.

- D. Certification: Ensure that the contractor installing the Central Control System is trained and certified in the installation of the Central Control System. The training and certification must have been completed within two years prior to the installation date.
- E. Standards:
 - 1. Provide work and material in full accordance with the rules and regulations of the California Electric Code; the California Plumbing Code; and other applicable state or local laws or regulations.
 - 2. Furnish, without extra charge, additional material and labor required to comply with these rules and regulations, though the work may not be specifically indicated in the Specifications or Drawings.
 - 3. Where the Specification requirements exceed those of the above-mentioned codes and regulations, comply with the requirements in the Specifications.
- F. Delivery, Storage, and Handling:
 - 1. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect related work and material.
 - 2. Handle plastic pipe carefully, especially protecting it from prolonged exposure to sunlight. Store pipe on beds that are the full length of the pipe, and keep pipe flat and off the ground with blocks.
- G. Comply with the requirements of Section 01 77 00 – CLOSEOUT PROCEDURES.

1.05 INSPECTION REQUIREMENTS

- A. Request and hold a pre-construction meeting prior to beginning the work of this Section. Parties required to be in attendance are the Landscape Contractor, Project Inspector, Owner's Representative, and the Landscape Architect.
- B. Prior to commencement of the work of this Section, obtain written verification from the project Civil Engineer that the rough grade in landscape areas is in conformance with Section 31 00 00 - EARTHWORK.
- C. Obtain verification from Project Inspector for the following at the appropriate times during construction and prior to further progression of work in this Section:
 - 1. Pressure testing of all mainlines and lateral lines (See "Hydrostatic Tests – Open Trench" in Part 3.12 of this Section),
 - 2. Trench depth,
 - 3. Sleeves under pavement,
 - 4. Flushing of all mainlines and lateral lines,
 - 5. Backfill and pipe bedding,
 - 6. Layout of heads,

- 7. Installation of subsurface inline drip tubing (with Landscape Architect),
 - 8. Operation of system and coverage adjustments (with Landscape Architect) after system is fully automated and operational, backfill of trenching is completed, and surface has been restored to original grades.
- D. In case of failure to obtain any verification by the Project Inspector as required above, remove and replace work as necessary to obtain the verification at no additional cost to the Owner.

1.06 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with requirements of Section 01 33 00 – SUBMITTAL PROCEDURES.
- B. Product names are used as standards; provide proof as to equality of any proposed material and do not use other materials or methods unless approved in writing by the Owner's Representative. Submit no more than one request for substitution for each item. The decision of the Owner's Representative is final.
- C. Use equipment capacities specified herein as the minimum acceptable standards.
- D. List materials in the order in which they appear in Specifications; include substitutions. Submit the list for approval by the Owner's Representative.
- E. Make any mechanical, electrical, or other changes required for installation of any approved, substituted equipment to satisfaction of Owner's Representative and without additional cost to Owner. Approval by Owner's Representative of substituted equipment and/or dimensional drawing does not waive these requirements.
- F. Do not construe approval of material as authorization for any deviations from Specifications unless attention of Owner's Representative has been directed to specified deviations.

1.07 PROJECT CONDITIONS, AND PROTECTION

- A. Information on Drawings relative to existing conditions is approximate. During progress of construction, make deviations necessary to conform to actual conditions, as approved by Owner's Representative, without additional cost to Owner. Accept responsibility for any damage caused to existing services. Promptly notify Owner's Representative if services are found which are not shown on Drawings.
- B. Protect existing trees-to-remain as specified in "Existing Tree Protection" in Part 3.02 of this Section.
- C. Protect existing utilities within construction area. Repair damages to utility lines that occur as a result of operations of this work.
- D. Verify dimensions at building site and check existing conditions before beginning work. Make changes necessary to install work in harmony with other crafts after receiving approval by Owner's Representative.

1.08 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Furnish three complete sets of operating maintenance instructions bound in a hardback binder and indexed. Start compiling data upon approval of list of materials. Do not request final inspection until booklets are approved by Owner's Representative.
- B. Incorporate the following information in these sets:
 - 1. Complete operating instructions for each item of irrigation equipment.
 - 2. Typewritten maintenance instructions for each item of irrigation equipment.
 - 3. Manufacturer's bulletins which explain installation, service, replacement parts, and maintenance.
 - 4. Service telephone numbers and/or addresses posted in an appropriate place as designated by Owner's Representative.

1.09 RECORD DRAWINGS

Upon completion of work, and as a precedent to final payment, deliver to Owner's Representative one complete set of reproducible originals of Drawings showing work exactly as installed. (See "Record Drawings" in Part 3.15 of this Section)

PART 2 - PRODUCTS**2.01 GENERAL**

Use materials as specified; any deviation from the Specifications must first be approved by the Owner's Representative in writing. All material containers or certificates shall be clearly marked by manufacturer as to contents for inspection.

2.02 MATERIALS

- A. Automatic Control Valves: As indicated on Drawings.
- B. Gate Valve: As indicated on Drawings.
- C. Pipe and Fittings:
 - 1. PVC pipe: As indicated on Drawings.
 - 2. PVC fittings three-inch (3") size and smaller: High impact, standard weight, Schedule 40, molded PVC as manufactured by George Fischer, Lasco, Spears, or approved equal.
 - 3. All plastic pipe and fittings: Continuously and permanently marked with manufacturer's name, type of material, IPS size, schedule, NSF approval, and code number.

4. Threaded PVC pipe and nipples: IPS Schedule 80 when necessary to use threaded connections to gauges, valves, or control valves. Threaded adapters may be used in place of nipples when making pipe to valve connections.
 5. Use 45-degree fittings for changes in depth of pipe, and at transition from main line to automatic control valves.
- D. PVC Primer: Weld-On P-70 Purple Primer or approved equal.
- E. PVC Glue: Weld-On 711 Gray heavy bodied PVC Cement or approved equal.
- F. Sprinkler Heads: As indicated on Drawings.
- G. Sleeves: As indicated on Drawings.
- H. All Valve Boxes and Covers: Manufactured, green with "Irrigation – Non-Potable" permanently embossed on cover. Carson, Rainbird or approved equal.
- I. Sub-surface Inline Drip Tubing:
1. Tubing: As indicated on Drawings. Make all tubing connections with manufacturer-approved fittings. See Drawings for emitter flow rates and spacing.
 2. Soil Staple: Hold tubing in place with soil staples spaced evenly every three to five feet (3' - 5') on center, and with two staples at each change of direction.
 3. Line Flushing Valve: As indicated on Drawings.
 4. Pressure Regulator: As indicated on Drawings.
 5. Disc Filter/Screen Filter: As indicated on Drawings.
- J. Automatic Sprinkler Control Wire:
1. Connections between remote control valves and controller: UF-14 direct burial polyethylene (PE) insulated wire, Paige Electric P7079D or approved equal. Common wire to be white, and lead wire to be colored. If multiple controllers are used, a different color is to be used for each controller's lead wire. (Use red for the first controller). Spare wires are to be yellow.
 2. UL Listed waterproof sealing pack for wire connections: 3M DBR/Y-6, or approved equal.
 3. Provide adequate working space around electrical equipment in compliance with local codes and ordinances.
 4. Electrical, other than low voltage, such as power wiring, conduit, fuses, thermal overloads and disconnect switches, is included under Division 26 of these Specifications.

