# DSA BACK CHECK SUBMITTAL
# MARCH 27, 2018

## TECHNICAL SPECIFICATIONS

## FOR

## VENTURA COUNTY COMMUNITY COLLEGE DISTRICT

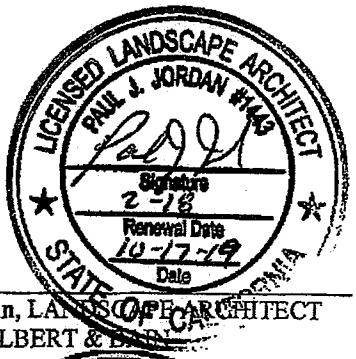
## MOORPARK COLLEGE
## FIELD HOUSE AND SHADE STRUCTURE

## VENTURA COUNTY COMMUNITY COLLEGE DISTRICT
**Bid No. 549**

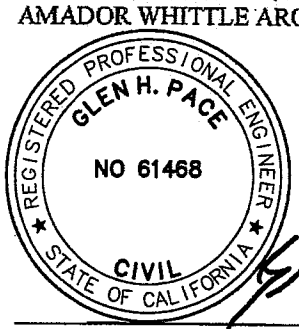
## FOR

## MOORPARK COLLEGE
## 7075 CAMPUS ROAD
## MOORPARK, CA 93021


**William J Amador AIA**, ARCHITECT
AMADOR WHITTLE ARCHITECTS, INC.




**Paul J. Jordan**, LANDSCAPE ARCHITECT
JORDAN, GILBERT & [illegible]

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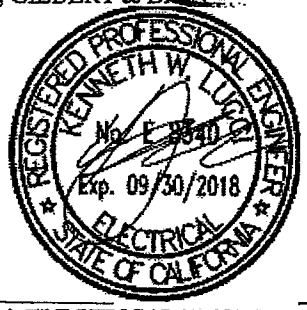


**Ken Lucci**, ELECTRICAL ENGINEER
LUCCI & ASSOCIATES, INC.

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DIV OF THE STATE ARCHITECT
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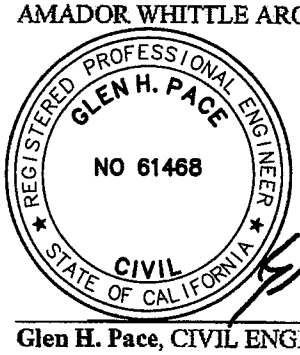


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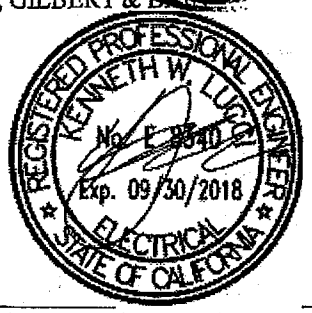


**Ken Lucci**, ELECTRICAL ENGINEER
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**TECHNICAL SPECIFICATIONS**
**FOR**
**MOORPARK COLLEGE FIELD HOUSE AND SHADE STRUCTURE**

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS (NOT REVIEWED BY DSA)

DIVISION 10 - SPECIALTIES



DIVISION 11 – EQUIPMENT



DIVISION 12 - FURNISHINGS



DIVISION 26 – ELECTRICAL

**END OF TABLE OF CONTENTS**

# SECTION 01 4523

# TESTING AND INSPECTION

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES

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

B. Related Requirements:

1. Section 03 2000 – Concrete Reinforcing.
2. Section 03 3000 – Cast-in-Place Concrete.
3. Section 04 2200 – Concrete Unit Masonry.
4. Section 05 1200 – Structural Steel Framing.
5. Section 06 1000 – Rough Carpentry.
6. Section 31 2319 – Excavation Fill for Structures.

### 1.02 REFERENCES

A. American Concrete Institute (ACI):

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

B. American Institute of Steel Construction (AISC):

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

C. ASTM International (ASTM):

1. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
2. ASTM A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

3. ASTM A706 – Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

E. American Welding Society (AWS):

1. AWS D1.1 – Structural Welding Code.

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

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

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

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

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

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

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

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

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

7. DSA IR 22-3 – Open Web Steel Joists and Joist Girders.

8. DSA IR 23-4 – Metal-Plate-Connected Wood Trusses.

9. DSA IR-23-8 – Manufactured Wood-Chord-Metal-Web Trusses.

1.03 REGULATORY REQUIREMENTS

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

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

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

1.04 TESTS

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

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

C. Any material shipped from the source of supply prior to having satisfactorily passed such testing and inspection, or prior to the receipt of notice from Project Inspector such testing and inspection is not required, shall not be incorporated into the Work.

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

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

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

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

1.05 TEST REPORTS

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

1.06 VERIFICATION OF TEST REPORTS

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

1.07 INSPECTION BY OWNER

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

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

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

1.08 PROJECT INSPECTOR

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

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

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

1.09 STRUCTURAL TESTS AND SPECIAL INSPECTIONS

A. Soils:

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

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

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

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

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

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

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

1) Perform qualification testing of fill materials.

2) Test the compaction of fill.

3. Cast-in-place Deep Foundations (Piers): Continuous inspections by Geotechnical Engineer in conformance to Table 1705A.8:

a. Inspect drilling operations and maintain complete and accurate records for each pier.

b. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, and embedment into bedrock (if applicable). Record concrete or grout volumes.

c. Confirm adequate end strata bearing capacity.

d. Concrete Piers: Tests and inspections will be as indicated on paragraphs below for concrete.

4. Retaining Walls:

a. Continuous inspections by Geotechnical Engineer:

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

2) Segmental retaining walls; inspect placement of units, dowels, connectors, etc.

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

c. Masonry Retaining Walls: Provide tests and inspections as indicated on paragraphs below for masonry.

B. Concrete:

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

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

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

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

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

3) Inspect all other welds.

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

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

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

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

e. Design Mix:

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

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

with CBC section 1705A3.3.1, item 1, and requires first batch inspection, weightmaster, and batch tickets.

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

g. Inspect concrete and shotcrete placement for proper application techniques, per ACI 318, section 26.4.5.

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

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

2. Post-installed Anchors:

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

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

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

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

C. Structural Steel:

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

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

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

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

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

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

D. Welding:

1. Verification of Materials, Equipment and Welders:

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

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

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

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

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

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

   c. Inspect welding of stairs and railing systems.

   d. Verification of reinforcing steel weldability.

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

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

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

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

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

d. Floor deck welds.

e. Welding of structural cold-formed steel.

f. Welding of stairs and railing systems.

g. Verification of reinforcing steel weldability.

h. Inspect welding of reinforcing steel.

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

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

F. Anchor Bolts, Anchor Rods and Other Steel:

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

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

PART 2 – PRODUCTS (Not used).

PART 3 – EXECUTION (Not used).

END OF SECTION

# SECTION 02 4116

# DEMOLITION

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes: Furnishing labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, or required for completion of the Work. Includes items such as the following:

1. Protection of existing improvements to remain.
2. Cleaning existing improvements to remain.
3. Disconnecting and capping utilities.
4. Removing debris, waste materials, and equipment.
5. Removal of items for performance of the Work.
6. Salvageable items to be retained by the Owner.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 1100 - Summary of Work.
3. Section 01 5000 - Construction Facilities and Temporary Controls.
4. Section 01 7329 - Cutting and Patching.
5. Section 01 7419 - Construction and Demolition Waste Management.
6. Division 22 — Plumbing.
7. Division 23 — HVAC.
8. Division 26 — Electrical.

### 1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating the extent of items and systems to be removed. Indicate items to be salvaged or items to be protected during demolition. Indicate locations of utility terminations and the extent of abandoned lines to be removed. Include details indicating methods and location of utility terminations.

### 1.03 QUALITY ASSURANCE

A. Perform the Work of this section by workers skilled in the demolition of buildings and structures. Perform the Work of this section under direct superintendence at all times.

B. Prior to commencement of Work, schedule a walkthrough with the OWNER, to confirm Owner property items have been removed from scheduled Work areas. Identify and mark remaining property items and schedule their removal.

C. Coordinate demolition for the correct sequence, limits, and methods. Schedule demolition Work to create least possible inconvenience to the public and facility operations.

D. Related Standards:

1. ANSI/ASSE A10.6.
2. CBC Chapter 33.
3. CFC Chapters 11 and 33.
4. NFPA 241

1.04 PROJECT CONDITIONS

A. Drawings may not indicate in detail all demolition Work to be performed. Examine existing conditions to determine the full extent of required demolition.

B. Repair damage to existing improvements or damage due to excessive demolition.

C. Provide all measures to avoid excessive damage from inadequate or improper means and methods, improper shoring, bracing or support.

D. If conditions are encountered that varies from those indicated, promptly notify the Architect for clarification before proceeding.

PART 2 - PRODUCTS

2.01 HANDLING OF MATERIALS

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

B. Items scheduled for reuse shall be stored on the Project site and protected from damage, theft and other deleterious conditions.

PART 3 - EXECUTION

3.01 GENERAL

A. Protection:

1. Do not commence demolition until safety partitions, barricades, warning signs and other forms of protection are installed. Refer to Section 01 5000 - Construction Facilities and Temporary Controls.

2. Provide safeguards, including warning signs, lights and barricades, for protection of workers, occupants, and the public.

B. If safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the OWNER.

3.02 DEMOLITION

A. Do not throw or drop materials. Furnish ramps or chutes as required by the Work.

B. Remove existing construction only to extent necessary for proper installation of Work and interfacing with existing construction. Cut back finished surfaces to straight, plumb or level lines as required for a smooth transition.

C. Where openings are cut oversize or in improper locations, replace or repair to required condition.

3.03 CUTTING EXISTING CONCRETE

A. Cutting of existing concrete shall be performed by skilled workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Do not damage concrete intended to remain.

B. Extent of cutting of structural concrete shall be as indicated on Drawings. Cutting of non-structural concrete shall be as indicated on Drawings or as reviewed by the Architect or structural engineer. Replace concrete demolished in excess of amounts indicated.

C. Prior to cutting or coring concrete, determine locations of hidden utilities or other existing improvements and provide necessary measures to protect them from damage.

3.04 REMOVAL OF EXISTING PLUMBING AND ELECTRICAL EQUIPMENT AND SERVICES

A. Remove existing plumbing and electrical equipment fixtures and services not indicated for reuse and not necessary for completion of the Work. Remove abandoned lines and cap unused portions of existing lines.

3.05 REMOVAL OF OTHER MATERIALS

A. Masonry: Cut back to joint lines and remove mortar without damaging units to remain. Allow space for repairs to backing where applicable.

B. Woodwork: Cut or remove to a joint or panel line.

C. Roofing: Remove as required, including accessory components such as insulation and flashings. At penetrations through existing roofing, trim cut edges back to sound roofing with openings restricted to the minimum size necessary to receive Work.

D. Sheet Metal: Remove back to joint, lap, or connection. Secure loose and unfastened ends or edges and provide a watertight condition. Re-seal as required.

E. Glass: Remove broken or damaged glass and clean rebates and stops of glazing channels.

F. Modular materials such as acoustical ceiling panels, resilient tile, or ceramic tile: Remove to a natural joint without leaving damaged or defective Work where joining new Work. After flooring removal, clean substrates to remove setting materials and adhesives.

G. Gypsum Board: Remove to a panel joint line on a stud or support line.

H. Plaster: Saw cut plaster on straight lines, leaving a minimum 2-inch width of firmly attached metal lath for installing new lath and plaster.

I. Remove existing improvements not specifically indicated or required but necessary to perform Work. Cut to clean lines, allowing for installation of Work.

3.06 PATCHING

A. Patch or repair materials to remain when damaged by the performance of the Work of this section. Finish material and appearance of patch and/or repair Work shall match existing.

3.07 CLEANING

A. Clean existing materials to remain with appropriate tools and equipment.

B. Protect existing improvements during cleaning operations.

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

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

E. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Owner, or store and protect for reuse where required. Continuously clean up and remove items as demolition Work progresses.

F. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

# SECTION 03 1000

# CONCRETE FORMING AND ACCESSORIES

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete as indicated.

2. Installation of items to be embedded in concrete, such as anchor bolts, inserts, embeds, and sleeves.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 2000: Concrete Reinforcing.

3. Section 03 3000: Cast-In-Place Concrete.

### 1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 318 – Building Code Requirements for Structural Concrete, Chapter 6, Formwork, Embedded Pipes, and Construction Joints.

2. ACI 347 – Guide to Formwork for Concrete.

B. American Plywood Association (APA):

1. Form No. V345 - Concrete Forming Design/Construction Guide.

C. National Institute of Standards and Technology (NIST):

1. NIST Voluntary Product Standard PS 1.

### 1.03 SUBMITTALS

A. Submit detailed structural calculations and drawings approved and signed by a California registered Civil Engineer where the height of the falsework or vertical shoring, as measured from the top of the sills to the soffit of the superstructure exceeds 14 feet, or where individual horizontal span lengths exceed 16 feet, or where provision for vehicular traffic through falsework or shoring occurs. For all other falsework and shoring submit layout signed by California registered Civil Engineer, manufacturer's authorized representative or a licensed contractor experienced in the

usage and erection of falsework and vertical shoring. A copy of the plans and calculation shall be available at the jobsite at all times.

B. Shop Drawings: Submit Shop Drawings indicating locations of forms, construction and expansion joints, embedded items, and accessories.

C. Product Data: Submit manufacturer's Product Data for form materials and accessories.

1.04 REGULATORY REQUIREMENTS

A. California Building Code (CBC), Chapter 19A.

B. California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 4, Construction Safety Orders, Article 6, Excavations, Sections 1713 and 1717.

1.05 DELIVERY, STORAGE AND HANDLING

A. Storage shall prevent damage and permit access to materials for inspection and identification.

PART 2 - PRODUCTS

2.01 GENERAL

A. Form materials may be reused during progress of the Work provided they are completely cleaned and reconditioned, recoated for each use, capable of producing formwork of required quality, and are structurally sound.

B. Form Lumber: WCLIB Construction Grade or Better, WWPA No. 1 or Better.

C. Plywood: NIST Voluntary Product Standard PS 1, Group 1, Exterior Grade B-B Plyform or better, minimum 5-ply and 3/4 inch thick for exposed locations and at least 5/8 inch thick for unexposed locations, grade marked, not mill oiled. Furnished plywood with medium or high density overlay is permitted.

D. Coated Form Plywood: For exposed painted concrete, plastic overlaid plywood of grade specified above, factory coated with a form coating and release agent Nox-crete", or equal.

E. Tube Forms: Sonoco "Seamless Sonotubes," Ceme-Tube, Quik-Tube, or equal, of the type leaving no marks in concrete, one-piece lengths for required heights.

F. Joist Forms: Code recognized steel or molded plastic types as required.

G. Special Forms: For exposed integrally-colored concrete, plywood as above with high density overlay, plywood with integral structural hardboard facing or fibrous glass reinforced plastic facing, providing specified finish.

H. For Exposed Concrete Finish:

1. Plywood: New, waterproof, synthetic resin bonded, exterior type Douglas fir or Southern pine plywood manufactured especially for concrete formwork and conforming to NIST Voluntary Product Standard PS 1, Grade B-B grade, Class I.

2. Glass-Fiber-Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.

3. Steel: Minimum 16 gage sheet, well matched, tight fitting, stiffened to support weight of concrete, without deflection detrimental to tolerances and appearances of finished concrete surfaces.

4. Plywood: "Finland Form,," "Combi Form" by North American Plywood Corporation, "Plyform" by Roy O. Martin, "ProForm" by Pacific Wood Laminates, or equal. The material shall be furnished with hard smooth birch face veneers with phenolic resin thermally fused onto panel sides. Edges shall be factory sealed.

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

J. Form Coating: Non-staining clear coating free from oil, silicone, wax, not grain-raising, "Formshield" by A.C. Horn, Inc., "Release" by Edoco/Dayton Superior, "Cast-Off" by Sonneborn/BASF Building Systems or equal. Where form liners are furnished, provide form coatings recommended by form liner manufacturer.