K. Unions And Flanges:

1. Steel unions and flanges two inches (2") and smaller: 150 lb. screwed black (brass to iron seat) or galvanized malleable iron (ground joint).
2. Steel unions and flanges two and one-half inches (2 ½") and larger: 150 lb. black flange union, flat-faced, full gasket.
3. Gaskets: One-sixteenth inch (1/16") thick rubber Garlock No. 122, Johns-Manville or approved equal.
4. Flange Bolts: Open-hearth bolt steel, square heads with cold pressed hexagonal nuts, cadmium plated in ground. Provide copper-plated steel bolts and nuts or brass bolts and nuts for brass flanges.

L. Valve Identification Tags: Christy's irrigation ID tags, standard yellow color or approved equal.**M. Sand for Trench Backfill:** Natural sand, free of roots, bark, sticks, rags, or other extraneous material.**PART 3 - EXECUTION****3.01 SITE CONDITIONS**

Locations of existing utilities and other improvements shown on the Drawings are approximate. Verify existing conditions and, should any utilities be encountered that are not indicated on the plans, notify the Owner's Representative immediately. Accept responsibility for any damages caused to existing services.

3.02 PREPARATION

- A. Scheduling: Notify the Project Inspector prior to commencing and/or continuing the work of this Section. Remove and replace, at no cost to Owner, any work required as a result of failure to give the appropriate notification.
- B. Examination: Examine conditions of work in place before beginning work; report defects.
- C. Measurements: Take field measurements; report variance between plan and field dimensions.
- D. Protection: Maintain warning signs, shoring and barricades as required. Prevent injury to, or defacement of, existing improvements. At no additional cost to Owner, repair or replace items damaged by installation operations.
- E. Existing Tree Protection:
 1. Avoid unnecessary root disturbance, compaction of soils within drip line, or limb breakage.
 2. Do not store material or dispose of any material other than clean water within the drip line.

3. Provide adequate irrigation during construction.
 4. Replace any tree damaged during construction with a tree of equal size and value at no additional cost to Owner.
 5. Adjust trench locations in field to minimize damage to existing elements and plant roots of trees-to-remain at no additional cost to Owner.
- F. Surface Preparation: Prior to beginning sprinkler irrigation work, complete placement of topsoil as specified in Section 31 00 00 – EARTHWORK. Notify Project Inspector of irregularities if any.

3.03 GRADING

Install all irrigation features to their finished grade and at depths indicated. Complete and /or accommodate all rough grading and/or finish grading before commencing with trenching.

3.04 LAYOUT

- A. Lay out work as accurately as possible to Drawings. Drawings are generally diagrammatic to extent that swing joint offsets and fittings are not shown. Record all changes on the Record Drawings.
- B. Do not willfully install the irrigation system as shown on Drawings when it is obvious, in the field, that obstructions or other discrepancies exist which may not have been considered in the design. Notify Owner's Representative of discrepancies before proceeding.

3.05 EXCAVATING AND TRENCHING

- A. General: Perform excavations as required for installation of work included under this Section, including shoring of earth banks to prevent cave-ins. Restore surfaces, existing underground installations, etc., damaged or cut as result of this work to their original condition and in a manner approved by the Landscape Architect.
- B. Width:
 1. Make trenches wide enough to allow a minimum of six inches (6") between parallel pipelines and three inches (3") between side of pipe and side of trench. Do not allow stacking of pipe within trench.
 2. Allow a minimum clearance of twelve inches (12") in any direction from parallel pipes of other trades.
- C. Preparation of Excavations: Remove rubbish and rocks from trenches. Bed pipe on a minimum of three inches (3") of clean, rock-free soil to provide a firm, uniform bearing for entire length of pipeline. Cover pipe with a minimum of three inches (3") of clean, rock-free soil. If clean, rock-free soil is not available, use sand for pipe bedding and three inches (3") of backfill above the pipe. The remainder of the trench backfill material can be native soil. Do not allow wedging or blocking of pipe.
- D. Minimum depth of cover: Unless shown otherwise, provide the following minimums:
 1. Mainline: twenty-four inches (24") cover.

2. Lateral line: twelve inches (12") cover for spray heads, and eighteen inches (18") cover for rotor heads.
3. Sub-surface inline drip tubing: five inches (5") cover.

E. Conflicts with other trades:

1. Hand-excavate trenches where potential conflict with other underground utilities exist.
2. Where other utilities interfere with irrigation trenching and piping work, adjust the trench depth as instructed by Owner's Representative.

3.06 BACKFILL AND COMPACTING

- A. General: Do not begin until hydrostatic tests are completed. When system is operating and after required tests and inspections have been made, backfill trenches under paving areas to the compaction rate specified in Section 31 00 00 – EARTHWORK.
- B. Place backfill in six-inch (6") layers and compact with an acceptable mechanical compactor.
 1. Compact backfill material in landscape areas to eighty-five percent (85%) maximum dry density of the soil.
 2. If settlement occurs along trenches, make adjustments in pipes, valves, and sprinkler heads, soil, sod or paving as necessary to bring the system, soil, sod or paving to the proper level or the permanent grade, without additional cost to the Owner.
- C. Excess Soil: Remove all rocks, debris, and excess soil that results from sprinkler irrigation trenching operations, landscape planting, and soil preparation operations off site at no additional cost to the Owner. If soil meets topsoil requirements in Section 31 00 00 – EARTHWORK, it may be used for finish grading.
- D. Finishing: Dress-off areas to eliminate construction scars.

3.07 CONTROL WIRES

- A. General: Install control wires beneath sprinkler main line whenever possible; tape wires to mainline pipe. Provide one spare wire for each controller.
- B. Slack Wire: Provide eighteen inches (18") of slack wire for each wire connected to automatic control valve. Slack wire shall be coiled and left in the valve box. Tape wires in bundles every ten feet (10'); do not tape wires in sleeves.
- C. Expansion and Contraction: Snake wire in trench to allow for contraction of wire.
- D. Wire Passing Under Existing or Future Paving or Construction: Encase in PVC Schedule 40 or galvanized steel conduit extending at least twelve inches (12") beyond edges of paving or construction.

- E. Wire Connections: Install wire connections in a waterproof sealing pack.
- F. Wire Splicing: Permit splicing only on runs exceeding 500 feet. Locate all splices within valve boxes.
- G. Wire Termination: Install wire in a valve box with eighteen inches (18") of slack wire coiled and individually capped with approved waterproof sealing pack.
- H. Spare Wire: Install two (2) spare wires along each wire path. If there is more than one wire path from the controller, the contractor to install two (2) spare wires per path. Provide eighteen inches (18") of slack wire at each automatic control valve.

3.08 FLUSHING LINES

Thoroughly flush lines prior to installing valves, performing hydrostatic testing, or installing sprinklers. Divert water to prevent washouts.

3.09 AUTOMATIC CONTROL

- A. Install where shown and where practical; place no closer than twelve inches (12") to walk edges, building walls, or fences. Refer to detail for example.
- B. Thoroughly flush mainline before installing valve.
- C. Install valves in ground cover areas where possible.

3.10 PIPING

- A. General: Install in conformance with reference standards, manufacturer's written directions, as shown on Drawings and as herein specified.
- B. Workmanship:
 - 1. General: Install sprinkler irrigation equipment in planted areas throughout the site.
 - 2. Coordination: Organize location of sleeves with other trades as required.
- C. Pipe Line Assembly:
 - 1. General:
 - a. Cutting: Cut pipe square; remove rough edges or burrs.
 - b. Solvent-welded Connections: Use materials and methods recommended by the pipe manufacturer.
 - c. Brushes: Use non-synthetic brushes to apply solvents and primer.
 - d. Cleaning: Clean pipe and fittings of dirt, moisture, and debris prior to applying solvent or primer.
 - e. Assembly: Allow pipe to be assembled and welded on the surface or in the trench.

- f. Expansion and Contraction: Snake pipe from side to side of trench to allow for expansion and contraction.
 - g. Location: Locate pipes as shown on Drawings except where existing supply valves, utilities or obstructions prohibit or where slight changes are approved to better suit field conditions.
2. Connections:
- a. Threaded Plastic Pipe Connection:
 - 1.) Use Teflon tape or pipe joint compound.
 - 2.) When assembling to threaded pipe, take up joint no more than one full turn beyond hand-tight.
 - b. Metal Valves and Plastic Pipe: Use threaded plastic male adapters.
 - c. Metal to Metal Connections:
 - 1.) Use specific joint compound or gasket material for type of joint made. Where pipe of dissimilar metals are connected, use dielectric fittings.
 - 2.) Where assembling, do not allow more than three full threads to show when joint is made up.
 - d. Where assembling soft metal (brass or copper) or plastic pipe, use strap-type friction wrench only; do not use a metal-jawed wrench.
 - e. Threading:
 - 1.) Do not permit the use of field-threading of plastic pipe or fittings. Use only factory-formed threads.
 - 2.) Use factory-made nipples wherever possible. Permit the use of field-cut threads in metallic pipe only where absolutely necessary. When field-threading, cut threads accurately on axis with sharp dies.
 - 3.) Use pipe joint compound for all threaded joints. Apply compound to male thread only.
3. Sleeves and conduits:
- a. Use sleeves of adequate size to accommodate retrieval for repair of wiring or piping and extend a minimum of twelve inches (12") beyond edges of walls or paving.
 - b. Provide removable, non-decaying plug at end of sleeve to prevent entrance of soil.

4. Unions: Locate unions for easy removal of equipment or valve.
5. Capping: Plug or seal opening as lines are installed to prevent entrance materials that would obstruct pipe. Leave in place until removal is necessary for completion of installation.

D. Sub-surface Inline Drip Tubing:

1. Install as per Drawings and as per manufacturer's recommendations. Prior to installation of tubing, obtain approval of finish grade in all planters where tubing is to be installed. (See inspection requirements.)
2. After tubing is installed, operate system for coverage test. Obtain approval of the Project Inspector and/or Landscape Architect prior to backfill.

3.11 SPRINKLER HEADS

- A. Sprinkler heads: Locate as shown on the Drawings except where existing conditions prohibit, or slight changes are approved to achieve as good or better coverage under the same conditions. Do not allow sprinkler head spacing to exceed the maximum shown on the Drawings. Plumb heads.
- B. Handling, Assembly of Pipe, Fittings, and Accessories: Allow only skilled tradesmen to handle and assemble pipe, fittings and equipment. Keep interior of pipes, fittings and accessories clean at all times. Close ends of pipe immediately after installation; leave closure in place until removal is necessary for completion of installation. Do not permit bending of pipe.
- C. Flushing: Remove end heads and operate system at full pressure until all rust, scale, and sand is removed. Divert water to prevent ponding or damage to finished work.
- D. Coverage: Accept responsibility for full and complete coverage of irrigated areas to satisfaction of Landscape Architect and make necessary adjustments to better suit field conditions at no additional costs to Owner.

3.12 FIELD QUALITY CONTROL

- A. Visual Inspection: Verify that all pipe is homogenous throughout and free from visual cracks, holes, or foreign materials. Inspect each length of pipe. All materials are subject to impact test at the discretion of the Landscape Architect.
- B. Hydrostatic Tests – Open Trench:
 1. Center-load piping with a small amount of backfill to prevent arching or slipping under pressure.
 2. Request the presence of the Project Inspector in writing at least forty-eight hours in advance of testing.
 3. At no additional cost to Owner, test in the presence of the Project Inspector.
 4. Apply continuous static water pressure of 100 psi when welded plastic joints have cured at least twenty-four hours, and with the risers capped, as follows: test main lines and submains for four hours; test lateral lines for two hours.

5. Repair leaks resulting from tests; and repeat tests.
 6. Test to determine that all sprinkler heads function according to manufacturer's data and give full coverage according to intent of Drawings. Replace any sprinklers not functioning as specified with ones that do, or otherwise correct system to provide satisfactory performance.
- C. Continuity Testing: Test locating device and control wires for continuity prior to and after back-filling operations.

3.13 CLEAN-UP

Remove debris resulting from work of this Section.

3.14 ADJUSTMENTS AND MAINTENANCE

- A. Adjusting System: Prior to acceptance, satisfactorily adjust and regulate entire system. Set watering schedule on controller appropriate to types of plants and season of year. Adjust remote control valves to operate sprinkler heads at optimum performance based on pressure and simultaneous demands through supply lines.
- B. System Layout: Provide reduced prints of Record Document irrigation plans, laminated in four (4) mil. plastic, of size to fit controller door. Enlarge remote-control valve designations as necessary for legibility. Color-code areas covered by each station. Affix plans to inside of controller door.
- C. Instructions: Upon completion of work, instruct maintenance personnel on operation and maintenance procedures for entire system.
- D. Flow Charts: Record and prepare an accurate flow-rate chart for each automatic control valve.

3.15 RECORD DRAWINGS

- A. Regularly update plans of the system and any changes made to the system throughout the project. Record all changes on this plan before trenches are back-filled.
- B. Record the as-built information on reproducible plans provided by the Architect. Complete and submit the Record Drawings to the Architect before applying for payment for work installed.
- C. As-built drawings are to be completed electronically with a pdf editing software or computer aided drafting software. As-built drawing done by hand will not be accepted for final submittal.
- D. Show the following on the Record Drawings accurately to scale and dimensioned from two permanent points of reference:
 1. Distance of mainline from nearby hardscape.
 2. Location of automatic control valves, quick couplers, and gate valves.

3. Location and size of all sleeves.
4. Location of automatic control wires and spares.

3.16 OPERATION MANUALS

Deliver two complete sets of manufacturer's warranties, Contractor guarantees, instruction sheets, parts lists and operation manuals to the Architect before requesting final acceptance of the project. Do not request final inspection until the sets are approved.