K. Form Liner: Rigid or resilient type by L.M. Scofield, Symons, Greenstreak, or equal.

L. Void Forms: Manufactured by SureVoid Products, Inc., Sonotube, Void Form International, or equal. Forms shall be "WallVoid" for temporary support of concrete walls and grade beams spanning between supports, and "SlabVoid" for creating gaps between concrete slabs or steps and underlying soils. Void forms shall be fabricated of corrugated paper with moisture resistant exterior, and shall be capable of withstanding working load of 1,500 psf. Provide accessories as required.

## PART 3 - EXECUTION

### 3.01 GENERAL

A. Forms shall be constructed so as to shape final concrete structure conforming to shape, lines and dimensions of members required by Drawings and Specifications, and shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape. Forms and their supports shall be designed so that previously placed structures will not be damaged.

B. Use form coating at all surfaces in contact with concrete.

### 3.02 TOLERANCES

A. Permitted abrupt or gradual irregularities in formed surfaces as measured within a 5 feet length with a straightedge shall per ACI 347, Table 3.1:

| Class of Surface | | | |
|---|---|---|---|
| A | B | C | D |
| 1/8 inch | 1/4 inch | 1/2 inch | 1 inch |

1. Class A: Use for concrete surfaces prominently exposed to public view.

2. Class B: Use for coarse-textured concrete-formed surfaces intended to receive plaster, stucco or wainscoting.

3. Class C: Use as a general standard for permanently exposed surfaces where other finishes are not specified.

4. Class D: Use for surfaces where roughness is not objectionable and will be permanently concealed.

3.03 ERECTION

A. Plywood shall be installed with horizontal joints level, vertical joints plumb and with joints tight. Back joints by studs or solid blocking, and fill where necessary for smoothness. Reused plywood shall be thoroughly cleaned, damaged edges or surfaces repaired and both sides and edges oiled with colorless form oil. Nail plywood along edges, and to intermediate supports, with common wire nails spaced as necessary to maintain alignment and prevent warping.

B. Openings for Cleaning: Provide temporary openings at points in formwork to facilitate cleaning and inspection. At base of walls and wide piers, bottom form board on one face for entire length shall be omitted until form has been cleaned and inspected.

C. Chamfers: Provide 3/4 inch by 3/4 inch chamfer strips for all exposed concrete corners and edges unless otherwise indicated.

D. Reglets and Rebates: As specified in Section 03 3000: Cast-In-Place Concrete.

3.04 REMOVAL OF FORMS

A. Forms shall not be removed until concrete has sufficiently hydrated to maintain its integrity and not be damaged by form removal operations. Unless noted otherwise and/or permitted by the Architect, columns and wall forms shall not be removed in less than five days, floor slabs in less than seven days, beams and girders in less than 15 days, pan forms for joists may be removed after three days, but joist centering shall not be removed until after 15 days, and ramp, landing, steps and floor slabs shall not

be removed in less than seven days. Shoring shall not be removed until member has acquired sufficient strength to support its weight, load upon it, and added load of construction.

B. Compressive strength of in-place concrete shall be determined by testing field-cured specimens representative of concrete location or members, as specified in Section 03 3000: Cast-In-Place Concrete.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

# SECTION 03 2000

# CONCRETE REINFORCING

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Concrete steel reinforcement.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4523: Testing and Inspection.
3. Section 03 1000: Concrete Forming.
4. Section 03 3000: Cast-In-Place Concrete.

### 1.02 REGULATORY REQUIREMENTS

A. Fabrication and placement of reinforcing shall be in accordance with requirements of CBC, Chapter 19A.

### 1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM):

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
5. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
6. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
7. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

B. American Concrete Institute (ACI) Publication:

1. ACI SP-66 – ACI Detailing Manual.

2. ACI 318 – Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1908A.

C. American Welding Society (AWS):

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

1.04 SUBMITTALS

A. Shop Drawings: Submit steel reinforcement Shop Drawings in accordance with ACI 315. Include assembly diagrams, bending charts and slab plans. Indicate lengths and location of splices, size and lengths of reinforcing steel.

B. Closeout Submittals: Record exact locations of reinforcing that vary from Shop Drawings.

1.05 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.

2. American Welding Society (AWS).

3. American Concrete Institute (ACI).

4. CBC, Chapter 19A, Concrete.

B. Source Quality Control: Refer to Division 01 Sections for general requirements and to the following paragraphs for specific procedures. Testing laboratory retained by the Owner shall select test Samples of bars, ties, and stirrups from the material at the Project Site or from the place of distribution, with each Sample consisting of not less than two 18 inch long pieces, and perform the following tests according to ASTM A615, or ASTM A706, as applicable:

1. Identified Bars: If Samples are obtained from bundles as delivered from the mill, identified as to heat number, accompanied by mill analyses and mill test reports, and properly tagged with the identification certificate so as to be readily identified, perform one tensile and one bend test for each 10 tons or fraction thereof of each size of bars. Submit mill reports when Samples are selected.

2. Unidentified Bars: When positive identification of reinforcing bars cannot be performed and when random Samples are obtained; perform tests for each 2.5 tons or fraction thereof, one tensile and one bend test from each size of bars.

C. Certification of Welders: Shop and Project site welding shall be performed by welding operators certified by AWS.

1.06 DELIVERY, STORAGE AND HANDLING

A. Avoid exposure to dirt, moisture or conditions harmful to reinforcing.

B. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated for size and shape.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide reinforcing of sizes, gages and lengths indicated, bent to indicated shapes.

2.02 MATERIALS

A. Steel Reinforcing Bars: ASTM A615, or ASTM A706 deformed grade 60 billet steel unless otherwise specified or indicated.

B. Bars or Rod Mats: ASTM A184.

C. Welded Wire Fabric for Reinforcement: ASTM A185.

D. Tie Wire: ASTM A82, fully annealed, copper-bearing steel wire, 16 gage minimum.

E. Chairs, Spacers, Supports, and Other Accessories: Standard manufacture conforming to ACI 315 fabricated from steel wire of required types and sizes. For reinforcement supported from grade, provide properly sized dense precast blocks of concrete.

2.03 FABRICATION OF REINFORCING BARS:

A. Comply with CRSI Manual of Standard Practice for Reinforced Concrete Construction for fabrication of reinforcing steel.

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

C. Welding: Provide only ASTM A706 steel where welding is indicated. Perform welding by the direct electric arc process in accordance with AWS D1.4 and specified low-hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is not permitted. Do not tack weld bars. Clean metal surfaces to be welded of loose scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds deemed defective, using chisel, and replace with proper welding. Prequalification of welds shall be in accordance with CBC requirements.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Bars shall be bent cold. Bars partially embedded in concrete shall not be field bent except as indicated on reviewed Shop Drawings.

B. Before installation and just prior to placing concrete, clean reinforcing of loose scale, rust, oil, dirt and any coating that could reduce bond.

C. Accurately position, install, and secure reinforcing to prevent displacement during the placement of concrete.

D. Provide metal chairs to hold reinforcement the required distance above form bottoms. In beams and slab construction, provide chairs under top slab reinforcement as well as under bottom reinforcement. Space chairs so that reinforcement will not be displaced during installation. Provide metal spacers to secure proper spacing. Stirrups shall be accurately and securely wired to bars at both top and bottom. At slabs, footings, and beams in contact with earth, provide concrete blocks to support reinforcement at required distance above grade.

E. Install and secure reinforcement to maintain required clearance between parallel bars and between bars and forms. Lapped splices shall be installed wherever possible in a manner to provide required clearance between sets of bars. Stagger lapped splices. Dowels and bars extending through construction joints shall be secured in position against displacement before concrete is installed and subsequently cleaned of concrete encrustations while they are still soft.

F. Do not install reinforcing in supported slabs and beams until walls and columns have been installed to underside of slabs and beams or until construction joints have been thoroughly cleaned. Reinforcing shall be inspected before placement of concrete and cleaned as required.

G. Use deformed bars unless otherwise indicated, except for spiral reinforcement.

### 3.02 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

### 3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

# SECTION 03 3300

# CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Cast-in-place normal weight and lightweight concrete, placement and finishing.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 1000: Concrete Forming and Accessories.
3. Section 03 2000: Concrete Reinforcing.

### 1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 – Specifications for Structural Concrete.
3. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
4. ACI 305R - Specification for Hot Weather Concreting.
5. ACI 306.1 – Standard Specification for Cold Weather Concreting.
6. ACI 318 - Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1908A.

B. American Society for Testing and Materials (ASTM) Standards:

1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

5. ASTM C88 - Standard Test Method for Soundness of Aggregates by use of Sodium Sulphate or Magnesium Sulphate.

6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

8. ASTM C150 - Standard Specification for Portland Cement.

9. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

10. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.

11. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

12. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

13. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).

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

15. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

16. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

17. ASTM C567 - Standard Test Method for Determining Density of Structural Lightweight Concrete.

18. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

19. ASTM C845 - Standard Specification for Expansive Hydraulic Cement

20. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.

21. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

22. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.

23. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures

24. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).

25. ASTM D1751 - Standard Test Method for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

26. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

27. ASTM E1155 - Standard Test Method for Determining $F_F$ Floor Flatness and $F_L$ Floor Levelness Numbers.

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

29. ASTM E1745 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating locations of cast-in-place concrete Work and accessory items such as vapor barriers. Include details and locations of reinforcing, embedded items, and interfacing with other Work.

B. Mix Design Data: Submit concrete mix designs as specified herein and in Article 2.02.

1. Submit name, address and telephone number of the concrete production facility which the contractor intends to engage to design the concrete mixes. Submit name and qualifications of the proposed concrete technologist.

2. Mix Design: Submit a concrete mix design for each strength and type of concrete indicated in the drawings or specified. Include water/cement ratio, source, size and amount of coarse aggregate and admixtures. Predict minimum compressive strength, maximum slump and air content percentage. Clearly indicate locations where each mix design will be used.

a. Water/cement ration for concrete slabs on grade shall be 0.50 maximum.

3. Test Reports: Submit copies of test reports showing that the proposed mixes produce concrete with the strengths and properties specified. Include tests for cement, aggregates and admixtures. Provide gradation analysis.

C. Material Samples: Submit Samples illustrating concrete finishes and hardeners, minimum 12-inch by 12-inch.

D. Certificates: Submit certification that each of the following conforms to the standards indicated:

1. Portland cement: ASTM C150.

2. Normal weight concrete aggregates: ASTM C33.

3. Lightweight concrete aggregates: ASTM C330.

4. Aggregates: Submit evidence that the aggregate is not reactive in the presence of cement alkalis. In the absence of evidence, aggregate shall be tested per ASTM C289. If results of test are other than innocuous, aggregates shall be tested per ASTM C1567 as reported per ACI 318 as modified by CBC, Section 1903A.3.

5. Curing materials: ASTM C171.

E. Admixtures: Submit product data for proposed concrete admixtures.

1.04 QUALITY ASSURANCE

A. Continuous inspection shall be provided at the batch plant and for transit-mixed concrete to run check sieve analysis of aggregate, check moisture content of fine aggregate, check design of mix, check cement being used with test reports, check loading of mixer trucks, and certify to quantities of materials placed in each mixer truck.

B. Inspection shall be performed by a representative of a testing laboratory selected by the OWNER. OWNER will pay for inspection costs. Notify the laboratory 24 hours in advance of time concrete is to be mixed. Notify the laboratory of postponement or cancellation of mixing within at least 24 hours of scheduling time.

C. CONTRACTOR shall assist the testing laboratory in obtaining and handling samples at the project site and at the source of materials.

D. Continuous batch plant inspection requirement may be waived in accordance with CBC Section 1704A.4.3. Waiver shall be in writing, including DSA approval. When batch plant inspection is waived by DSA, the following requirements shall be met:

1. Approved inspector of the testing laboratory shall check the first batching at the start of work and furnish mix proportions to the licensed weightmaster.

2. Licensed weightmaster shall positively identify materials as to quantity and certify to each load by a ticket.

3. Tickets shall be transmitted to the Inspector by a truck driver with load identified thereon. The Inspector will not accept the load without a load ticket identifying the mix and will keep a daily record of placements, identifying each truck, its load and time of receipt and approximate location of deposit in the structure and will transmit a copy of the daily record to DSA.

4. At the end of the project, the weightmaster shall furnish an affidavit to DSA certifying that all concrete furnished conforms in every particular to proportions established by mix designs.

E. Special Inspections and Tests shall be in accordance with CBC Chapter 17A, Reinforcement and Anchor testing per CBC Section 1916A and Specification Section 01 4523.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store cement and aggregate materials so as to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.

B. Packaged materials shall bear the manufacturers and brand name label, and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.

1.06 PROJECT CONDITIONS

A. Cold Weather Requirements: Batching, mixing, delivering and placing of concrete in cold weather shall comply with the applicable requirements of ACI 306.1.

B. Hot Weather Requirements: Batching, mixing, delivering and placing of concrete in hot weather shall comply with the applicable requirements of ACI 305R.

C. Concrete temperature of freshly mixed concrete shall be determined per ASTM C1064.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: ASTM C150. Portland Cement.

B. Aggregates: Conform to the following standards:

1. Normal weight concrete: ASTM C33.

2. Lightweight concrete: ASTM C330, with fine aggregates per ASTM C33.

3. Aggregate shall be tested for Potential Alkali Reactivity of Cement-Aggregate Combinations per ASTM C289.

4. Nominal maximum size of coarse aggregate shall be no larger than:

a. 1/5 the narrowest dimension between sides of forms, nor

b. 1/3 the depth of slabs, nor

c. 3/4 the clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, or ducts.

d. CONTRACTOR may request the ARCHITECT and DSA waiver of the above limitations reported per ACI 318 as modified per CBC Section 1903A.3, provided that the workability and methods of consolidation are such that the concrete can be placed without honeycombs or voids.

C. Water: Water for concrete mixes, curing and cleaning shall be potable and free from deleterious matter.

D. Admixtures: Shall be shown capable of maintaining essentially the same composition and performance throughout the work as the product used in establishing concrete proportions in accordance with ACI 318, Section 3.6.

1. Admixtures containing chlorides or sulfides are not permitted.

2. Air-entraining admixtures shall comply with ASTM C260. Air-entrained admixtures shall not be used for floor slabs to receive steel trowel finish.

3. Admixtures for water reduction and setting time modification shall conform to ASTM C494.

4. Admixtures for producing flowing concrete shall conform to ASTM C1017.

5. Fly ash, pozzolan and ground granulated blast-furnace slag: Modify ACI 318 Sections 3.6.6 and 3.6.7 as follows:

   a. Fly ash or other pozzolan used as a partial substitution for ASTM C150 Portland cement shall meet the following requirements:

      1) Shall conform to ASTM C618 for Class N or F materials (Class C is not permitted).

      2) 15-25 percent by weight of fly ash or other pozzolans shall substitute for ASTM C150 Portland cement provided the mix design is proportioned per ACI 318, Section 318 5.3,and the durability requirements of CBC Section 1904A are met.

6. Admixtures containing ASTM C845 expansive cements shall be compatible with the cement and produce no deleterious effects.

7. Silica fumes used as an admixture shall conform to ASTM C1240.

E. Reinforcement Fibers: Chop strands of alkali-resistant polypropylene or nylon fibers added to the concrete mix for protection against shrinkage cracks.

F. Expansion Joint Fillers: Preformed strips, non-extruding and resilient bituminous type, of thickness indicated, conforming to ASTM D1751.

G. Curing Paper: Shall conform to ASTM C171 and consist of two sheets of kraft paper cemented together with a bituminous material in which are embedded cords or strands of fiber running in both directions. The paper shall be light in color, shall be free of visible defects, with uniform appearance.

H. Floor Hardener: Water soluble, inorganic, silicate-based curing, hardening, sealing and dustproofing compound. Aquaseal W20 by Monopole Inc., Kure-N-Harden by BASF, Chem Hard by L&M, Liqui-Hard by W. R. Meadows, or equal.