END OF SECTION

SECTION 32 90 00**LANDSCAPING****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Scope of Work: Furnish all labor, materials, tools, equipment, and transportation required to perform and complete the following work as specified herein:
 - 1. Soil Preparation and Fertilization
 - 2. Planting
 - 3. Hydroseeding and/or Sodding
 - 4. Weed Control
 - 5. Mulch
 - 6. Clean-up
 - 7. Landscape Maintenance Period
 - 8. Guarantee
- B. Work not included in this Section: Landscape elements such as concrete walks, fencing, outdoor lighting, rough grading, and clearing are not a part of this Section unless shown on the landscape Drawings.
- C. Construction Documents and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications sections, apply to this section.

1.02 RELATED SECTIONS

- A. SUBMITTAL PROCEDURES: Section 01 33 00.
- B. CLOSEOUT PROCEDURES: Section 01 77 00.
- C. EARTHWORK: Section 31 00 00.
- D. IRRIGATION: Section 32 80 00.

1.03 GUARANTEE

- A. The guarantee period for lawn and plant material shall be the duration of the landscape maintenance period, from commencement until final acceptance of the work of this Section. See Division 01 for other applicable guarantee requirements.
- B. During the guarantee period, repair and/or replace plants and lawn not in satisfactory growing condition, as determined by Owner's Representative, without additional cost to Owner. Plants are to be replaced as per "Landscape Maintenance" in Part 3.08 of this Section, using plants of the same kind and size specified in plant list.

1.04 QUALITY CONTROL

- A. Qualifications: Work must be completed by a licensed Landscape Contractor. Provide proof of five years of continuous experience in landscaping and irrigation of projects of similar size (+/- 20% of the construction cost) and scope for education campuses. Contractor to have a minimum of two projects either completed or in construction in the last five years.
- B. Work Force: Ensure that an experienced foreman is present at all times during installation. Keep the same foreman and workers on the job from commencement to completion.
- C. Reviews: Specifically request reviews of all items listed below in "Inspection Requirements" prior to progressing to the next level of work. The Owner's Representative reserves the right to inspect and reject material, both at place of growth and at site, before and/or after planting, for compliance with requirements for name, variety, size and quality.
- D. Reference Standards: Meet or exceed Federal, State and County laws requiring inspection of all plants and planting materials for plant disease and insect control.
- E. Delivery, Storage, and Handling:
 - 1. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
 - 2. Bulk Materials:
 - a. Do not dump or store bulk materials near structures, utilities, walkways or pavements, or on existing turf areas or plants.
 - b. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - c. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.
- F. Plant Material:
 - 1. Conform to the current edition of Horticultural Standards for quality of Number 1 grade nursery stock as adopted by the American Association of Nurserymen. Conform to sizes specified on plant legend. Select plants which have a natural shape and appearance.
 - 2. Select only plants that are true to name, and tag one of each bundle or lot with the name of the plant in accordance with the standards of practice of the American Association of Nurserymen. In all cases, botanical names shall take precedence over common names.
 - 3. Tag each plant of a patented variety with the variety and identification number, where applicable, as it is delivered to the job site.
 - 4. Select only plants which have been nursery-grown in accordance with good horticultural practices and which have been grown under climatic conditions similar to those in the locality of the project for at least one year.

5. Select only plants which are typical of their species or variety; have normal habits of growth; are sound, healthy, vigorous, well-branched and densely-foliated when in leaf; are free of disease, insect pests, eggs or larvae; and have a healthy and well-developed root system.
6. Select only container stock that has been grown in the containers in which delivered for at least six (6) months, but not over two (2) years. Provide samples to show that there are no root-bound conditions.
7. Do not use plants that are severely pruned or headed-back to meet size requirements.
8. Do not plant container-grown plants that have cracked or broken balls of earth when taken from the container. Remove canned stock carefully from cans after containers have been cut on two sides with tin snips or other approved cutter.
9. Coordinate a time for the Landscape Architect to inspect the plants upon their delivery to the project site.
10. At any time prior to final acceptance, be prepared to replace any plants that are rejected by the Owner's Representative because of physical damage to the plant.
11. Do not remove container-grown stock from containers before time of planting.
12. Stake shrubs with one-inch by one-inch by eighteen-inch (1"x1"x18") stakes in such manner that the stakes are not visible, and tie to upright position if they lean and/or are not growing in a vertical position.
13. Furnish quantities necessary to complete the work as shown on the Drawings and, if necessary, make up for any discrepancies in the quantities given in the Plant List at no additional cost to Owner.

G. Comply with the requirements of Section 01 77 00 – CLOSEOUT PROCEDURES.

1.05 INSPECTION REQUIREMENTS

- A. Landscape Architect reserves the right to examine and reject plant material both at place of growth and at site, before and after planting, for compliance with requirements of name, variety, size, and quality.
- B. Request and hold a pre-construction meeting prior to beginning the work of this Section. Parties required to be in attendance are the Landscape Contractor, Project Inspector, Owner's Representative, and Landscape Architect.
- C. Obtain verification from Project Inspector for the following at the appropriate times during construction and prior to further progression of work in this Section:
 1. Rough grading is to tolerances specified in Section 31 00 00 – EARTHWORK.
 2. The placement of landscape backfill material is as specified in this Section.
 3. Prior to the commencement of the work specified in this Section, the coverage and operation of the sprinkler irrigation system are as specified in Section 32 80 00 - IRRIGATION.

4. The soil amendment does not include any metal fragments. (Obtain a letter from the manufacturer stating that the material submitted for use on this project has no metal or foreign objects. Submit this letter as part of the Data Sheet submittal package [see "Submittals and Substitutions" in this Section])
 5. Required Test: For each load of soil amendment delivered to the site, spread at least two cubic yards (2 cy) of material onto a paved surface approximately two inches (2") deep. Pass a magnetic rake over the material in two directions. If any metal is found, test the entire load in the same manner. Perform all testing in the presence of the Project Inspector.
 6. Soil amendments, fertilizer, bark mulch and materials used for hydroseeding have been delivered to the site by the supplier, the invoices from the supplier indicate the project name and quantities delivered, and the Project Inspector has received copies of all such documents.
 7. Prior to planting, amendments and conditioners have been incorporated as per pre-planting recommendations, and planting areas have been made ready to receive planting.
- D. In case of failure to obtain any verification by the Project Inspector as required above, remove and replace work as necessary to obtain the verification at no additional cost to the Owner.
- E. Beginning of Maintenance Period: Verify all work is complete, then request and hold a meeting to include the Landscape Architect, Project Inspector, Architect and Owner's Representative for authorization to begin the landscape maintenance period.
- F. End of Maintenance: Verify that all work is complete and acceptable, and that the maintenance has been completed per specifications; and continue to provide landscape maintenance until the Owner's Representative has accepted the work.