I. Underlayment: Two component latex underlayment for filling low spots in concrete for both interior and exterior applications, from featheredge to a maximum of 3/8 inch in thickness. Underlayment shall be non-shrink and suitable for repairing exposed concrete

surfaces and for underlayment of carpet, resilient, tile and quarry floor coverings. La-O-Tex by TexRite, Underlay C, RS by Mer-Krete Systems, Underlayment 962 by C-Cure, or equal.

J. Vapor Barrier: Refer to Section 07 2600, Vapor Barriers.

K. Stair Treads and Nosings: Two part stair tread and nosing with ribbed abrasive bars. Fabricated from 6063-T5 or 6063-T6 extruded aluminum, mill finish. Anti-slip abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Color shall extend uniformly throughout filler.

1. American Safety Tread: TP-311R.
2. Balco Inc.: DST-330.
3. Nystrom: STTB-P3.375E.
4. Wooster Products Inc.: WP-RN3SG.
5. Equal.

L. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 7 days; of consistency suitable for application and a 30 minute working time.

## 2.02 CONCRETE MIX

A. Mix shall be signed and sealed by a Civil or Structural Engineer currently registered in the State of California.

B. Strength of Concrete: Strengths and types of concretes shall be as indicated in the Drawings. Unless otherwise indicated or specified, concrete shall be provided with minimum 28-day strength of 3000 psi (f'c).

C. The required strength and durability of concrete shall be determined by compliance with the proportioning, testing, mixing and placing provisions of CBC Sections 1905A.1 through 1905A.13. Concrete mix shall meet the durability requirements of ACI 318, Chapter 4.

D. Concrete proportioning shall be determined on the basis of field experience and/or trial mixtures shall in accordance with ACI 318, Section 5.3. Proportions of materials shall provide workability and consistency to permit concrete to be placed readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.

E. Ready-Mixed Concrete: Mix and deliver in accordance with requirements of ASTM C94.

PART 3 - EXECUTION

3.01 GENERAL

A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.

B. Time of Placing: Do not place concrete until reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, and other embedded materials are securely fastened in place. Contact the Inspector at least 24 hours before placing concrete; do not place concrete until inspected by the Project Inspector.

C. Pouring Record: A record shall be kept on the Project site of time and date of placing concrete in each portion of structure. Such record shall be maintained on the Project site until Substantial Completion and shall be available for examination by the ARCHITECT and DSA.

3.02 TOLERANCES

A. Concrete construction tolerances shall be as specified in ACI 117 and as modified herein.

B. Floor Flatness ($F_F$) and Floor Levelness ($F_L$) shall be as indicated below:

| | Specified Overall Value | | Minimum Local Value | |
|---|---|---|---|---|
| | $F_F$ | $F_L$ | $F_F$ | $F_L$ |
| Slabs on ground: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring. | 20 | 15 | 15 | 10 |
| Slab on ground: carpet. | 25 | 20 | 17 | 15 |
| Slab on ground: thinset tile and resilient flooring. | 35 | 25 | 24 | 17 |
| Suspended slabs: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring. | 20 | 15 | N/A | N/A |
| Suspended slabs: carpet. | 25 | 20 | N/A | N/A |
| Suspended slabs: thinset tile and resilient flooring. | 35 | 20 | N/A | N/A |

C. Refer to ACI 302.1R, Tables 8.1 and 8.2 Slab on Ground and Suspended Flatness/Levelness Construction Guide, for recommended concrete placing and finishing methods.

D. Floor Flatness and Floor Levelness shall be tested in accordance to ASTM E1155. Floor measurements shall be made within 48 hours after slab installation, and shall precede removal of shores and forms.

3.03 PREPARATION

A. For installation of vapor barrier refer to Section 07 2600, Vapor Barriers.

B. Reglets and Rebates:

1. Form reglets and rebates in concrete to receive flashing, frames and other equipment as detailed and required. Coordinate dimensions and locations required with other related Work.

2. If concrete slabs on grade adjoin a wall or other perpendicular concrete surface, form a reglet in wall to receive and carry horizontal concrete Work. Reglet shall be full thickness of the slab and shall be 3/4 inch wide, unless otherwise indicated. Requirement does not apply to exterior walks, unless specifically indicated.

C. Screeds: Install screeds accurately and maintain at required grade or slab elevations after steel reinforcement has been installed, but before starting to place concrete. Install screeds adjacent to walls and in parallel rows not to exceed 8 feet on centers.

3.04 INSTALLATION

A. Conveying and Placing:

1. Concrete shall be placed only under direct observation of the Project Inspector. Do not place concrete outside of regular working hours, unless the Inspector has been notified at least 48 hours in advance.

2. Concrete shall be conveyed from mixer to location of final placement by methods that will prevent separation or loss of materials.

3. Concrete shall be placed as nearly as practicable to its final position to avoid segregation due to re-handling or flowing. No concrete that has partially hydrated or has been contaminated by foreign materials shall be placed, nor shall re-tempered concrete or concrete which has been remixed after initial set be placed.

4. In placing concrete in columns, walls or thin sections, provide openings in forms, elephant trunks, tremies or other recognized devices, to prevent segregation and accumulation of partially hydrated concrete on forms or metal reinforcement above level of concrete being placed. Such devices shall be installed so that concrete will be dropped vertically. Unconfined vertical drop of concrete from end of such devices to final placement surface shall not exceed 6 feet.

5. Concrete shall be placed as a continuous operation until placing of panel or section is completed. Top surfaces of vertically formed lifts shall be level.

6. Concrete shall be thoroughly consolidated by suitable means during placement, and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.

7. Where conditions make consolidation difficult or where reinforcement is congested, batches of mortar containing same proportions of cement, sand, and water as provided in the concrete, shall first be deposited in the forms to a depth of at least one inch.

B. Cold Weather:

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. All ground with which concrete is to come in contact shall be free from frost. No frozen materials or materials containing ice shall be used.

2. The temperature of concrete at the time of placement shall not be below the minimum temperatures given in Table 3.1 of ACI 306.1.

3. Concrete shall be maintained at a temperature of at least 50° F. for not less than 72 hours after placing or until it has thoroughly hardened. Cover concrete and provide sufficient heat as required. When necessary, aggregates shall be heated before mixing. Special precautions shall be taken for protection of transit-mixed concrete.

C. Hot Weather:

1. Concrete to be placed during hot weather shall comply with the requirements of ACI 318, Section 5.13.

2. Maintain concrete temperatures indicated in Table 2.1.5 of ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square feet of exposed concrete per hour.

3. Cool concrete using methods indicated in ACI 305R Appendix B.

4. Place and cure concrete as specified in ACI 305R Chapter 4.

D. Compaction and Screeding:

1. Tamp freshly placed concrete with a heavy tamper until at least 3/8 inch of mortar is brought to surface. Concrete shall then be tamped with a light tamper and screeded with a heavy straightedge until depressions and irregularities are eliminated, and surface is true to finish grades or elevations. Remove excess water and debris.

2. Where slabs are to receive separate cement finish or mortar setting bed, continued tamping to raise mortar to surface is not performed. Laitance shall be removed by brushing with a stiff brush or by light sandblasting to expose clean top surface of coarse aggregate.

E. Floating and Troweling:

1. When concrete has hydrated sufficiently, it shall be floated to a compact and smooth surface. After floating, wait until concrete has reached proper consistency before troweling. Top surfaces shall receive at least 2 troweling operations with steel hand trowel. Prior to and during final troweling, apply a fine mist of water frequently with an atomizing type fog sprayer. Omit troweling for slabs to receive a separate cement finish.

2. For interior finish slabs, final troweling shall provide a hard, impervious, and non-slip surfaces, free from defects and blemishes. Finished surface shall be within tolerances indicated in Article 3.02. Avoid burnishing. Do not add cement or sand to absorb excess moisture.

   a. Floor of Walk-In Refrigerator: Finish as specified above, to a smooth finish.

   b. Floor of Gymnasium Locker Rooms: After floating, and while the surface is still plastic, provide a fine textured finish by drawing a fine fiber bristle broom uniformly over the surface in one direction only. Floors sloped for drainage should be brushed in the direction of flow.

3. Exterior Paving and Cement Walks: Finish as specified above, except surface shall be given a non-slip broom finish to match Sample reviewed by the ARCHITECT.

4. Vertical concrete surfaces shall be finished smooth and free from marks or other surface defects.

F. Curing:

1. Length of time, temperature and moisture conditions for curing concrete shall be in accordance with ACI 318, Section 5.11.

2. Forms containing concrete, top of concrete between forms, and exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for at least 7 consecutive days after placing.

3. If weather is hot or surface has dried out, spray surface of concrete slabs and paving with fine mist of water, starting not later than 2 hours after final troweling and continuing until sunset. Surface of finish shall be kept continuously wet until curing medium has been installed.

4. Immediately after finishing, monolithic floor slabs shall be covered with curing paper. Paper shall be lapped 4 inches at joints and sealed with waterproof sealer. Edges shall be cemented to finish. Repair or replace paper damaged during construction operations.

G. Filling, Leveling and Patching:

1. Concrete slabs exhibiting high or low spots and indicated to receive resilient floor covering or soft floor covering, shall have surfaces repaired. High spots shall be honed, or ground with power-driven machines to required tolerances. Low spots

shall be filled with latex underlayment, installed in strict accordance with manufacturer's written recommendations.

2. Holes resulting from form ties or sleeve nuts shall be solidly packed, through exterior walls, by pressure grouting with cement grout, as specified. Grouted holes on exposed surfaces shall be screeded flush and finished to match adjoining surfaces.

H. Cement Base: Cement base shall be of the height, thickness, and shape detailed. Base shall be reinforced with one inch mesh, 18 gage, zinc-coated wire fabric. Base finish mixture shall be one part Portland cement, 2 parts of fine aggregate and one part pea gravel. Colored cement base shall include a chemically inert mineral oxide pigment in the mix.

3.05 FINISHING

A. Soda and Acid Wash: Concrete surfaces to receive plaster, paint or other finish, and which have been formed by oil coated forms, shall be scrubbed with a solution of 1-1/2 pounds of caustic soda to one gallon of water. Surfaces where smooth wood or waste molds have been furnished shall be scrubbed with a solution of 20 percent muriatic acid. Wash with clean water after scrubbing.

B. Sacking: Exposed concrete curbs, walls, and other surfaces shall be sacked by an application of Portland cement grout, floated, and rubbed. Sacking shall not be performed until patching and filling of holes has been completed. Entire sacking operation for any continuous area shall be started and completed within the same day.

1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having consistency of thick paint. Wet surface of concrete sufficiently to prevent absorption of water from grout. Apply grout uniformly with a brush or spray gun, then immediately float surface with a cork or other suitable float, scouring wall vigorously.

2. While grout is still plastic, finish surface with a sponge-rubber float, removing excess grout. Allow surface to dry thoroughly, then rub vigorously with dry burlap to completely remove dried grout. No visible film or grout shall remain after rubbing with burlap.

C. Sandblasting: Exterior concrete surfaces to receive stucco dash coat finish, where plywood or other smooth forms have been furnished, shall be uniformly sand-blasted with sharp quartz sand under sufficient air pressure to remove dirt, form oil and other foreign materials, and roughen surface to provide a proper bond. Such surfaces shall be thoroughly washed with clean water after sandblasting.

D. Abrasive: Concrete stair treads, landings, ramps and steps on interior and exterior of buildings, and interior exposed concrete floors in shop buildings shall receive an abrasive finish.

E. Floor Hardener: Exposed interior concrete floors throughout shall be treated with floor hardener.

1. Protect adjacent surfaces. Clean surfaces to receive treatment in accordance with manufacturer's instructions, ensuring that all stains, oil, grease, form release agents, laitance, dust and dirt are removed prior to application.

2. Apply hardener in accordance with manufacturer's instructions as soon as concrete is firm enough to work on after final troweling.

F. Cement Grout and Dry-Pack Concrete: Cement grout shall be mixed at the Project site and shall be composed of one volume of Portland cement and 2-1/2 volumes of fine aggregate. Materials shall be mixed dry with sufficient water added to make mixture flow under its own weight. When grout is used as a dry pack concrete, add sufficient water to provide a stiff mixture, which can be molded into a sphere.

G. Broom Finish: Exterior stair treads and landings shall be provided with a non-slip broom finish in addition to abrasive finish specified.

H. Abrasive Stair Nosing: Nosing shall be installed according to manufacturers written recommendations.

## 3.06 EXPANSION AND CONSTRUCTION JOINTS

A. Construction Joints: Details and proposed location of construction joints shall be as indicated on the Drawings, located to least impair strength of structure, in accordance with the following:

1. Thoroughly clean contact surface by sand blasting entire surface not earlier than 5 days after initial placement.

2. A mix containing same proportion of sand and cement provided in concrete plus a maximum of 50 percent of coarse aggregate shall be placed to a depth of at least one inch on horizontal joints. Vertical joints shall be wetted and coated with a neat cement grout immediately before placing of new concrete.

3. Should contact surface become coated with earth, sawdust, or deleterious material of any kind after being cleaned, entire surface shall be re-cleaned before applying mix.

B. Expansion Joints: Provide expansion joints where indicated in walks and exterior slabs. Space approximately 20 feet apart, unless otherwise indicated. Joints shall extend entirely through slab with joint filler in one piece for width of walk or slab. Joint filler shall be 3/8 inch thick, unless otherwise indicated.

C. Tooled Joints: Slabs, walks and paving shall be marked into areas as indicated with markings made with a V-grooving tool. Marks shall be round-edged, free from burrs or obstructions, with clean cut angles and shall be straight and true. Walks, if not indicated, shall be marked off into rectangles of not more than 12 square feet and shall have a center marking where more than 5 feet wide.

## 3.07 TESTING

A. Molded Cylinder Tests:

1. Inspector or testing lab personnel will prepare cylinders and perform slump tests. Samples for concrete strength shall be taken in accordance to ASTM C172. Each cylinder shall be dated, given a number, point in structure from which sample was obtained, mix design number, mix design strength and result of accompanying slump test noted.

2. Separate tests of molded concrete cylinders obtained at same place and time shall be made at age of three days, seven days, and 28 days. A strength test shall be the average of the compressive strength of two cylinders, obtained from the same sample of concrete and tested at 28 days or at test age designated for determination of f'c.

3. Test cylinders shall be prepared at the Project site and stored in testing laboratory in accordance with ASTM C31, and tested in accordance with ASTM C39.

B. Core Test: At request of the ARCHITECT, cores of hardened concrete shall be cut from portions of hydrated structures for testing, in accordance with CBC and ASTM C42.

1. Provide 4 inch diameter cores at representative places throughout the structure as designated by the ARCHITECT.

2. In general, provide sufficient cores to represent concrete placed with at least one core for each 4,000 square feet of building area, and at least 3 cores total for each Project.

3. Where cores have been removed, fill voids with drypack, and patch the finish to match the adjacent existing surfaces.

C. Concrete Consistency: Measure consistency according to ASTM C143. Test twice each day or partial day's run of the mixer.

D. Adjustment of Mix: If the strength of any grade of concrete for any portion of Work, as indicated by molded test cylinders, falls below minimum 28 days compressive strength specified or indicated, adjust mix design for remaining portion of construction so that resulting concrete meets minimum strength requirements.

E. Air Content Testing: Measure in accordance to ASTM C173 or ASTM C231, for each composite sample taken in accordance to ASTM C172.

F. Defective Concrete:

1. Should strength of any grade of concrete, for any portion of Work indicated by tests of molded cylinders and core tests, fall below minimum 28 days strength specified or indicated, concrete will be deemed defective Work and shall be replaced or adequately strengthened in a manner acceptable to the ARCHITECT and DSA.

2. Concrete Work that is not formed as indicated, is not true within 1/250 of span, not true to intended alignment, not plumb or level where so intended, not true to intended grades and levels, contains sawdust shavings, wood or embedded debris, or does not fully conform to Contract provisions, shall be deemed to be defective Work and shall be removed and replaced.