1.06 SUBMITTALS AND SUBSTITUTIONS

- A. See Section 01 33 00 – SUBMITTAL PROCEDURES for additional requirements.
- B. Plant Material: Within fifteen (15) days after award of contract, locate plant materials required for construction. Ensure that shrubs are contract-grown from a certified nursery. Notify Owner's Representative of plant material "tied off" for review at selected nursery. If specified material is not obtainable, submit the following to Owner's Representative: proof of non-availability, proposal for use of equivalent material, photographs of alternative choices of plant material. Include clear, written description of type, size, condition, and general character of plant material.
- C. Data Sheets: Provide product data for each type of landscape material indicated in the Drawings and Specifications.
- D. Samples: Submit samples of the following materials to Landscape Architect for approval:
1. Soil amendment: (3) one-quart zip-locked plastic bags.
 2. Bark Mulch: (3) one-quart zip-locked plastic bags.
 3. Imported Topsoil: (3) one-quart zip-locked plastic bags. (if needed)

- E. Provide soils analysis reports prepared by a qualified soils laboratory in compliance with the Soil Testing Requirements under "Soil Testing" in Part 3.02 of this Section.
- F. Prior to planting, submit copies of all trucking or packaging tags for all soil amendment, fertilizer and other additives to Landscape Architect so the quantities can be verified.

1.07 PROTECTION AND CLEAN-UP

- A. Provide protection for persons and property throughout progress of work. Use temporary barricades as required. Proceed with work in such manner as to minimize spread of dust and flying particles and to provide safe working conditions for personnel. Store materials and equipment where directed.
- B. Existing Construction: Execute work in an orderly and careful manner to protect paving, work of other trades, and other improvements.
- C. Existing Utilities: Provide protection for existing utilities within construction area. At no additional cost to Owner, repair any damages to utility lines that occur as a result of this work.
- D. Landscaping: Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods.
- E. Paving: Maintain cleanliness of paving areas and other public areas used by equipment, and immediately remove spillage; remove rubbish, debris, and other material resulting from landscaping work, leaving site in a safe and clean condition.

1.08 PLANTING SCHEDULE / ENVIRONMENTAL REQUIREMENTS

- A. Install, establish, and maintain all lawn areas for a minimum of ninety (90) days prior to date of substantial completion. Coordinate schedule with other work and overall project schedule. Failure to install lawn areas by this date shall result in assessment of liquidated damages.
- B. Proceed with work in an orderly and timely manner to complete installation of landscaping within contract limits.
- C. Planting Season Limits: Do not plant when grounds are wet or temperature is below 25° F. Do not proceed with any soil preparation and fertilization if all planting cannot be completed within Planting Season Limit.

1.09 LANDSCAPE MAINTENANCE PERIOD REQUIREMENTS

- A. Beginning of Landscape Maintenance Period:
 - 1. General: Landscape Maintenance Period does not begin until all work is installed and lawn has evenly germinated to an approximated blade height of one and one-half inches (1 ½"), as determined by Landscape Architect, in writing.
 - 2. On-site Inspection: When all work is complete, request and hold a meeting to include the Landscape Architect, Project Inspector, Architect and Owner's Representative who must together authorize and determine the start date for the landscape maintenance period. Coordinate and give notice of the date and time of the on-site meeting to all parties at least forty-eight (48) hours in advance.

3. Acceptability: In cases where the lawn has reached adequate fullness and germination in some areas but not all, and authorization has not been given to begin the maintenance period, proceed with mowing, trimming, spraying, etc., as necessary prior to the beginning of the maintenance period.

B. Duration of Landscape Maintenance Period:

The Landscape Maintenance Period shall continue for a minimum of ninety (90) calendar days. During this time, continuously maintain all areas involved until final acceptance of the work by the Owner's Representative. See Landscape Maintenance Period procedure in Part 3.08 of this Section.

C. Final Acceptance of the Landscape Maintenance Period:

Request the final inspection forty-eight (48) hours in advance. If items require attention, hold on-site meetings until Landscape Architect can certify, in writing, and in concurrence with the Owner's Representative, the successful completion of the Landscape Maintenance Period.

1.10 RECORD DRAWINGS

Upon completion of work, and as a precedent to final payment, deliver to Owner's Representative one complete set of reproducible originals of Drawings showing work exactly as installed.

PART 2 - PRODUCTS

2.01 GENERAL

Use material in new and perfect condition as specified. Any deviations or substitutions from the Specification and Drawings must first be approved by Owner's Representative in writing prior to use.

2.02 SOIL PREPARATION MATERIALS

- A. Topsoil: Fertile; friable; natural loam surface soil; reasonably free of subsoil, clay lumps, brush, weeds and other litter; and free of roots, stumps, stones/rocks, and other extraneous or toxic matter harmful to plant growth.
- B. Soil Amendment: One-percent nitrogen-impregnated bark product with a ninety-percent (90%) bark base and zero to one-quarter inch (0-1/4") particle size, or approved equivalent. Do not spread until testing requirements have been satisfied.
- C. Fertilizer/Soil Conditioner: Gro-Power Plus or approved equal.
- D. Fertilizer for Shrubs: Seven-gram Gro-Power Planting Tablets (12-8-8 NPK) or approved equal.
- E. Vitamin B-1: "Superthrive", "Liquinox Start", "Cal-Liquid", or approved equal.

2.03 MISCELLANEOUS LANDSCAPE MATERIALS

- A. Bark Mulch: Untreated, shredded cedar.

- B. Pre-Emergent Weed Control: Oxadiazon, "Treeflam", "Ronstar 2G", "Surflan" (Elano Products Company), or approved equal.

2.04 PLANT MATERIAL:

- A. Nursery Plant Stock:

1. As indicated on Drawings. Do not remove container-grown stock from containers until planting time. Plants shall be true to name.
2. Healthy, shapely, well-rooted, not pot-bound, free from insect pests or plant diseases and properly "hardened off" before planting. Replace plants that are not alive or are not in satisfactory growing condition, as determined by the Landscape Architect, without additional cost to Owner. The Landscape Architect may reject plants before and/or after planting.
3. Labeled. Label at least one shrub of each species with a securely-attached, waterproof tag bearing legible designation of botanical and common name.

- B. Lawn Sod: Ninety percent (90%) Perennial Ryegrass and ten percent (10%) Kentucky Bluegrass.

- C. Lawn Hydroseed: Premium, new crop seed, delivered to site in original, unopened containers bearing a dated guaranteed analysis. Hydroseed mixture shall be as follows:

1. Seed: Sports Turf Mix by Seed Research or approved equal
 - a. 40% Perennial Ryegrass (SR4200 or approved equal)
 - b. 40% Perennial Ryegrass (SR4100 or approved equal)
 - c. 20% Kentucky Bluegrass (SR2100 or approved equal)
2. Starter Fertilizer: 16-20-0 with biosolids or approved equal.
3. Wood Fiber Mulch: As manufactured by Conwed or approved equal.
4. Soil Binding Agent: Polyacrylamide or approved equal.
5. Herbicide: Tenacity or approved equal.

PART 3 - EXECUTION

3.01 SITE CONDITIONS

- A. Examine the site, verify grade elevations, and observe conditions under which work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Owner's Representative.
- B. Proceed with complete landscape work as rapidly as portions of the site become available, working within seasonal limitations for each kind of landscape work required.

- C. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand-excavate, as required, to minimize possibility of damage to underground utilities. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- D. When conditions detrimental to sod or plant growth are encountered, such as rubble fill, adverse drainage condition, or other obstructions, notify the Owner's Representative before planting.