G. Concrete for Equipment Pads, Mechanical and Electrical Work: Unless otherwise indicated, strength shall have a minimum $f'c$ = 3,000 psi. Exposed concrete shall be provided with a hand trowel finish with radius corners and edges. Form and place concrete where necessary as described in Section 03 1000 Concrete Forming and Accessories, and reinforced as described in Section 03 2000 Concrete Reinforcing. Calcium chloride shall not be furnished in any concrete mix provided for the installation of underground electrical conduits. For concrete encasement of more than one conduit, furnish 3/4 inch maximum aggregate.

3.08 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.09 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

# SECTION 05 5000

# METAL FABRICATIONS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes: Metal fabrications:

1. Steel pipe.
2. Square and rectangular steel tubing.
3. Pipe columns.
4. Steel stairs.
5. Handrails and guardrails.
6. Steel thresholds.
7. Steel ladders.
8. Steel Gates.
9. Gratings, frames and covers.
10. Miscellaneous fabrications, as indicated on the Drawings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4523: Testing and Inspection.
3. Section 05 1200: Structural Steel Framing.
4. Section 08 7100: Door Hardware.

### 1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating provided materials, dimensions, anchoring detail, and details of termination or connection to adjacent construction. Indicate items that are purchased from a manufacturer and items that are shop fabricated. Indicate component parts requiring Project site fabrication or assembly.

B. Product Data: Submit Product Data for manufactured items. Submit Product Data for primers and finishes.

C. Material Samples: Submit Samples of primers and finishes on fabricated items.

D. Installation Instructions: Submit installation instructions for manufactured items.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Design, fabricate, and install miscellaneous metals in accordance with AISC - Design, Fabrication, and Erection of Structural Steel for Buildings.

2. AWS D-1.1 Code - Welding in Building Construction.

3. Inspection of Welding: Refer to Section 01 4523: Testing and Inspection.

4. Welding: Refer to Section 01 4523 Testing and Inspection.

5. CFC CHAP 35 - WELDING HOTWORK PROVISIONS.

B. Coordinate installation of accessory items required for metal fabrications.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store miscellaneous metal items above grade on platforms, skids, or other required supports.

B. Protect from corrosion or damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel Shapes: ASTM A36.

B. Steel Pipe:

1. Steel pipe for pipe columns and other structural purposes shall conform to ASTM A53, Type E or S, Grade B, as required.

2. Steel pipe other than pipe furnished for structural purposes shall conform to ASTM A53.

C. Square and Rectangular Steel Tubing:

1. Steel tubing for structural purposes shall be carbon steel conforming to ASTM A500 or ASTM A36.

2. Steel tubing other than tubing furnished for structural purposes shall be hot or cold rolled carbon steel electric welded tubing.

D. Cast Steel: ASTM A27, Grade 65-35.

E. Steel Bolts: ASTM A307, Grade A, with bolt head and nut dimensions conforming to ANSI B 18.2.1.

F. Rolled Steel Plates and Shapes:

1. Shapes and plates shall conform to ASTM A36, except for plates to be bent or cold-formed.

2. Plates to be bent or cold-formed shall conform to ASTM A283, Grade C.

G. Chain: Chain shall be 4/0 double loop pattern coil chain.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications"Rapid set Cement".

2.02 FABRICATION

A. General:

1. For fabrication of Work exposed to view, provide only materials smooth and free of blemishes. Remove blemishes by grinding or by welding and grinding, before cleaning, treating, and installation of surface finishes including zinc coatings.

2. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated or specified.

B. Steel Pan Type Stairs:

1. Provide stringers, risers, sub-treads and platforms to profiles indicated. Form each tread pan and riser in one continuous piece to receive finished tread. Weld or bolt risers and treads to carrier angles. Weld or rivet carrier angles to structural steel stringers. Fasten countersunk bolts, or stud weld clips, through pans and platforms to facilitate fastening of welded wire fabric for concrete fill. Provide welded-on clips for support of soffits. Close ends of channel or box stringers.

2. At intermediate landings, provide metal bases formed of stringers. Miter and weld internal and external corners of metal bases.

3. Provide uprights and posts of rectangular or round tubing as indicated. Provide members a special shop straightening to eliminate distortion and to provide straight alignment. Correct bends, distortions, and damage. Fill dents and grind smooth.

4. Provide railings of profile indicated, fastened to stair stringers and wall substrates as indicated or required.

5. Countersink rivets, bolt heads and screws on finished surfaces, or cut flush with surfaces.

6. Fit and securely fasten components together, with exposed tight-fitting joints. Cut, drill, punch and tap as required for installation.

7. Furnish joints as strong and rigid as adjoining sections. Weld continuously along entire line of contact, except where spot welding is indicated.

C. Stair and Balcony Railings:

1. Railings: Handrails and standards shall be fabricated of Grade B standard weight steel pipe or indicated on Drawings. After fabrication, rails shall be galvanized. Standards shall be attached to stringers and face of balcony as detailed.

2. Panels:

   a. Mesh shall be 10 gage 1 ½-inch diamond mesh. The wires shall extend through the channel frame and shall be clinched.

   b. Frame members shall be 1 inch by 1/2 inch by 1/8 inch thick plate welded to top and end members. Corners shall be mortised and tenoned and continuously welded together. Panels shall be galvanized. Fasten panels to rails and standards as indicated.

3. Handrail Brackets: Type indicated.

D. Folding Steel Gates: Furnish and install folding steel gates, complete, where indicated. Gates shall be provided with hinged bottom track and shall allow for padlocking in both open and closed positions. Manufactured by Acorn Wire and Iron Works, American Woven Wire Corporation, King Wire Partitions, Inc., or equal.

1. Vertical bars shall consist of pairs of steel channels 3/4 inch by 3/8 inch by 1/8 inch minimum, approximately 6 inches on center with 5/8 inch by 3/16"inch steel lattice bars.

2. Gate leaves extending more than 8 feet shall be provided with over head tracks and hangers. Gates shall have casters unless over-head tracks are furnished and shall be hot dip galvanized or powder coat finish.

E. Ladder Extensions: Where vertical ladders are installed for access to roof hatches, provide the following:

1. Roof hatch ladders shall be provided with ladder extensions. Ladder extensions shall be Bilco Model 1, "LadderUP Safety Post," Maxam Metal Products, "Spring Balance Safety Post", or equal, on fixed ladders below roof hatches. Device shall be manufactured of high strength steel with telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by a stainless steel spring balancing mechanism. Finish shall hot dip galvanized. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.

F. Miscellaneous Framing and Supports:

1. Except as otherwise indicated, space anchors 2 feet on center, and provide minimum anchor units of 1 ¼-inch by ¼ inch by 8-inch steel straps.

2. Shelf angles for exterior construction shall be galvanized steel of sizes indicated.

G. Welding:

1. Weld connections unless otherwise indicated.

2. Weld corners and seams continuously and in accordance with requirements of AWS Code. Welds shall be inspected as required in Section 05 1200: Structural Steel Framing.

3. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

H. Galvanizing:

1. ASTM A123, ASTM A153, or ASTM A386, as applicable, hot dip with 2.0 ounces per square foot on actual surface and 1.8 ounces per square foot minimum on any specimen, and as specified herein.

2. Galvanizing Repair Material: DRYGALV as manufactured by the American Solder and Flux Company, Galvalloy, Galvion, or equal. Hot applied repair material, or anodic zinc- rich galvanizing repair paint conforming to Mil Spec DOD-P-21035.

3. Items to be galvanized shall be hot-dip galvanized in sections as large as possible.

I. Shop Finish:

1. Metal fabrications shall be provided with a coat of primer, except those indicated to be completed with exposed galvanized finish.

2. Primers:

a. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

b. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

c. Minimum dry film thickness of primer shall be 2.0 mils.

3. Preparation for Primer Painting: Miscellaneous ferrous metal, except items specified galvanized, shall be thoroughly cleaned and prepared for painting, including removal of shipping oils or protective coatings, mill scale, grease, dirt and rust. Prepare in accordance with SSPC recommendations. Deliver to Project site primed or galvanized as indicated, and ready to receive Project site applied finishes.

4. Galvanized Metal Work to receive Paint: Clean oil, grease and other foreign materials from surfaces. Apply vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Handrails and Guardrails:

1. Install standards into metal sleeves cast in concrete, and extending into it at least 9 inches. Wedge standards true, plumb, and fastened by packing with grout. Finish grout smooth and flush with adjacent surfaces.

2. Rails contacting a vertical surface shall be fitted with standard pipe rail flanges, secured to concrete or masonry surfaces with 3/8 inch 2-unit cinch anchor bolts and secured to wood frame surfaces with 3/8 inch lag screws, unless otherwise indicated.

3. Railings abutting pipe columns shall be provided with shaped end caps to fit columns welded to rails, and secured to columns with self-tapping machine screws.

B. Steel Thresholds: Fabricate channel or angle thresholds of rolled steel sections of size indicated, galvanized after fabrication. Anchor into concrete with countersunk 2-unit cinch anchor bolts, unless otherwise indicated.

C. Steel Ladders: Provide at locations indicated, fabricated as detailed. Ladders shall be anchored to concrete or masonry with 1/2 inch cinch anchor bolts. Ladders secured to a wood framed wall shall be anchored with 1/2 inch lag screws. Provide provisions for anchoring ladders before lath is applied to plastered walls.

D. Gratings, Frames and Covers:

1. Over areas indicated, provide steel gratings and grating frames as detailed. Frames shall have mitered and welded corners, and be fitted with anchors.

2. Provide steel checkered plate covers and steel frames for sumps, grease traps, and sand traps, and other covers for access where indicated. Frames shall be provided with mitered and welded corners and be fitted with anchors as detailed. Cover shall be perforated. Each section of access cover shall be furnished with steel pull rings and tool operated fastening device. Screws to fasten covers shall be brass.

3.02 ADJUSTING

A. Touch Up Damaged Surfaces:

1. Shop Painted Finishes: Comply with SSPC-PA-1 for touch-up; apply with brush to produce a minimum 2.0 mil dry film thickness.

2 Galvanized Surfaces: Clean field welds, connections and damaged areas. Repair galvanized finishes in accord with ASTM A780.

3.03 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

# SECTION 06 2000

# FINISH CARPENTRY

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Finish carpentry.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 1000: Rough Carpentry.
3. Section 06 4000: Architectural Woodwork.
4. Section 08 1416: Flush Wood Doors.
5. Section 08 7100: Door Hardware.
6. Section 08 8000: Glazing.
7. Section 09 2900: Gypsum Board.

### 1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings of each item of finish carpentry and millwork, indicating materials, dimensions, construction, and anchorage details.

### 1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Douglas fir finish lumber shall be manufactured and graded in accordance with WCLIB - Standard Grading and Dressing Rule No. 17.
2. Redwood finish lumber shall be manufactured and graded in accordance with RIS - Standard Specifications for Grades of California Redwood Lumber.
3. Hardwood finish lumber shall be manufactured and graded in accordance with NHLA - Rules for the Measurement and Inspection of Hardwood and Cypress Lumber.

4. Softwood Plywood: Plywood shall comply with APA - Product Standard PS 1. Plywood shall be grade marked by APA.

5. Products and installation shall comply with the North American Architectural Woodwork Standards (NAAWS) for the Grade or Grades specified.

B. Finish lumber shall be kiln-dried according to recognized methods for the thickness and species. Lumber one inch thick or less shall be dried to an average moisture content of not more than 13 percent. Lumber 1-1/4 inches to 2 inches in thickness shall be dried to an average moisture content of not more than 15 percent.

1.04 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.

B. Interior millwork and finish carpentry shall not be installed unless interior building temperature and humidity levels are within the ranges recommended by the manufacturer and/or recognized standards.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Douglas Fir: Interior trim, solid lumber shelves, partitions, door frames and other concealed members of interior finish; NAAWS Economy Grade.

B. Hardwood: Birch, maple firsts and seconds.

1. Birch: NAAWS Custom Grade.

2. Maple: NAAWS Custom Grade.

C. Softwood Plywood: Except where otherwise specified, AWI Custom Grade, Douglas fir unless otherwise indicated.

D. Hardwood Plywood: NAAWS Premium Grade, species as indicated.

E. Redwood: Exterior millwork, except framing lumber, shall be clear heartwood redwood. Where installed in direct contact with earth or provided for exterior storage units, install Foundation Grade.

F. Perforated Hardboard Panels: Panels shall be 1/4 inch thick tempered hardboard, SIS with 1/4 inch diameter holes spaced one inch on center.

2.02 FABRICATION

A. The means of fastening various parts together shall be concealed in finished Work. Work which is curved shall be fabricated from solid stock, or if veneered, shall be bent to a uniform radius.

## PART 3 - EXECUTION

### 3.01 GENERAL

A. Interior and exterior wood, millwork, blocking, and lumber shall be installed level, plumb, and true to line. Members shall be neatly and accurately scribed in place, maintaining full widths of end members, wherever possible. Trim shall be installed in full lengths, without piecing, except where use of single lengths is not required. Butt joints, if necessary, shall be beveled. Exterior angles shall be mitered, and interior angles of molding parts coped. Nails shall be set for putty. Grain and color of adjoining interior finish shall match adjacent finishes. Where Work specified in this section adjoins other Work, provide a neat tight joint.

B. Interior and exterior finish carpentry and other fixed wooden equipment having hammer marks or other visible damage will be deemed defective Work.

C. Staff or brick moulds of exterior wood doorframes shall be attached to frames after frames have been set and caulked. Moulds shall be mitered at corners and coped to sills, accurately secured in place with finish nails, and nails set.

### 3.02 INSTALLATION

A. Install Work of this section as specified in the North American Architectural Woodwork Standards.

B. Wood shoe base shall be fitted and temporarily tacked in place until floor covering is installed. Provide and install corner fillets, same contour and materials as shoe base, in corners where shoe base is installed.

C. Platform Front: Plywood at platform front and adjoining steps in Multi-Purpose Building shall be provided with face veneers of unselect birch. Trim and frames shall match face veneer of panels. Joints shall be V-shaped where indicated.

D. Door Frames: Frames shall be installed plumb and true, solidly blocked, reinforced for butts and hardware, and shall be fastened to structural frame with 16d set finish nails at not more than 24 inches on centers. Nails securing exterior door and window frames shall be cement coated. Doorframes shall be dadoed together at the head.

E. Sealing of Joints: Joints between exterior frames and adjoining surfaces shall be primed before sealing.

### 3.03 CLEAN UP

A. Remove debris, rubbish and waste material and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

# SECTION 06 4000

# ARCHITECTURAL WOODWORK

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Architectural woodwork, casework, trim, hardware, countertops, and shelving as indicated on Drawings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 1000: Rough Carpentry.
3. Section 06 2000: Finish Carpentry.
4. Section 08 8000: Glazing.
5. Section 09 9000: Painting and Coating.
6. Section 10 1100: Visual Display Units.
7. Section 22 1000: Plumbing.

### 1.02 DEFINITIONS

A. "Sustainably managed" is defined as "forests that are being managed through a professionally administered forestry management plan in which timber growth equals or exceeds harvesting rates in both quantity and quality, protecting rivers and streams from degradation, minimizing damage to the forest when harvesting and promoting biodiversity".

### 1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide wood products from certified sustainably harvested sources.

### 1.04 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings of casework indicating materials and hardware, details of construction, dimensions, methods of fastening and installation details. Shop Drawings shall bear a Woodwork Institute (WI) Certified Compliance Label indicating that Shop Drawings fully meet requirements of the North American Architectural Woodwork Standards (NAAWS) grade or grades specified. Shop Drawings shall indicate grounds,

backing, blocking, sleepers and other items required for installation of casework, which are to be provided and installed as part of the Work.

B. Certificates: Provide a WI Certified Compliance Certificate certifying that materials, fabrication and installation will comply with the specified requirements.

C. Material Samples: Submit 2-inch by 3-inch plastic laminate and solid surfaces color Samples of manufacturer's entire color range.

D. Submit manufacturer's product data for adhesives and finishes. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.

E. Forest Stewardship Council (FSC): Provide letter of certification signed by lumber supplier. Indicate compliance with FSC "Principles for Natural Forest Management" and identify certifying organization.