3.02 SOIL TESTING

- A. Coordinate soil testing in an expeditious and timely manner as required for on-site topsoil materials. Contract with a soil laboratory and include cost of sampling and testing in contract price. Take one (1) sample for every 5,000 square feet of landscape area up to a maximum of six (6) samples under the direction of and in the presence of the Owner's Representative.
- B. Submit each sample, according to the quantity of soil required by testing laboratory, to a competent laboratory approved by the Owner's Representative.
- C. Provide analysis of soil samples for pH, salinity, ammonia, phosphate, potassium, calcium, magnesium, boron, and sodium levels. Provide appraisal of chemical properties, including particle size determination, and recommendations for types and quantities of amendments and fertilizers.

3.03 PREPARATION

- A. Clearing of Vegetation:
 - 1. If live perennial weeds exist on site at the beginning of work, spray with a non-selective systemic contact herbicide as recommended and applied by an approved licensed landscape pest control advisor and applicator. Leave sprayed plants intact for at least 15 days.
 - 2. Clear and remove existing weeds by mowing or grubbing off all plant parts at least one-quarter inch ($\frac{1}{4}$ ") inch below surface of soil over entire areas to be planted.
- B. Soil preparation:
 - 1. Loosen soil in all planting areas, and on slopes flatter than 3:1 gradient, to a depth of six to eight inches (6" - 8") below finish grade. All debris, foreign matter, and stones shall be removed prior to the placing of any fertilizers or conditioners. Soil preparation is for all shrub planting beds, lawn hydroseeded areas and sodded lawn areas.
 - 2. Conduct the required soil tests and instruct the lab to include a minimum of the following soil improvements in the recommendation on the soils report.
 - a. Soil Amendment: Two cubic yards (2 cy) per 1,000 square feet.
 - b. Gro-Power Plus: One hundred fifty pounds (150 lbs) per 1,000 square feet.
 - c. If the lab recommends less than six cubic yards (6 cy) of soil amendment, the excess bid amount shall be applied to the cost of any additional recommended soil improvements, or returned to the Owner as a credit

3. Apply amendments as follows, using rates recommended by the soils testing laboratory (the rates of amendments shown below are for bidding purposes only):
 - a. Fertilizer/Soil Conditioner: Broadcast 150 pounds of Gro Power Plus per 1,000 square feet in all planting areas and rototill to a depth of six to eight inches (6" - 8"). Remove from the site any rock and debris brought to the surface by cultivations. "Cultipack" all areas to receive sod or hydroseed.
 - b. Apply soil amendment to all planting areas at the rate of six cubic yards (6 cy) per 1,000 sf and rototill into the top six to eight inches (6" – 8").
 4. Upon completion of finish grading, request a review and obtain approval of Landscape Architect prior to commencement of planting or hydroseeding.
- C. Finish Grading for all Planting areas
1. Refer to Earthwork Specification Section for Rough Grading.
 2. Grade to elevations and contours shown on Drawings. Fill low spots with landscape backfill material and grade to surface drain in manner indicated on Drawings.
 3. Finish-grade so that the entire area within the contract lines has a natural and pleasing appearance as specified and as directed by Landscape Architect.
 4. Adjust sprinkler heads flush to finish grade in preparation to receive hydroseeding or one-half inch above finish grade in preparation to receive sod. Reset sprinkler heads flush to grade after turf has germinated.
 5. Flag the sprinkler heads and valve markers.
- D. Planting Pits for Shrubs/Groundcover:
1. Excavate pits and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage.
 2. Loosen hard subsoil in bottom of excavation. Extend excavation as required to insure proper drainage from plant pits.
 3. Fill excavated planting pits with water to half the depth of pit. Pits should drain within four hours (4 hrs). If planting pits do not drain, notify Project Inspector immediately. Do not proceed with planting until Landscape Architect has resolved a method to provide drainage.

3.04 PLANTING

- A. Lawn Hydroseeding:
1. Do not begin hydroseeding until finish-grading has been checked by Landscape Architect. If work is rejected due to failure to obtain Landscape Architect's approval prior to hydroseeding, redo rejected work at no additional cost to Owner.

2. General: Hydroseeding is an artificial planting process which provides vegetation to an area by using a mixture of soil conditioner/fertilizer, seed, binder, and wood fiber mulch. This mixture should be of such character that it will disperse into a uniform slurry when mixed with water in a mechanical mixer.
3. Equipment: Use a standard hydraulic mulching machine with a continuous agitation system that keeps material in uniform suspension throughout mixing and distribution cycles and with a minimum mixing tank capacity of 500 gallons (3,000+ sq. ft. of coverage).
4. Mix per 1,000 square feet:
 - a. Lawn Seed 8 lbs.
 - b. Starter Fertilizer 25.0 lbs.
 - c. Wood Fiber Mulch: 45 lbs.
 - d. Soil Binding Agent: 3 oz.
 - e. Herbicide: 0.7 oz.
5. Application: Spray the slurry mix, under pressure, uniformly over the soil surface in a one-step operation. Protect adjacent paving, building walls, etc.
6. Clean any overspray from surfaces at end of each day's work.
7. Permit slurry to "set" approximately twenty-four hours (24 hrs.) before watering. Once watering has begun, do not allow newly hydroseeded areas to dry out.

B. Lawn Sod:

1. Cultivate all lawn areas to a depth of six inches (6"). If cultivation does not break lumps, pull a spike-toothed harrow over the area behind the tractor.
2. Give all lawn areas that are to be sodded a smooth finish to prevent pockets. Do not allow any abrupt changes of surface. Prior to installation of sod, roll the grade with a 200-pound water-ballast roller. Request that the lawn grade be inspected and approved by the Landscape Architect prior to sodding to determine its suitability for planting. Obtain such approval prior to commencing sodding operations.
3. Do not take heavy objects (except lawn rollers) over lawn areas after they have been prepared for planting.
4. Completely lay the sod within twelve hours (12 hrs.) of delivery. Do not leave sod on pallets in the hot sun longer than necessary.
5. Unroll sod carefully. Lay sod tight without any visible open joints, and without overlapping; stagger end joints twelve inches (12") minimum. Do not stretch or overlap sod pieces. Do not place sod in pieces smaller than twenty-four inches (24") in length by width of roll.

6. When new sod is to match existing turf, cut the edge of the existing turf in a series of straight lines that will accept new sod rolls in full width of the sod roll. Make the transition of grade between existing turf and new sod to be seamless with no change in elevation.
7. Immediately after laying sod, roll lawn areas with a 200-pound water-ballast roller.
8. Trim sod to conform to lawn shapes designated in Drawings.
9. On slopes of six inches (6") per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at a maximum of two feet (2') on center. Drive pegs flush with soil portion of sod.
10. Ensure that finished appearance is that of one continuous lawn.
11. Do not lay whole lawn before watering. When a conveniently large area has been sodded, water lightly to prevent drying. Continue to lay sod and to water until installation is complete.
12. All sod areas must be approved by Landscape Architect.
13. Water the complete lawn surface thoroughly. Moisten soil at least eight inches (8") deep. Repeat sprinkling at regular intervals to keep sod moist at all times until rooted. After sod is established, decrease frequency and increase amount of water per application as necessary.

C. Shrubs, and Groundcover:

1. Lay out individual shrub locations and areas for multiple plantings. Stake the locations, outline the areas, and secure the Owner's Representative's acceptance before beginning the planting work. Make minor adjustments as requested.
2. Scarify root ball prior to planting. Plant in holes twice the diameter of the root ball and to a depth equal to the container's height. Place the shrub and/or groundcover so the top of the root ball is one inch (1") higher than the surrounding grade. Set container-grown stock in center of pit. In hot weather, pre-wet the pit. When set, place additional backfill around base and sides of root ball. Work each layer to settle backfill and eliminate voids and air pockets. Thoroughly compact lower half of backfill in plant pit. See staking or guying detail. Water after planting. Add Vitamin B-1, in the proper solution as recommended by the manufacturer, to the second watering of the basin.
3. Place fertilizer planting tablets in root zone and alongside each plant. Follow manufacturer's instructions for number of tablets to use for each container size.
4. See Drawings for additional information.
5. Grooming of Shrubs:
 - a. Prune, thin-out and shape shrubs in accordance with standard horticultural practice. Prune shrubs to retain natural character and to accomplish their use in landscape design. The required plant size is its size after pruning.
 - b. Remove and replace excessively pruned or malformed new plants resulting from improper pruning.

3.05 WEED CONTROL

Apply pre-emergent weed control to all planting areas (except lawn) after completion of all planting and one complete watering. Follow manufacturer's directions. To prevent washing away of weed control, do not over-water after its application. Do not allow any weed control into lawn areas. Treat any existing noxious weeds, such as Johnson grass, with Roundup in successive treatments until all roots are destroyed, then remove all grass and roots. Notify Owner's Representative of time of installation for verification of application.

3.06 BARK MULCH

Apply mulch at the rate of three inches (3") deep to all planting areas, exclusive of lawn, after the planting and weed control are completed. Twelve inches (12") from planter edges, taper full depth of mulch to meet adjacent grades. Do not place mulch within three inches (3") of trunk or stems.

3.07 CLEAN-UP

- A. During construction, keep the site free of rubbish and debris, and clean up the site promptly when notified to do so. Take care to prevent spillage on streets from hauling and immediately clean up any such spillage and/or debris deposited on streets due to the work of this Section.
- B. During all phases of the construction work, take all precautions to abate dust nuisance by clean-up, sweeping, sprinkling with water, or other means as necessary.

3.08 LANDSCAPE MAINTENANCE

- A. The Landscape Maintenance Period will begin when all the Landscape Maintenance Period Requirements have been met (See Part 1 of these Specifications).
- B. Cleaning: Maintain cleanliness on paving areas and other public areas used by equipment and immediately remove all spillage. Remove from project site all rubbish and debris found thereon and all material and debris resulting from landscaping work, leaving the site in a safe and clean condition.
- C. Maintenance:
 - 1. Sprinkler Irrigation System:
 - a. Check system weekly for proper operation. Flush lateral lines out after removing last sprinkler head or two at each end of lateral. Adjust all heads as necessary for unimpeded coverage.
 - b. Set and program automatic controllers for seasonal water requirements. Provide the Owner's Representative with keys to the controllers and instructions on how to turn off system in case of emergency.
 - c. Repair all damages to sprinkler irrigation system as part of the contract work. Make repairs within one watering period or one week, whichever is the least amount of time.

2. Turf Areas:

- a. Begin mowing turf when grass has reached a height of three inches (3") and cut to a height of one and one-half inches to two inches (1 ½" - 2"). Mow at least weekly after the first cut. Turf must be well-established and free of bare spots and weeds, to satisfaction of Landscape Architect, prior to final acceptance. Do not mow lawns when the soil is not able to support maintenance equipment. Repair wheel marks and ruts caused by the maintenance equipment at no additional cost to the Owner.
- b. Pick up grass clippings and remove from the site and premises.
- c. Trim edges at least twice monthly for neat appearance. Vacuum or blow clippings off walks.
- d. Water the lawns at such frequency as weather conditions require to replenish soil moisture below the root zone. Normally, a total of one and one-half inches (1 ½") of water is needed weekly in hot weather.
- e. Fertilize the lawn areas at the beginning of the Landscape Maintenance Period and at the completion of the Landscape Maintenance Period. Use a fertilizer with the following characteristics:
 - 1.) Slow release, Best 16-6-8, or approved equal, at the rate of 6.25 lbs per 1,000 square feet from March through October.
 - 2.) Calcium Nitrate (15-0-0) at the rate of 6.5 lbs per 1,000 square feet from November through February.
- f. Broadcast fertilizer using a mechanical spreader; do not apply by hand-broadcasting. Sweep all fertilizer off hardscape into adjacent planters.
- g. Weekly as needed and as directed, re-sod lawn areas with material that matches previously installed material. Use sod to repair any bare areas. Repair areas to receive sod as follows:
 - 1.) Mark out areas to receive new sod repair.
 - 2.) Cut straight lines that will accept sod the full width of the roll and a minimum of twenty-four inches (24") in length.
 - 3.) Transition the grade between existing turf and new sod seamlessly, with no change in elevation.

3. Shrubs:

- a. Water enough that moisture penetrates throughout root zone and only as frequently as necessary to maintain healthy growth.
- b. Construct and/or remove water basins around each plant, depending on the time of the year and as directed.
- c. Do not prune unless directed by the Landscape Architect.

- d. Replace any dead, dying or vandalized plant material on a weekly basis throughout the Landscape Maintenance Period.
4. Insecticide and Herbicide Application:
- a. If needed, control weeds with selective herbicides and sprays. In areas where crabgrass has infested the lawn, apply pre-emergent herbicides such as Dacthal by Amvac, Balan, or Betasan by Gowan for control prior to crabgrass germination. Control insect pests if necessary.
 - b. Use only a licensed Pest Control Operator to apply herbicides and sprays and to maintain a log for applications indicating material, timing, and rate.
5. Decomposed Granite with Binder:
- a. Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed.
 - b. During the first year, a minor amount of loose aggregate will appear on the paving surface (1/16" to 1/4"). If this material exceeds a ¼", redistribute the material over the entire surface. Water thoroughly to the depth of 1". Compact with power roller of no less than 1,000 lbs. This process should be repeated as needed.
 - c. If cracking occurs, sweep fines into the crack, water thoroughly and hand tamp with an 8"-10" hand tamp plate.
6. Pre-scheduled On-site Meetings: Hold regularly-scheduled (monthly or bimonthly as determined by the Landscape Architect) on-site meetings with the Landscape Architect, Project Inspector and Owner's Representative. Dates and times will be jointly agreed upon.
7. Request, forty-eight hours (48 hrs.) in advance, on-site visits by the Landscape Architect to determine the end of the Landscape Maintenance Period.

END OF SECTION

SECTION 33 4000

SITE DRAINAGE

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 50 00, Construction Facilities and Temporary Controls.
- B. Section 31 23 33, Trenching and Backfilling.
- C. Section 32 12 00, Asphalt Concrete Paving.
- D. Section 32 16 00, Site Concrete

1.03 QUALITY ASSURANCE

- A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- B. 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.
- C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.
- D. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction are the responsibility of the contractor.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00.
- B. 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.