F. Closeout Submittals: Provide a WI Certified Compliance Certificate for Installation.

1.05 QUALITY ASSURANCE

A. Comply with the North American Architectural Woodwork Standards (NAAWS), latest edition, published jointly by the Architectural Woodwork Manufacturer's Association of Canada and the Woodwork Institute of California, grades as specified herein.

B. Each elevation of casework shall bear a WI Certified Compliance Label indicating that casework fully meets requirements of the AWS grade specified.

C. Each plastic laminate countertop and/or solid surface top shall bear a WI Certified Compliance Label indicating tops fully meet requirements of the AWS grade specified.

D. Mock-ups: When required by the Architect, submit a full-scale base cabinet, countertop, and wall-hung cabinet, illustrating joinery and plastic laminate finish. Base cabinet shall incorporate a drawer, an adjustable shelf, and a door. Wall-hung cabinet shall incorporate two doors, one adjustable shelf and finished end, including required hardware.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in humidity and temperature. Refer to the North American Architectural Woodwork Standards (NAAWS) for recommended care and storage.

B. In event of damage immediately furnish necessary repairs or replacements.

1.07 PROJECT CONDITIONS

A. Store indoors, in ventilated areas with constant but minimum temperature of 60 degrees F. and maximum relative humidity of 25 percent to 55 percent. Do not install casework until

building is enclosed and ambient conditions are within the temperature and humidity range to be expected during occupancy. Acclimatize materials to the installation temperature and humidity for at least 72 hours prior to installation. Maintain conditions until Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Plastic Laminate Faced Cabinets:

1. Plastic laminate: High pressure plastic laminate conforming to NEMA standard LD-3; Grade HGS 0.048 inches at horizontal surfaces, Grade VGS 0.028 inches at exposed vertical surfaces and edge bands, and HGP 0.039 inch minimum for post-formed countertops.

2. Particle Board Core Material: 45 lb. density, conforming to ANSI A208.1, Table 1, Grade 1-M-2.

3. Solid Lumber:

   a. Solid lumber for exposed members, drawers, trays and special details shall be Clear birch or maple.

   b. Unexposed solid lumber for concealed webs or structural members shall be of Douglas Fir., alder or birch.

4. Softwood Plywood: Rotary cut exterior type A-C grade softwood plywood complying with PS1.

5. Hardboard: Factory finished pressure sealed hardboard conforming to the requirements of PS 58. Oil tempered hardboard shall conform to CS 251.

6. Cabinet Liner: Semi-exposed surfaces shall be finished with 0.020 inch high-pressure laminate cabinet liner, conforming to NEMA Standard LD-3.

7. Edge Banding: One of the following.

   a. T-type extruded tenite-butyrate 1/16 inch minimum thickness, with serrated leg 3/8 inch in length. Use only when matching existing.

   b. 0.028 inch minimum thickness plastic laminate.

   c. PVC, 0.6 mm at cabinet sides, top, bottom divisions and shelves, 3 mm at doors, drawer fronts and false fronts.

8. Glass Doors: 1/4 inch laminated safety glass.

9. Adhesive: Type II water-resistant, rigid type glue of formula conforming to PS 51.

10. Sealer: Thompson Water Seal 101, Watco Oil, Zinsser, or equal.

11. The Owner will supply tote trays unless otherwise indicated.

12. Base: Cover toe spaces with typical wall base unless otherwise indicated.

B. Wood Casework:

1. Sheets:

a. Medium Density Fiberboard (MDF): ANSI A208.2.

b. Medium Density Overlay (MDO): APA PS-1.

c. Hardwood Plywood: ANSI/HPVA – HP–1.

2. Edge Banding: Same species of wood as adjacent to exposed surfaces.

C. Countertops:

1. Solid Surfaces: Filled cast polymeric resin panel, with homogeneous composition throughout its thickness.

a. Corian.

b. Formica.

c. Wilsonart.

d. Equal.

D. Hardware:

1. Drawer Slides for Custom Grade Cabinetry:

a. Pencil drawers: Full extension type: Accuride 2006, Blum, Hafele, or equal.

b. Drawers and box drawers, up to 24 inches wide: Accuride 3832E, Blum, Hafele, or equal.

c. Lateral file drawers, up to 30 inches wide: Accuride 4034 overtravel or 4033 equal travel, Blum, Hafele, or equal.

d. Lateral file drawers, more than 30 inches wide: Accuride 3640, Blum, Hafele, or equal.

2. Drawer Slides for Premium Grade Cabinetry:

a. Pencil drawers: Full extension type: Accuride 2632, Blum, Hafele, or equal.

b. Drawers and box drawers, up to 24 inches wide: Accuride 7432, Blum, Hafele, or equal.

c. Lateral file drawers, up to 30 inches wide: Accuride 4034 overetravel or 4033 equal travel, Blum, Hafele, or equal.

d. Lateral file drawers, more than 30 inches wide: Accuride 3641, Blum, Hafele, or equal.

3. Flipper Door Slides for Premium and Custom Grade Cabinetry:

a. For vertically mounted retracting cabinet doors up to 75 pounds and 72 inches tall: Accuride 1432, Blum, Hafele, or equal, with hinge carrier strip.

4. Door Mutes: Rubber, approximately 1/4 inch diameter, colors to match adjacent finish.

5. Plastic Grommets: Doug Mockett, Alliance Express, Rockler, or equal; color as selected by Architect.

6. Adjustable Shelves with Clips: Adjustable shelf supports (EDP type, unless otherwise noted) set in 5 mm holes spaced 32 mm on center:

a. Hafele America, Co., No. 282.04.711, Blum, Hettich, or equal.

b. Hafele America, Co., No. 282.24.13, Blum, Hettich, or equal.

7. Hinges: Five-knuckle overlay hinge with hospital tip - Rockford 376, or equal.

8. Cabinet Locks:

a. Door Locks: Pin tumbler type – CompX National No. C8173, Olympus 100DR x 12-1 strike, CCL Security Products, or equal.

b. Locks for Sliding Doors: National No. C8142 x thimble strike, Olympus 300 SD x thimble strike, CCL Security Products, or equal.

c. Drawer Locks: CompX National C8179brass strike, Olympus 200 DW x 12-1 strike, CCL Security Products, or equal.

d. Cabinet locks shall be flush with surface of door and protrude no greater than 3/16 inch.

9. Top-hung Hardware Assembly for Sliding Doors: Grant No. 6064, Hafele, Blum, or equal.

10. Track for Sliding Doors: K & V 455 x or 455.55, Hafele, Blum, or equal.

11. Pull Flush Ring at Drawers behind Doors: Safe No. 6116, Trimco 24, Quality, or equal.

12. Pulls: Quality No. 179 x 180, Trimco No. 553P, Hafele, or equal.

13. Catches: Magnetic type - Epco No. 592, Lawrence No. SC1364-AL, or equal.

14. Four-way Tension Catch: Glynn-Johnson GJ21A, Trimco, Quality, or equal.

15. Noiseless Catch:

16. Elbow Catch: Schlage SP2A3, or equal.

17. Bolts: Surface type, Quality B6, Trimco No. 4856-6, or equal.

18. Brackets and Shelf Strip for Glass Shelves: K & V No. 80 x 180, Garcy 604 x 686, or equal.

19. Shelf Standards and Brackets: K & V No. 255 x 256, line bored holes for pins as approved by AWI Standards Stanley No. 798 x 799, steel zinc plated, or equal.

20. Card Holders for Drawers: Corbin No. 1913-1/4H, Garcy No. 853, or equal.

21. Hanger Rods: 1-1/16 inches minimum diameter metal tubing, aluminum or stainless steel clad, KV660; heavy wall steel tubing KV770, Stanley, or equal.

22. Hanger Rod Flanges: KV757, or flanges KV734, KV735; Ronther Reiss R44-55; or equal.

23. Hardware Finish: With exception of finish hardware items which have finishes specified, hardware shall be furnished with dull chrome US 26D or dull stainless steel US 32D finish.

24. Keying:

    a. Key locks inside one room alike. Furnish three keys for each lock keyed separately, and 2 keys for each lock in keyed alike groups. Master keys shall be tagged and delivered to the Inspector. Locks and keys shall be stamped with coded set number / direct digit.

    b. Master keys shall be National GM2.

## 2.02 FABRICATION

A. Plastic Laminated Casework: Construction of plastic laminated casework shall conform to the material and construction requirements for North American Architectural Woodwork Standards Custom grade, flush overlay construction, except, modified as follows:

1. Exposed Exterior surfaces shall be High Pressure Decorative Laminate grade VGS.

a. Edge Band: PVC 1 mm. for cabinet body and 3 mm. at doors and drawer fronts.

2. Exposed Interior surfaces: Interior surfaces of open cabinets shall be laminated to match exteriors. Cabinets with glass doors shall use cabinet liner grade CLS.

3. Semi-exposed Surfaces: Shall be cabinet liner grade CLS and edges of panels shall be edge banded per 2.01 A.

4. Cabinet bases may be integral or separate. Bases shall be 3/4 inch thick plywood securely jointed at four corners to a supporting block 1 ½-inch thick.

5. Adjustable shelving shall be 3/4 inch thickness particleboard for spans up to 25 inches and one inch thickness for spans over 25 inches up to 34 inches. Adjustable shelving over 34 inches in span shall be one inch thick plywood core with 0.020 inch cabinet liner grade CLS both sides. Shelving hardware shall be adjustable to 1 1/4 inch centers. Faces of shelving shall be finished with 0.020 inch thickness cabinet liner grade CLS both sides.

6. Drawers:

a. Drawers shall be of dovetail or dowel construction. Sides, backs and sub-fronts shall be made of 1/2 inch thick clear birch or maple solid stock, or 9 ply plywood without knots or interior voids. Drawer bottoms shall be in accordance with AWI requirements, glued and nailed.

b. Drawers shall be fitted with ball bearing slides accurately installed for smooth drawer operation.

c. Drawer fronts shall be of 3/4 inch thick plastic laminate construction, fully edge-banded with plastic laminate T-banding to be used when matching existing. T-banding joint shall occur at center of bottom edge of panel.

7. Doors:

a. Doors shall be of flush overlay type. Doors shall be fully edge-banded. Doors of cabinets within any group of adjacent units shall be in alignment.

b. Wrap around hinges shall be routed into edge of door.

8. Back Priming: Seal unfinished materials installed for backs, bases, self-edge backing, stripping and other concealed portions with a water-repellent sealer.

9. Banding:

a. Edge banding shall be accurately fitted. Where edge band joins plastic surfaces, there shall be no open spaces, voids, or chipping of plastic laminate surface.

b. Exposed cabinet surfaces shall be flush, and any protruding edges of banding shall be machined or trimmed to provide a flat smooth corner at intersection of banding and adjoining surfaces. Plastic laminate edge banding shall be installed on tops, webs, bottoms, ends, and inside partitions. T banding may only be installed on drawer fronts and door edges and when required to match existing.

C. Countertops:

10. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

a. Manufacturers:

1. Avonite Surfaces.

2. E. I. du Pont de Nemours and Company.

3. Formica Corporation.

4. Wilsonart International.

5. Equal.

b. Type: Provide Standard Type.

c. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.

d. Colors and Patterns: As selected by Architect from manufacturer's full range.

e. Butt splash or seamless (coved) backsplash.

f. Provide drip groove.

## 2.03 FINISHING

A. Wood casework and wood components of laminated plastic casework shall be factory finished. Exposed surfaces shall be finished with one coat of lacquer sealer and 2 coats of finish lacquer. Unexposed materials such as backs, webs, back of tops, and the like, shall be sealed with one oil base prime coat. Semi-exposed wood surfaces such as drawers shall be finished with one coat of sanding sealer and one coat of clear gloss lacquer.

# PART 3 - EXECUTION

## 3.01 INSTALLATION

A. Install Work of this section as specified in the North American Architectural Woodwork

Standards (NAAWS), grade to match the grade of the work to be installed.

B. Cabinets: Install cabinets level, plumb, and secure to walls. Exposed screws shall have finish washers.

C. End Panels and Fillers: Furnish to match exposed surfaces and accurately scribe to walls and neatly and securely fit to cabinets.

D. Completion: Upon completion of installation, cabinets including drawers and shelves shall be cleaned. Doors and drawers shall operate easily and freely.

E. Scribe plastic laminated cabinets to walls. Installation of surface-applied moldings is not permitted.

F. Coordinate sink and penetration locations with 22 1000 Plumbing.

G. Install solid surface countertops per NAAWS custom grade.

3.02 CLEAN UP

A. Remove debris, rubbish and waste material and legally dispose of off the Project site.

3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

# SECTION 07 1326

# SELF-ADHERING SHEET WATERPROOFING

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes: Sheet waterproofing in locations indicated including:

1. Sheet waterproofing on vertical walls below grade enclosing occupied spaces.
2. Sheet waterproofing in planters and retaining walls.
3. Drainage sheets and protection boards.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
4. Section 07 1400 - Fluid Applied Waterproofing.

### 1.02 SUBMITTALS

A. Certificates: Submit a certificate stating applicator is certified by the waterproofing material manufacturer and, upon completion, submit a certificate stating that waterproofing systems have been installed in conformance with reviewed submittals and manufacturer's recommendations.

B. Product Data: Submit manufacturer's Product Data including complete installation instructions.

C. Shop Drawings: Submit Shop Drawings indicating each condition of the Work. Indicate all adjoining Work, and indicate methods of adhesion and attachment, laps, and related conditions.

D. Samples: Submit Samples, not less than 12-inch square, of each type of composite sheet membrane, mounted on plywood. Submit 12-inch square Samples of each type of drainage and protection board.

E. Experience Record: Submit a list of at least five installations on which each of the materials and systems proposed for installation have been in satisfactory service for at least three years.

### 1.03 QUALITY ASSURANCE

A. References:

1. ASTM D6506 - Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing.

2. ASTM D6135 - Standard Practice for Application of Self-Adhering Modified Bituminous Waterproofing.

3. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

4. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

B. Qualifications of Manufacturer: Sheet membrane waterproofing system shall be manufactured by a firm with a minimum of 20 years experience in the production of self-adhesive sheet membrane waterproofing.

C. Qualifications of Installer: A firm which has at least three years experience in work of the type required by this section, and is recommended by manufacturer to install the specified products.

D. Pre-Installation Conference and Inspection: After review of submittals but before starting installation of the Work of this section, conduct a meeting at the Project site attended by the Project Inspector, Architect, OAR, Contractor waterproofing applicator and a technical representative of the waterproofing material manufacturer. The waterproofing applicator and material manufacturer's technical representative shall inspect the substrates to receive Work of this section and report defective conditions to Project Inspector, Architect, OAR and Contractor.

E. Manufacturer's Representative: Provide arrangements necessary to have a trained representative of the manufacturer visit the Project site on a weekly basis during membrane waterproofing Work to review installation procedures.

F. Materials shall comply with current State of California and local Air Quality Management District requirements for volatile organic compounds of not over 350 grams per liter.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened packages fully identified with manufacturer's name, trade name, type, class and grade. Each package shall be identified with material name, date of manufacturer and batch number.

B. Store materials at the Project site under cover and maintain in dry condition. Protect from damage from excessive temperature and construction operations. Do not double-stack pallets of membrane. Protect mastic and adhesive from moisture and excessive heat.

C. Store drainage composite or protection board flat and above grade. Provide cover on top and all sides of pallets and provide for adequate ventilation. Protect surface conditioner from freezing.

1.05 PROJECT CONDITIONS

A. Install suitable impervious type masking to preclude staining of surfaces to remain exposed wherever waterproofing abuts or laps on to other finish surfaces, and provide additional protection as necessary to supplement masking; cover entire area of building subject to damage or staining.

B. Protect adjacent Work during installation of Work of this Section.

C. Apply sheet waterproofing materials only in dry weather and when outside temperature is within the limits established by the manufacturer of the materials and products used.

D. Do not apply sheet waterproofing materials to damp or wet surfaces unless specifically approved in writing by manufacturer.

1.06 WARRANTY

A. Manufacturer shall provide a five year material warranty.

B. Installer shall provide a five year labor warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Sheet waterproofing shall be as manufactured by:

1. W.R. Grace & Co., W.R. Meadows, Inc.

2. Protecto Wrap Company.

3. Equal.

2.02 MATERIALS

A. Sheet waterproofing material shall be self-adhesive, cold-applied such as W.R. Grace Bituthene 4000, W.R. Meadows Mel-Rol, Protecto Wrap PW 100/60, or equal. The material shall be a self-adhesive, cold-applied composite sheet consisting of a thickness of 0.056 inches of rubberized asphalt and 0.004 inches of cross-laminated, high density polyethylene film specially formulated for use with water-based surface conditioner. Provide rubberized asphalt membrane covered with a release sheet, which is removed during installation. No special adhesive or heat shall be required to form laps.

B. Surface conditioner: Latex based surface conditioner as recommended by manufacturer

C. Adhesives fillets and sealers: Types as recommended by manufacturer for installation with specified membrane sheet.

D. Prefabricated Drainage Sheet:

1. For vertical surfaces: Hydroduct 220, Mel-Drain 5035B, Protecto Drain 2000-V, or equal, consisting of a dimpled high impact polystyrene core and a needle punched non-woven filter fabric adhered to one side of the core. A film shall be adhered to the other side of the core.

2. For horizontal surfaces: Hydroduct HSF, Mel-Drain 7555, Protecto Drain 2000-V, or equal, consisting of dimpled high impact polystyrene core and an extra heavy woven filter fabric bonded to the core.

E. Protection board for horizontal surfaces shall be 1/8 inch thick complying with ASTM D6506, semi-rigid sheets of fiberglass or mineral-reinforced asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

F. Protection board for vertical surfaces shall be 1 inch thick extruded polystyrene per Section 07 2100 Thermal Insulation.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Inspect and verify condition of substrates and related Work, in the presence of the manufacturer's technical representative. Do not start installation of membranes until defects in substrates have been corrected. Concrete shall be smooth, dry, and free of voids. Masonry shall have a parge coat applied.

### 3.02 APPLICATION OF MEMBRANE ON VERTICAL WALLS BELOW GRADE ENCLOSING OCCUPIED SPACES AND IN PLANTERS

A. Surface Conditioning: Install surface conditioner and allow to dry to surfaces to be covered with membrane the same day.

B. Corner Treatment: Pretreat inside corners with liquid membrane compound, to form a fillet or use formed reinforcement fillet recommended by manufacturer. Smooth all surfaces of outside corners.

C. Horizontal Surfaces: Install nine inch wide strips of membrane material over construction joints, cracks, and grouted joints. Seal expansion joints as recommended by manufacturer. At drains and vertical projections, install two layers of membrane sheet extended out not less than 6 inches in all directions, and seal. At drains, extend the membrane into the clamping ring and seal. Over prepared surfaces install membrane in one layer and roll into place. Lap sheets 2-1/2 inches at edges and ends.

D. Vertical Surfaces: Install membrane vertically in heights to 8 feet. Lap seams 2 ½ inches. Roll membrane with hand roller. Extend membrane over top of foundation walls, planter walls and parapet walls, except where reglets are provided for termination.

### 3.03 PREFABRICATED DRAINAGE SHEET

A. Vertical Surfaces: Install rolls of vertical drainage sheet over the completed membrane, starting at the base of the wall. Peel the fabric back approximately 12 inches from the lower edge. Where drainage pipe occurs, install the drain core behind the pipe and extend the fabric over the outside of the pipe. Adhere the drainage sheet to the wall using strips of adhesive as recommended by manufacturer.

B. Horizontal Surfaces: Adhere the drainage sheet to the membrane with strips of adhesive. Butt adjacent panels together and overlap fabric onto the previous panel. At corners, cut the core and cover the core with filter fabric or tape.

3.04 COMPOSITE STRIP WATERPROOFING

A. Provide at sills, copings, eaves, ridges, and under other flashing as indicated. Do not fold over exposed edges. Prime concrete and masonry surfaces as recommended by manufacturer. Cut the membrane into 10 to 15-foot lengths and reverse roll. Separate membrane from release paper, press firmly into place, and roll to eliminate bubbles and assure full adhesion. Lap sides of sheets not less than 3.5 inches and ends not less than 6 inches.

3.05 HIGH TEMPERATURE RESISTANT UNDERLAYMENT

A. Seal joints in insulation as recommended by manufacturer. Prime insulation at rate of one gallon per 500 square feet if recommended by manufacturer. Over prepared surfaces install membrane in one layer and roll into place. Lap sheets 3 ½ inches at edges and 6 inches at ends. Roll firmly into place to obtain full adhesion of sheets to substrate.

3.06 APPLICATION OF MONOLITHIC MEMBRANE FOR ALL SUBSTRATES OTHER THAN CONCRETE

A. Membrane Application:

1. Install the rubberized asphalt membrane at a rate to provide a continuous, monolithic coat of 90 mil, into which is fully embedded a layer of spunbound polyester fabric reinforcing sheet, followed by another continuous monolithic coat of membrane at a minimum thickness of 125 mils. Total membrane thickness to be provided is 215 mils.

2. Overlap fabric reinforcing sheet 1 to 2 inches with membrane between sheets.

3.07 PROTECTION BOARD

A. Cover all surfaces, vertical and horizontal, with protection board, unless indicated otherwise. Install with adhesive recommended by manufacturer, and compatible with membrane materials.

3.08 TESTS OF MEMBRANES

A. Horizontal membranes shall be subjected to standing water test after completion, but before protection board is applied. Tests shall be conducted as soon as possible after

completion of membrane in each area. When membrane installation is completed, seal drain, sandbag perimeter, fill membrane with water to height of not less than 2 inches, pond test for not less than 24 hours, repair all leaks or defects disclosed, and test until results are satisfactory. Remove all sandbags, plugs and drain when testing is completed. Clean surfaces of membrane.

3.09 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.10 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 07 51 13

# COLD APPLIED BITUMINOUS ROOFING (EMULSION AND POLYESTER)

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes the following:
   1. Tapered Crickets
   2. Barrier board
   3. Emulsion and Polyester membrane system
   4. Elastomeric Flashings at penetrations
   5. Instant Cure White Title 24 Roof Coating
   6. Walk Pads
   7. Elastomeric wall covering membrane

### 1.3 RELATED SECTIONS BY REFERENCE

A Substitutions, Section 01600
B. Roof Accessories
C. Mechanical and Plumbing Equipment
E. Electrical Equipment

### 1.4 SCOPE OF WORK

A Furnish and install specified roofing and related components to Roof Area indicated.

B. Work includes: **Base Bid**
   1. Cleaning and priming roof deck, curbs and wall flashings.
   2. Installation of the following:
      a. Install Tapered Insulation Crickets.
      b. Install Dens Deck barrier board.
      c. Install Base Sheet with a 3-ply polyester and emulsion system across all roof areas.
      d. Install elastomeric membrane flashings at all penetrations, curbs and walls.

C. Installation of Title 24 compliant White Instant Cure roof coating on all roof surfaces within the contract area or as indicated.

1.5 QUALITY CONTROL

A. Comply with requirements of Division 07 Sections "Sheet Metal Flashing and Trim" and "Manufactured Roof Specialties." Provide base flashings, perimeter flashings, detail flashings and component materials 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.
   3. Roof System Manufacturer details for existing conditions.

B. Contractor shall:
   4. Submit an affidavit attesting the Contractor has in place and fully implemented a written Health, Safety, and Environmental Plan and the plan is compliant with all applicable Federal, State, and Local regulations.
   5. Be experienced in "Instant cure" polyester and emulsion systems.
   6. Be qualified by specified manufacturer as an applicator capable of performing the work and whose work will qualify for the specified Warranty.

C. Roofing material manufacturer shall:
   1. Manufacturers, other than that specified as Basis of Design, must submit information, samples and Data Sheets for the following data prior to bid for evaluation.
      a. Assure to the Building Owner, that the manufacturer can consistently deliver quality materials, and shall be required to submit and provide evidence of twenty (20) quarters of continuous plant inspections of roofing manufacturing sites over the past five (5) years by an independent Nationally Recognized Testing Laboratory (NRTL) as defined in 29 CFR Ch. XVII (7-1-93 Edition) from the Occupational Safety and Health Administration (OSHA).
      b. Furnish a sample of Manufacturers Service Agreement and Warranty. No third party warranties or agreements allowed.
      c. To help ensure ethical conduct, reduce the potential for conflict of interest, and to provide full disclosure, the supplier of the major roof system components will provide an affidavit of a company officer, which shall include:
         1) Confirmation that all field employees in their organization have signed an ethics policy agreeing they will conduct business in an ethical manner.
         2) The name and address of each consultant paid by the supplier for specifying, recommending, or soliciting the supplier's products for the project.
   2. Employ Field Technical Services Representatives available for monitoring project work on a periodic basis. Manufacturer's inspectors are to be approved RRO (Registered Roof Observers) as designated by RCI (Roof Consultants International)
   3. Employ Field Technical Services Representatives available for final roof inspection.
   4. The presence and activity of the manufacturer's/ specifier's representative and/or Owner's representative shall in no way relieve the contractor of contract responsibilities or duties.
   5. Roofing Manufacturer shall be ISO 9001 Certified.

D. Project meetings:
   1. Final inspection:
      a. Will be scheduled by roofing material manufacturer upon job completion.
      b. Attendance:

1) Contractor.
2) Roofing material manufacturer/specifier.
3) Roofing material manufacturer/ technical service representative.
4) Owner.

c. Minimum agenda:
1) Walkover inspection.
2) Identification of problems which may impede issuance of warranty.

E. Random sampling:
1. Roofing material:
a. During course of work, Owner's Representative may secure samples according to ASTM D140-93 of materials being used from containers at job site and submit them to an independent laboratory for comparison to specified material.
b. Should test results prove that a material is not functionally equal to specified material:
1) Contractor shall pay for all testing.
2) Roofing installed and found not to comply with the specifications shall be removed and replaced at no change in the contract price.

F. Plans and specifications:
1. Contractor must notify Owner and specifier of any omissions, contradictions or conflicts seven (7) days before bid date. Owner and specifier will provide necessary corrections or additions to plans and specifications by addendum. If Contractor does not so notify Owner and specifier of any such condition, it will be assumed that the Contractor has included the necessary items in the bid to complete this specification.
2. It is the intent that this be a completed project as far as the contract documents set forth. Contractor alone will be held responsible by the owner for the completed project.
3. It is the Contractor's responsibility during the course of the work, to bring to the attention of and notify the Owner's representative first verbally, then in writing, of any defective membrane, insulation or deck discovered where not previously identified.

## 1.6 SUBMITTALS

A. Copy of Manufacturer's ISO 9001 Certification.

B. Product Data:
1. Rubberized Emulsion, fast setting.
2. Dens Deck Barrier Board
3. Polyester fabric.
4. Elastomeric Covering (TPA).

C. Material Samples:
1. Two each, 12-inch X 12-inch section of polyester fabric, upon request.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery of materials:

1. Deliver materials to job-site in new, dry, unopened, and well-marked containers showing product and manufacturer's name.
2. Deliver materials in sufficient quantity to allow continuity of work.
3. Coordinate delivery with Owner.

B. Do not order project materials or start work before receiving Owner's written approval of submittal.

C. Storage of materials:
1. Store roll goods on ends only. Discard rolls which have been flattened, creased, or otherwise damaged. Place materials on pallets. Store roll goods on level pallets. Do not stack pallets.
2. Store materials marked "KEEP FROM FREEZING" in areas where temperatures will remain above 40□F (5□C).
3. Rooftop storage: Disperse material to avoid concentrated loading.
4. Do not store materials in open or in contact with ground or roof surface.
5. Store all materials on a raised platform covered with secured canvas tarpaulin (not polyethylene), top to bottom. Cover all materials when project is not in progress and maintain the ability at all times to cover the materials when required, such as during an unanticipated rain shower.
6. Contractor shall assume full responsibility for the protection and safekeeping of products stored on premises.

D. Material handling:
1. Handle materials to avoid bending, tearing, or other damage during transportation and installation.
2. Material handling equipment shall be selected and operated so as not to damage existing construction or applied roofing. Do not operate or situate material handling equipment in locations that will hinder smooth flow of vehicular or pedestrian traffic.

## 1.8 SITE CONDITIONS

A Field measurements and material quantities:
1. Contractor shall have SOLE responsibility for accuracy of all measurements, estimates of material quantities and sizes, and site conditions that will affect work.

B. Waste Disposal:
1. Do not re-use, re-cycle or dispose of material manufacturers product containers except in accordance with all applicable regulations. The user of manufactured products is responsible for proper use and disposal of product containers.

C. Safety requirements:
1. All applications, material handling, and associated equipment shall conform to and be operated in conformance with OSHA safety requirements.
2. Comply with federal, state, local and Owner fire and safety requirements.
3. Advise Owner whenever work is expected to be hazardous to Owner, employees, and/or operators.

4. Maintain a crewman as a floor area guard whenever roof work area is directly above an entrance or service area of an occupied building.
5. Maintain fire extinguisher within easy access whenever power tools, roofing kettles, fuels, solvents, torches, and open flames are being used.

D. Environmental requirements:
1. Do not work in rain, snow, or in presence of water.
2. Do not work in temperatures below 40□F (5□C).
3. Do not install materials marked "KEEP FROM FREEZING" when daily temperatures are scheduled to fall below 40□F (5□C).

E. Security requirements:
1. Comply with Owners security requirements.

## 1.9 SUBSTITUTIONS

A. No Substitute systems will be allowed. Roof conditions have been evaluated by the Owner and the system specified will be the only system considered.

B. The Owner has established their maintenance and repair procedures predicated upon the systems and materials identified.

## 1.10 WARRANTY/GUARANTEE

A. Guarantee:
1. Upon project completion and Owner acceptance, effective upon complete payment, Contractor shall issue Owner a guarantee against defective workmanship and materials for a period of two (2) years.

2. Manufacturer's Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents. Standard Warranty shall include all materials incorporated within the roof assembly and all flashings and penetrations.

a. Manufacturers Material Warranty Period: 20 years.
b. Manufacturers Maintenance Program: 15 years.
1) Program shall provide housekeeping, maintenance and service inspection each year for 15 years. Program may be extendible.

## 1.11 FIELD OBSERVATIONS

A. Provide manufacturers field Technical Service personnel to observe installation of specified materials. Technical Service personnel shall provide written reports of each inspection

providing observations and recommendations. Reports are to submitted within 48 hours of inspection.

B. Provide Technical Service Inspection, 4 as a minimum unless more are required as directed by the Manufacturer. Based upon quality of workmanship, should additional days be required, the costs shall be borne by the Contractor.

## PART 2 - PRODUCTS

### 2.1 GENERAL

A. Agreement. In accordance with the requirements established by the Owner, the contractor shall provide material as specified. "Domestic construction material" and "Construction material" means any article, material or supply brought to the construction site for incorporation in the building or work. An unmanufactured construction material is a "domestic construction material" if it has been mined or produced in the United States. A manufactured construction material is a "domestic construction material" if it has been manufactured in the United States and if the cost of its components which have been mined, produced or manufactured in the United States exceeds 50 percent of the cost of all its components. "Components" means any article, material or supply directly incorporated in a construction material.

B. Domestic component. A component shall be considered to have been "mined, produced or manufactured in the United States" (regardless of its source in fact) if the article, material or supply in which it is incorporated was manufactured in the United States and the component is of a class or kind determined by the Government to be not mined, produced or manufactured in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality.

C. SPECIAL NOTE: All materials are to be Asbestos Free and manufactured in the U.S.A. At Owner's discretion, special consideration may be given to products or materials manufactured in the State of California.

D. Comply with quality control, references, specifications, and manufacturer's data. Products containing asbestos are prohibited on this project. Use only asbestos-free products.

E. Use products with personal protection. User must read container label and material safety data sheets prior to use.

### 2.2 ACCEPTABLE MANUFACTURER

A. Tremco Inc., Vernon, Ca. (805) 492-5222.

B. Basis of Design: System is based upon the Rapid Set Polyester and Emulsion system with an integral Rapid Setting White Title 24 compliant roof coating. Materials shall meet or exceed cure rates of specified system.