1.05 WARRANTY

- A. Refer to General Conditions and Section 01 78 36.

1.06 REFERENCES AND STANDARDS

- A. ANSI/ASTM D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- B. ANSI/ASTM D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ANSI/ASTM D1557-02 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- D. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
- E. ANSI/ASTM D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.
- F. CALTRANS Standard Specifications.
- G. CAL-OSHA, Title 8, Section 1590 (e).
- H. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.
- I. California Plumbing Code current edition.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Transport, store and handle in strict accord with the local jurisdiction.
- B. 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.

1.08 PROJECT CONDITIONS

- A. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

1.09 EXISTING SITE 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.

1.10 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, the Contractor shall be solely and completely responsible for working conditions at the job site, 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. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- D. Provide shoring, sheeting, sheet piles and/or bracing to prevent caving, erosion or gullyng of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to provide pumps and all equipment necessary to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. 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.
- H. Trees: Carefully protect existing trees that are to remain.

1.11 SEASONAL LIMITS

- A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

1.12 TESTING

- A. General: Refer to Section 01 40 00 – Quality Requirements.
- B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.

1.13 RECORD DRAWINGS

- A. Keep a daily record of all pipe placed in ground, verified by Project Inspector.
- B. Upon completion of this Contract, furnish one tracing showing all outside utility lines, piping, etc., installed under this Contract. Locate and dimension all work with reference to permanent landmarks.
- C. All symbols and designations used in preparing "RECORD" drawings shall match those used in Contract drawings.
- D. Properly identify all stubs for future connections, as to location and use, by setting of concrete marker at finished grade in the manner suitable to Architect.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Pipe: Use one of the following, unless noted on the Drawings otherwise.
 - 1. Polyvinyl Chloride Pipe (PVC): SDR35 conforming to ASTM D3034 with elastomeric joints conforming to ASTM D3212. Sun damaged pipe will be rejected.
 - 2. High density polyethylene pipe (HDPE): The pipe shall be corrugated exterior/smooth interior pipe and water tight per ASTM D3212 with dual wall water tight gasket fittings.
- B. Perforated Pipe (for subdrains): Shall be ADS N12 pipe, 3 hole, ASTM F 405, AASHTO M 252; PVC ASTM D3034 SDR-35 storm drain pipe
- C. Manhole: Shall be as shown on the drawing details.
- D. Drop Inlet: Shall be as shown on the drawing details.
- E. Curb Inlet: Shall be as shown on the drawing details.
- F. Mortar: For pipe connections to concrete drainage structures, conform to ASTM C270 type N mortar. Place within one half hour after adding water.
- G. Crushed Rock: Imported washed crushed rock. Minimum 100% passing 3/4 inch sieve.
- H. Trench drain: Polycast, Polydrain or equal and as shown on drawings.
- I. Area Drains: Shall be as shown on the drawing details.
- J. Floor Drains: Shall be as shown on the drawing details.
- K. Clean-outs: Shall be as shown on the drawing details.
- L. Planter drains: Shall be as detailed on the drawing details.
- M. Filter Fabric: Mirafi 140N.

PART 3 - EXECUTION**3.01 INSPECTION LAYOUT AND PREPARATION**

- A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point where this installation may properly commence
- B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a licensed Land Surveyor or Professional Civil Engineer.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 INSTALLATION

- A. General: Installation shall be in strict conformance with referenced standards, the manufacturer's written directions, as shown on the drawings and as herein specified.
- B. Verify invert elevations at points of connection to existing systems prior to any excavation. If invert elevations differ from that shown on drawings, notify Architect immediately.
- C. Excavation and Bedding:
 - 1. General: Trench straight and true to line and grade with bottom smooth and free of irregularities or rock points. Trench width in accordance with pipe manufacturer's recommendations and as per the drawings. Follow manufacturer's recommendations for use of each kind and type of pipe.
 - 2. Bedding: Provide bedding as detailed on plans for the full length of the pipe. Bedding shall have a minimum thickness beneath the pipe of 4" or 1/8 the outside diameter of the pipe, which ever is greater. Provide bell holes and depressions for pipe joints only of size required to properly make joint.
 - 3. If the trenches for the site drainage fall within areas to be lime treated, the piping shall be installed prior to any lime treatment operations.
 - a. If additional piping is added to previously lime treated areas, the contractor shall backfill the trench with class 2 aggregate base and compact to 95%.
- D. Laying of Pipe:
 - 1. General: Inspect pipe prior to placing. Set aside any defective or damaged material. Do not place pipe in water nor place pipe when trenches or weather are unsuitable. Lay pipe upgrade, true to line and grade.
 - 2. Bell and Spigot Joints: Lubricate inside of bells and outside of spigots with soap solution or as recommended by manufacture. Wedge joints tight. Bell of bell and spigot pipe to be pointed upgrade.
 - 3. Pipe shall be bedded uniformly throughout its length.
 - 4. Pipe elevation shall be within 0.02 feet of design elevation as shown on plans.
 - 5. Off Site Work: All work beyond the property lines shall be done in strict conformance with the requirements of the governing agency.
- E. Backfilling:
 - 1. General: Do not start backfill operations until required testing has been accomplished.
 - 2. Trenches and Excavations: Backfill with material as detailed on plans, filling both sides of the pipe at the same time, carefully tamping to hold pipe in place without movement. Refer to Section 31 23 33 – TRENCHING AND BACKFILLING for fill above this layer.
- F. Grouting of Pipes: Grout pipes smooth and water tight at drop inlet, manholes, and curb inlets. Grout back side of hood at curb inlets all grouting shall be smooth and consistent.
- G. Off Site Work: All work beyond the property lines shall be done in strict conformance with the requirements of the local agency.
- H. Cutting and Patching: Remove and replace existing surface features per applicable specification section (i.e. asphaltic concrete or concrete paving) where pipe is installed in areas of existing improvements.

3.03 TOLERANCES

A. Storm Drain structure grates

1. In landscape and lawn areas $\pm 0.05'$.
2. In sidewalk and asphalt pavement $\pm 0.025'$.
3. In curb and gutter application $\pm 0.0125'$.

B. Cleanout Boxes and Lids

1. In landscape areas; 0.10 higher than surrounding finish grade, $\pm 0.05'$.
2. In sidewalks and asphalt pavement; Flush with surrounding finish grade, $\pm 0.025'$.

3.03 DEWATERING

- A. Contractor to provide trench dewatering as necessary, no matter what the source is, at no additional cost to the owner.
- B. If the previously excavated material from trenching is too wet to achieve trench backfill compaction the contractor shall make a reasonable effort to aerate and dry the material per section 31 00 00, 3.08, B

3.04 FLUSHING

- A. The Contractor shall thoroughly ball and flush the storm drain system to remove all dirt and debris. Discharge water to an approved location.

3.05 CLEANING

- A. Refer to Section 01 74 00.
- B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.
- C. Clean the dirt, rocks, and debris from all storm drain inlets, structures, and connecting pipes.

END OF SECTION