C. No substitutions. No known Equal.

## 2.3 ROOFING MATERIALS

A. Base Sheet: Composite Ply HT

B. Adhesives:
1. Base ply adhesive:
   a. Burmastic SF by Tremco.
2. Inter ply adhesive, rubberized emulsion.
   a. TremLastic SP by Tremco
3. Insulation Adhesive, Low Rise Insulation Adhesive for securing tapered edge strips.

C. Reinforcing Fabric:

2. Rapid Set Recycled Polyester Mat with quick-cure additive.

D. System Membrane
1. Plie(s) and Base Flashings:
   b. At all flashings: "Elastomeric TPA Membrane". 60 mil thickness, white on top side. No known equal.
   c. Properties

| Property | Typical Value | Test Method |
|---|---|---|
| Thickness | 0.60 | ASTM D 751 |
| Tensile Strength | 350 lbf | ASTM D 751 |
| Elongation @ fabric break | 35% MD 33% XMD | ASTM D 751 |
| Tear Strength | 100 lbf | ASTM D 751 |
| Dimensional Stability @ 176 degrees F | 0.3% @ 6 hours | ASTM D 1204 |
| Low Temperature Flexibility | -40 degrees F | ASTM D 2136 |
| Thermal Emittance | 0.86 | ASTM C 1371 |
| SRI<br>Solar Reflective Index | 108 (initial)<br>84 (3 year) | |
| Recycled Content | 25 % pre-consumer | |

E. Surfacing Coating: White, Title 24, instant cure coating material. Water-based, heavy bodied elastomeric coating that is compatible and interactive with polyester and emulsion assembly to initiate an instant cure. High solids and asbestos free. ICE Coating by TREMCO

| PROPERTY | TYPICAL VALUE | TEST METHOD |
|---|---|---|
| Density @ 77$^{O}$F | 6.8 lbs/ gal | ASTM D 1475-98 |
| Viscosity @ 77$^{0}$F | 11,000 caps lbs/gal | ASTM D 2196-99 |
| Non - Volatile content percent solids | 59 % by weight<br>65 % by volume | ASTM D 1664-88<br>ASTM D 5201-97 |
| Solar Reflectance | 83.2% | ASTM C 1549-04 |
| Emissivity | 0.83 | ASTM C 1370-04a |
| SRI (Solar Reflective Index) | 103 | ASTM E 1980-01 |
| Asbestos Content | None | EPA 600/R-93/116 |
| VOC | 39 g/L | ASTM D 3960-98 |

F. Barrier Board: ½" thick gypsum barrier board. Pre-primed. Screws and Plates of length sufficient to pass through board, deck and extend through decking minimum 1.5".

G Curb and Pipe and Perimeter Flashings:
1. Pipe and Stanchions: 60 mil TPA field fabricated flashings.
2. Curbs and all others: 60 mil TPA field fabricated Flashings.
3. Perimeter Base Flashings:
4. Elastomeric TPA, 60 mil

5. Perimeter Base Flashing Adhesive: Sheeting bond to walls

H. Tapered Adhesive.
1. Low Rise Insulation Adhesive.
2. Properties

| Property | Typical Value | Test Method |
|---|---|---|
| Flame Spread Index | 10 | ASTM E 84 |
| Density @ 77 degrees F | 8.5 lbs / gal | ASTM D 1875-69 |
| Tensile Strength @ 77 degrees F | 250 psi | ASTM D 412-87 |
| Elongation @ 77 degrees F | 1200% | ASTM D 412-87 |
| Flexibility | Pass | ASTM D 816 |
| T-Peel Adhesion @ 77 degrees F | 17 flb / in | ASTM D 903 |
| Smoke Developed Index | 30 | ASTM E 84 |

I. Related materials:
1. Asphalt mastic: Polyroof SF by Tremco.
a. Properties:

| Property | Typical Value | Test Method |
|---|---|---|
| Asbestos Content | None | EPA/600/r-93/116 |
| Viscosity @ 77 degrees F | 600,000 to 2,000,000 caps | ASTM D 2196-81 |
| Density @ 77 degrees F | 8.6 lbs / gal | ASTM D 1475-90 |
| Tensile Strength @ 77 degrees F | 30-50 psi | ASTM D 412-87 |
| Elongation @77 degrees F | 300% | ASTM D 412-87 |
| VOC | Less than 20g/l | ASTM D 3960-89 |

2. Cant strip:
a. ASTM C 208-94, coated fiberboard.
3. Cant strip adhesive:
a. Polyroof SF
4. Flashing bitumen:
a. Sheeting Bond.
5. Flashing membrane at penetrations:
a. TPA. 60 mil.
6. Sealants:
a. Draw-band sealant: Reglet Joint Sealant.
7. Stripping bitumen for metal flanges:
a. Tremlastic SP.
8. Stripping ply:
a. Rapid Set Reinforcing Fabric.

9. Walkway panels:
   a. TremTred by Tremco.
10. Primer
   a. TremPrime LV
11. Draw-band:
   a. Use double cinch draw-bands having special shapes at all irregular penetrations.
   b. Single piece draw-bands may be used on regular shapes in appropriate size(s)
   c. Manufacturers:
      1) Gold Seal stainless steel worm gear clamp by Murray Corporation, Cockeysville, MD.
      2) Power-Seal stainless steel worm drive clamps by Breeze Clamp Company, Saltsburg, PA

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify conditions as satisfactory to receive work.

B. Do not begin roofing until all unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions.

C. Verify that work of other trades penetrating roof deck or requiring men and equipment to traverse roof deck has been completed and approved by Owner, manufacturer, and roofing contractor.

D. Check projections, curbs, and deck for inadequate anchorage, foreign material, moisture, or unevenness that would prevent quality and execution of new roofing system.

### 3.2 GENERAL WORKMANSHIP

A. All work performed by Contractor shall conform to this specification and written recommendations by the Manufacturer.

B. The presence and activity of the manufacturer's representative, architect's representative, and/or Owner's representative shall in no way relieve Contractor of contract responsibilities or duties.

C. Substrate: Free of foreign particles prior to laying roof membrane.

D. Layout and verify positive slope of crickets to drain. Adjust as necessary. Mechanically attached first layer and adhere remaining panels.

E. Phased application: Base Sheet shall be installed and adhesive allowed to cure. Install additional layer of Base Sheet at all hips, ridges and valleys.

F. Each layer of the polyester and emulsion shall be allowed to cure prior to starting subsequent layers. Each layer of reinforcing fabric shall be installed no more than one day before the second ply of reinforcing fabric.

G. Second and third application of emulsion shall be firmly worked **onto** the previous layer of fabric prior to immediate application of second layer of reinforcing fabric. New layer of fabric shall make full contact with emulsion but not be embedded at the time of installation. Follow same procedure for subsequent layers where occurs. Apple additional layer at all hips, ridges and valleys.

H. Final White Surface Coating shall be applied at rate of four (4) gal per square; applied in two applications of 2 gallons each. Allow first coat to fully cure to support foot traffic. Back roll #10 white granules into final application of Surface Coating. Add additional materials as needed for complete and even distribution of granules and coating. No bare spots shall be accepted.

I. Traffic and equipment: Kept off completed plies until all adhesive has set.

J. Allow 5 days for membrane to fully cure before installing flashings.

K. Wrapper and packaging materials: Not to be included in roofing system.

L. Entrapped aggregate or debris: Not permitted within new membrane. Its discovery is sufficient cause for rejection.

M. Ply shall never touch ply, even at roof edges, laps, tapered edge strips, and cants.

N. Fit plies into roof drain rims; Clean, prepare, prime and install plies; secure clamping collars; install domes. Replace missing, plastic or broken domes with new metal domes.

O. Extend roofing membrane to top edge of cant at wall and projection bases.

P. Cut out fish-mouths/side laps which are not completely sealed; patch. Replace all sheets which are not fully and continuously bonded.

## 3.3 PREPARATION

A. Protection: Contractor shall be responsible for protection of property during course of work. Building shall be protected from damage. Repair damage at no extra cost to Owner.

A. Roofing, flashings, membrane repairs, and insulation shall be installed and sealed in a watertight manner on same day of installation or before arrival of inclement weather

B. At beginning of contract work check all drains for proper drainage. Report in writing, to Owner any drains found not to be operating correctly. At start of each workday, drains within

daily work area shall be plugged. Plugs to be removed at end of each workday or before arrival of inclement weather.

C. Preparation work shall be limited to those areas that can be covered with installed roofing material on same day and before arrival of inclement weather.

D. Arrange work sequence to avoid use of newly constructed roofing for storage, walking surface, and equipment movement. Move equipment and ground storage areas as work progresses.

E. At end of each working day, seal removal areas with water stops along edges to prevent water entry.

F. Provide clean plywood walkways and take other precautions required to prevent tracking of debris from existing membrane into new work area where debris pieces can be trapped within new roofing membrane. Contractor shall instruct and police workmen to ensure that debris is not tracked into new work areas on workmen's shoes or equipment wheels. Discovery of entrapped aggregate/debris within new membrane is sufficient cause for its rejection.

G. Surface preparation:
   1. Remove existing loose granules and debris from deck.
   2. Remove all latent debris or surface contamination.
   3. Sweep clean roof deck.
   4. Prime surfaces with TremPrime LV.
   5. Comply with other preparation requirements stated elsewhere.

## 3.4 TAPERED INSULATION CRICKETS

A. Coordinate installing roofing system components so any tapered insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Install tapered around designated perimeter walls, curbs and platforms, as designated, to provide smooth even transition. Provide a slope with positive drainage and no standing water. Provide and install tapered insulation panels as required to insure water drains to the actual drain sump. Adjust as required.

## 3.5 TAPERED EDGE STRIPS AND CRICKETS (As designated only)

A. Lay crickets and edge panels around perimeter of area.

B. Cut and trim as required to fit around obstructions

C. Install additional pieces as required to prevent ponding conditions behind curbs.
   1. Adhere panel units in insulation adhesive.
   2. Stagger ends from lower end minimum 18 inches and side laps minimum 12 inches.

## 3.6 ROOF SYSTEM APPLICATION

A. Overall roof area:
   1. Install base sheet in full bed of adhesive. Provide 4"side laps and 6" end laps. Extend base sheet 2" above top of cant.
   2. Install three (3) ply polyester and emulsion shingle fashion to substrate in a uniform and continuous installation of TremLastic SP Adhesive. All non-asphaltic surfaces shall be primed in accordance with manufacturers written recommendations.

B. Overlap starter strips 4 inches with first ply, then overlap each succeeding ply to develop a one ply assembly. Place ply sheets to ensure water will flow over or parallel to, but never against exposed edges.

C. Install first layer and subsequent layers of reinforcing fabric in emulsion that is applied at 4 to 5 gallons per square interply.

D. Ensure complete and continuous seal and contact between adhesive and ply sheets, including ends, edges, and laps without wrinkles, fish mouths, or blisters. Squeegee width: 34 inches (860 mm) minimum. Avoid walking on plies until adhesive has set.

E. Roofing membrane shall never touch roofing membrane, even at roof edges, laps, tapered edge strips, and cants.

F. Cut out fish-mouths/side laps which are not completely sealed; patch with a two ply system. Replace all sheets which are not fully and continuously bonded.

G. Lap ply membrane ends 4 inches (100 mm). Stagger end laps 3 feet (910 mm) minimum.

H. Adhesive application rate:
   1. 2 gallons for base ply.
   2. 4 gallons inter-ply and surfacing per 100 sq. ft. (1.2 kg/m2) average, tolerance ± 20 percent per ply.

I. Place roofing membrane in manner to ensure water flows over or parallel to, but never against exposed edges.

J. Use application technique to ensure selvage receives uniform and even application.

K. Apply uniform and continuous pressure to selvage and end laps to ensure complete adhesion.

L. Apply adhesive no more than 10 feet (3 meter) ahead of each roll being embedded. Under cool weather conditions or when wind gusts exceed 15 mph (24 km/h), apply adhesive no more than 5 feet (1.5 meter) ahead of each roll.

M. Squeegee Rapid Set Reinforcing Fabric membrane onto adhesive to achieve full contact before adhesive flashes off. Ensure complete and continuous seal and contact between adhesive and fabric, including ends, edges, and laps without wrinkles, fish mouths, or blisters. Squeegee width: 34 inches (860 mm) minimum. Avoid walking on membrane until adhesive has set.

N. Install a single ply of reinforcing fabric in emulsion. Butt all ends and sides tightly. Fill voids with emulsion and allow to cure.

3.7 FLASHINGS

A. General flashing requirements:
   1. Equipment and penetration Flashing:
      a. At Stanchion/pipe/conduit penetrations: Adhere elastomeric flashing substrate in a continuous application of flashing adhesive. Remove wrinkles and voids. Overlap sections 4 inches (100 mm).
      b. At curbs or platforms: Adhere elastomeric flashing ply to flashing substrate in a continuous application of sheeting bond flashing adhesive. Remove wrinkles and voids. Overlap sections 4 inches (100 mm).
      c. Extend flashing ply 6 inches (150 mm) beyond toe of cant.
      d. Secure top edge with 1-inch-wide termination bar secured at 6 inches on center.
      e. Cut flashing membrane in lengths not to exceed 6 feet (2 meter). Apply flashing adhesive to flashing substrate in a continuous application. Adhere flashing membrane to adhesive. Lap flashing membrane ends 4 inches (100 mm); extend membrane 6 inches (150 mm) beyond toe of cant; press sheet firmly in place. Ensure complete bond and continuity without wrinkles or voids. Adhere laps with flashing adhesive. Seal vertical laps of flashing membrane with reinforcing membrane embedded between alternate continuous courses of flashing bitumen.
      f. Stop wall flashings even with the modular unit parapet wall edge. Continue wall flashing on next unit. Install a 12" wide cover strip of flashing membrane in sheeting bond. Heat weld 2" minimum of cover strip edges
   2. Base flashing height:
      a. Not less than 8 inches (200 mm), above finished roofing surface unless approved by Manufacturer.
      b. Extend wall flashing membrane over top of parapet wall and extend 2" down the outside wall surface.
      c. Secure top edge with 1-inch-wide termination bar secured at 6 inches on center.
      d. Continuous cleat for the Coping Cap may be used for the pressure bar requirement above if the top of wall is less than 30" above the top of roof membrane
   3. Two-Ply Stripping for metal flanges:
      a. Set flange in asphalt mastic. Seal flange with two (2) stripping plies embedded between alternate applications of stripping adhesive/bitumen. Extend first ply 4 inches (100 mm) beyond flange; second ply 2 inches (50 mm) beyond first ply.

B. Perimeter flashing preparations:
   1. Disconnect existing metal counter flashing and save for reinstallation where required.
   2. Break corners of existing sheet metal covers. Fold vertical surfaces back as required to install new base flashings.
   3. Install base flashing as described in general flashing requirements section.
   4. Re-secure counter flashings. At two-piece, reinstall existing skirt. At one piece, fold back down and secure with mechanical fasteners for neat clean and straight finished appearance.
   5. Secure top edge of flashing to substrate with termination bar and double sided butyl tape (TF tape) secured with fasteners providing a minimum embedment of 1 1/4 inch at 6 inches o.c.
   6. Fabricate and install counterflashing where existing counter flashing has been damaged by roofing operations.

7. Fasten skirt metal with fasteners having EPDM washers at 12 inches o.c.

C. At plumbing vents:
1. Wedge plumbing vent tight against deck.
2. Apply 1/16 inch (1.6 mm) uniformly thick layer of asphalt mastic to surface receiving metal flange.
3. Fabricate and install plumbing vent flashing from elastomeric materials. Flange: 4 inches (100 mm) wide minimum; extend completely around periphery of vent flashing. Set flange into sheeting bond. Neatly dress flange with wood block.
4. Install two (2) ply stripping for flanges as described in general flashing requirements section.

C. At Drains:
1. Drain Bowls :
   a. Install two ply polyester and emulsion system into drain bowl.
   b. Install polyester and emulsion system down into drain bowl. Apply additional layer around perimeter of drain.
   c. Continue membrane into bowl of drain and terminate at drain outlet.
2. Scuppers:
   a. Fabricate through wall scuppers with TPA Clad Metal. Seams shall be located at the top of scupper units
   b. Extend flanges of scuppers 8" minimum on inside surfaces. Turn outside faces out 2". Provide drip spout at outside of scuppers.
   c. Provide 3" trim ring, set in full bed of butyl sealant.

3.8 ADJUSTING AND CLEANING

A. Repair of deficiencies: Repair voids, fish-mouths, and irregularities with a two-ply patch.

B. Installations of details noted as deficient during final inspection must be repaired and corrected by applicator, and made ready for re-inspection, within five (5) working days.

3.9 Clean-up:

A. Immediately upon job completion, roof membrane and flashing surfaces shall be cleaned of debris.

B. Clean gutters and downspouts of debris.

3.10 Close Out

A. Contractor shall review all work items and then complete the "Check List" below. Check List must be completed and submitted to Manufacturer before Manufacturer performs Final Inspection and acceptance for warranty issuance.

(Continued on next page)

## PRE-FINAL INSPECTION CHECKLIST

## FIELD HOUSE AND SHADE STRUCTURE

**Contractor to fill in Building Number, one Checklist per Building**

The following items, as applicable, are to be checked and initialed by superintendent/foreman and the list the faxed to manufacturer's representative prior to calling for any PRE-SURFACING INSPECTION. Items not applicable shall be marked "N/A"

_____ Corner Caps are installed and complete on all curb or platform corners.

_____ Round pipe, angle iron, or square tube roof penetrations, i.e., pipes, supports, etc. Gasket tape, stainless steel clamps, caulking, tightly wrapped.

_____ Roof Drains: New bolts are in placed and tight. Clamping rings and rim cleaned, drains tested, dome cover in place.

_____ Three (3) coursing is completed at all reinforced flashing terminations to the roof membrane. Five coursing or targets are completed at all metal flanges (gravel stops, lead flanges, pitch pans, etc.). There shall be no reinforcing fabric or membrane showing through mastic.

_____ All flanges properly secured to deck with appropriate fasteners.

_____ Caulk outside of the perimeter of thru-wall drains/scuppers. And install outside trim plate.

_____ Mastic, asphalt, and/or adhesive is cleaned off all pipes, conduits, metal surfaces, penetrations, perimeter metal and walls, or completely painted.

_____ Sheet metal corners installed and properly secured where metal flashing has been broken.

_____ The grounds surrounding the building or project area and the setup areas have been cleaned and all construction material and debris has been cleaned and removed from the grounds.

_____ Field deficiencies have been repaired, such as dry laps, fishmouths, blisters, torn felts, etc.

_____ All A/C duct seams sealed as specified.

_____ All holidays in wall coating have been given two additional coats of elastomeric coating.

**CONTRACTOR** _____

**SUPERINTENDENT** _____

**DATE** _____

*NOTE: FINAL INSPECTION WILL BE SCHEDULED UPON COMPLETION and SUBMISSION OF FORM!!!*

End of Section

# SECTION 07 6000

# FLASHING AND SHEET METAL

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Sheet metal flashings in connection with roofing.
2. Reglet and counter flashing assemblies.
3. Miscellaneous metal flashing and counter flashing as required, except where provided under Divisions 22, Plumbing, 23, HVAC, or 26, Electrical.
4. Drip flashings.
5. Roof pipe flashings.
6. Roof expansion joint covers.
7. Other sheet metal items, not necessarily specified herein or in other sections, but required to prevent penetration of water into building.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 3000 – Metal Decking.
3. Section 07 9200 - Joint Sealants.
4. Section 08 3313 - Coiling Counter Doors.
5. Section 09 2423 - Cement Plaster and Metal Lath
6. Division 22 –- Plumbing.
7. Division 23 - HVAC.
8. Division 26 - Electrical.

### 1.02 SUBMITTALS

A. Shop Drawings: Submit for fabricated sheet metal indicating shapes, details, methods of joining, anchoring and fastening, thicknesses and gages of metals, concealed reinforcement, expansion joint details, sections, and profiles.

B. Samples: Submit Samples for materials or assemblies as requested.

C. Product Data: Submit brochures of manufactured items.

### 1.03 QUALITY ASSURANCE

A. Drawings and requirements specified govern. Provide the Work of this section in conformance with the Architectural Sheet Metal Manual published by SMACNA for conditions not indicated or specified and for general fabrication of sheet metal items.

B. Materials shall conform to following standards:

1. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

2. ASTM A653 - Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

3. ASTM B370 - Copper Sheet and Strip for Building Construction.

C. Pre-installation Meetings: Refer to Division 07 roofing sections as appropriate. Attend the pre-installation and inspection meetings for roofing Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Do not install bent or otherwise damaged materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Galvanized Sheet Steel: ASTM A653, coating designation G90, hot-dip galvanized.

B. Copper Plate, Sheet and Strip: ASTM B370, cold-rolled, tempered. Copper sheet and strip shall be cold-rolled-temper.

C. Stainless Steel: Plate, sheet and strip shall conform to ASTM A167, Type 304 or Type 316, No. 4 finish on exposed surfaces and No. 2 finish on concealed surfaces unless otherwise specified or indicated. Furnish Type 304 for general applications and Type 316 where exposed to acidic or alkaline conditions.

D. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. As-Milled Finish: **[Mill] [One-side bright mill] [Standard one-side bright] [Standard two-side bright].**

E. Fastenings:

1. Galvanized Steel: Nails, rivets, and other fastenings furnished in connection with galvanized sheet steel Work shall be sealed with rust resistive coating. Rivets shall be tinned. Nails and other fastenings shall be zinc-coated.

2. Copper: Nails, rivets, and other fastenings furnished in connection with copper sheet metal Work, shall be manufactured from hard-temper copper or hard brass.

3. Stainless Steel: Nails, rivets and other fastenings furnished in connection with stainless steel Work, shall be 300 series alloy to match alloy of stainless steel being fastened.

F. Soldering Flux: Raw muriatic acid for galvanized steel; rosin for tin, lead and tinned copper; non-corrosive soldering salts for uncoated copper and acid-type flux formulated for soldering stainless steel.

G. Solder: ASTM B32, Grade 5A, composed of 95-5 tin-antimony. Name of product manufacturer and grade designation shall be labeled, stamped or cast onto each coil or bar.

2.02 FABRICATION

A. General:

1. Accurately form sheet metal Work to dimensions and shapes indicated and required. Cope finish molded and brake metal shapes with true, straight, sharp lines and angles and, where intersecting each other, to a precise fit. Unless otherwise specified, all galvanized sheet steel shall be 22 gage. Exposed edges of sheet metal shall have a ½ inch minimum hemmed edge.

2. Soldering of sheet steel or copper shall be performed with well-heated copper soldering iron or soldering torch, joints full flowing, neat and consistent. Fill joint completely with solder. Clean materials at joints before soldering, and tin coppers before soldering. Exposed soldering on finished surfaces shall be scraped smooth. Lock seam work shall be fabricated flat and true to line and soldered along its entire length. Acid-fluxed Work shall be neutralized after fabrication.

3. Form and install sheet metal Work to provide proper allowances for expansion and contraction, without causing undue stresses in any part of completed Work. Installation shall be water and weathertight.

B. Reglet Type Counterflashing: Where roof comes in contact with vertical surfaces, provide counterflashing. Set top of counter flashing 8 inches above roof deck unless otherwise indicated, and extend down at least 5 inches or to top of cant strip. Counterflashing and reglet shall be 22 gage galvanized sheet steel. Lap counter flashing and reglet 3 inches minimum at splices and miter at angles, or supply special metal corner fittings. Reglet and method of securing flashing shall be so constructed that flashing is firmly locked in place, but may be readily removed for replacement.

C. Roof Expansion Joint Covers: Fabricate of 22 gage galvanized sheet steel, as detailed. One side of joint shall be zee shaped, with 3-inch standing leg extended over the joint and turned down. The other side shall be box shaped, fabricated to extend over the joint, over the standing leg, and turn down to form a water barrier. Prefabricated bellows type joint covers are not permitted.

D. Miscellaneous Flashing: Unless otherwise indicated, miscellaneous flashing shall be fabricated of galvanized steel. Exterior doors and windows, unless covered by overhangs shall be provided with 22 gage galvanized steel drip flashing as detailed. At wood construction, nail flashing to framing before paper backed lath is installed.

E. Roof Pipe Flashings: Provide PVC flashings or prefabricated welded or seamless flashings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Concrete and masonry materials in contact with sheet metal shall be painted with alkali resistant coating, such as heavy-bodied bituminous paint. Wood in contact with sheet metal shall be painted with two coats of aluminum paint or one coat of heavy-bodied bituminous paint.

3.02 INSTALLATION

A. General: Coordinate with installation of underlayment indicated in the Drawings and specified in Section 09 2423.

B. Reglets: Install reglets at constant height above cant or as indicated. Provide minimum 3-inch lap at end splices of reglets. Seal laps watertight.

C. Counterflashing:

1. Install at constant horizontal elevation across roof slope and slope at constant height above cant or as indicated.

2. Provide minimum 3-inch lap at all end splices of counterflashing.

3.03 TESTING

A. Perform field water testing to demonstrate installation is watertight. Continue testing with a continuous hose stream applied at base of installation for at least 30 minutes. If leaking is observed, discontinue test and repair installation, then test until satisfactory results are obtained.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.05 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

# SECTION 07 9200

# JOINT SEALANTS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Joint sealants.
2. Preparation for application of sealants.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 2000 - Finish Carpentry.
3. Section 07 6000 - Flashing and Sheet Metal.
4. Section 07 8413 - Penetration Firestopping.
5. Division 08 - Openings.
6. Division 09 - Finishes.
7. Section 10 2813 - Toilet Accessories.

### 1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating sealant joint locations, with full-size sealant joint details.

B. Product Data: Submit manufacturer's literature for each sealant material.

C. Material Samples: Submit Samples indicating color range available for each sealant material intended for installation in exposed locations.

D. Certifications: Submit manufacturer's certification materials comply with requirements specified.

E. Site Samples: At locations required, provide a Sample of sealant for each typical installation, approximately 24 inches long, including joint preparation, backing, sealant and tooling. Allow backing to extend 6 inches beyond end of sealant for inspection of substrate.

F. Test Reports: Submit manufacturer's adhesion compatibility test reports according to ASTM C794 for each substrate.

### 1.03 QUALITY ASSURANCE

A. Qualifications of Installer: The Work of this section shall be installed by a firm which has been in the business of installing similar materials for at least five consecutive years; and can show evidence of satisfactory completion of five projects of similar size and scope. Installer shall have applicators trained and approved by manufacturer for performing this Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store in accordance with manufacturer's recommendations. Provide a uniform ambient temperature between 60 and 80 degrees F.

1.05 WARRANTY

A. Manufacturer: five year material warranty.

B. Installer: two year installation/application warranty.

PART 2 - PRODUCTS

2.01 GENERAL

A. Furnish sealants meeting following in-service requirements:

1. Normal curing schedules are permitted.

2. Non-staining, color fastness (resistance to color change), and durability when subjected to intense actinic (ultraviolet) radiation are required.

B. Furnish the products of only one manufacturer unless otherwise required, sealant colors as selected to match the adjoining surfaces.

2.02 MANUFACTURERS

A. Sealants must be approved by LAUSD's Office of Environmental Health and Safety (OEHS). Check OEHS website for approved products. Not all products by a manufacturer are approved by OEHS.

2.03 MATERIALS

A. Sealants:

1. Sealant 1: Acrylic latex, one-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C834, Type S, Grade NS, formulated to be paintable.

a. Tremco Inc., Acrylic Latex Caulk.

b. Pecora Corporation, AC-20.

c. Equal.

2. Sealant 2: Butyl sealant, one-part, non-sag, solvent-release-curing sealant complying with ASTM C1311, gun grade and formulated with a minimum of 75 percent solids.

   a. Tremco Inc., Tremco Butyl Sealant.

   b. Pecora Corp., BC-158.

   c. Equal.

3. Sealant 3: Silicone sealant, one-part non-acid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.

   a. Dow Corning Corp., Dow Corning 790, 791, 795.

   b. General Electric Co., Silpruf.

   c. Tremco, Inc., Spectrem 1.

   d. Pecora Corp., 864.

   e. Equal.

4. Sealant 4: One-part mildew-resistant silicone sealant, complying with ASTM C920, Type S, Grade NS, Class 25.

   a. Dow Corning Corp., Dow Corning 786.

   b. General Electric Co., Sanitary 1700.

   c. Tremco, Inc., Proglaze White.

   d. Equal.

5. Sealant 5: One-part non-sag urethane sealant, complying with ASTM C920, Type S, Grade NS, Class 25.

   a. Sika Corporation, Sikaflex -221e.

   b. Equal.

6. Sealant 6: Multi-part pouring urethane sealant, complying with ASTM C920, Type M, Grade P, Class 25.

   a. Sika Corporation, Sikaflex 2C NS/SL.

   b. Equal.

7. Sealant 7: Acoustical sealant, non-drying, non-hardening permanently flexible conforming to ASTM D217.

   a. Pecora Corp., BA-98 Acoustical Sealant.

b. Equal.

B. See 07 8413 - Penetration Firestopping for rated sealants.

C. .Joint Backing: ASTM D1056; round, closed cell Polyethylene Foam Rod; oversized 30 to 50 percent larger than joint width, reticulated polyolefin foam.

D. Primer: Non-Staining Type. Provide primer as required and shall be product of manufacturer of installed sealant.

E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer.

F. Sealants shall have normal curing schedules, shall be nonstaining, color fast and shall resist deterioration due to ultraviolet radiation.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Verify that joint openings are ready to receive Work and field tolerances are within the guidelines recommended by sealant manufacturer.

### 3.02 SURFACE PREPARATION

A. Joints and spaces to be sealed shall be completely cleaned of all dirt, dust, mortar, oil, and other foreign materials which might adversely affect sealing Work. Where necessary, degrease with a solvent or commercial degreasing agent. Surfaces shall be thoroughly dry before application of sealants.

B. If recommended by manufacturer, remove paint and other protective coatings from surfaces to be sealed before priming and installation of sealants.

C. Preparation of surfaces to receive sealant shall conform to the sealant manufacturer's specifications. Provide air pressure or other methods to achieve required results. Provide masking tape to keep sealants off surfaces that will be exposed in finished Work.

D. Etch concrete or masonry surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.

E. Perform preparation in accordance with ASTM C804 for solvent release sealants, and ASTM C962 for elastomeric sealants.

F. Protect elements surrounding Work of this section from damage or disfiguration.

### 3.03 SEALANT APPLICATION SCHEDULE

| | Location | Type | Color |
|---|---|---|---|
| A. | Exterior and Interior joints in horizontal surfaces of concrete; | Sealant 6 | To match adjacent material |

| | | | |
|---|---|---|---|
| | between metal and concrete masonry and mortar. | | |
| B. | Exterior door, entrance and window frames. Exterior and interior vertical joints in concrete and masonry metal flashing. | Sealant 3 or 5 | To match adjacent material |
| C. | Joints within glazed curtain wall system. Skylight framing system. Aluminum entrance system glass and glazing. | Sealant 3 | Translucent or Black |
| D. | Interior joints in ceramic tile and at plumbing fixtures. | Sealant 4 | Translucent or White |
| E. | Under thresholds. | Sealant 2 | Black |
| F. | All interior joints not otherwise scheduled | Sealant 1 | To Match Adjacent Surfaces |
| G. | Heads and sills, perimeters of frames and other openings in insulated partitions | Sealant 7 | Match Adjacent Surfaces |

3.04 APPLICATION

A. Provide sealant around all openings in exterior walls, and any other locations indicated or required for structure weatherproofing and/or waterproofing.

B. Sealants shall be installed by experienced mechanics using specified materials and proper tools. Preparatory Work (cleaning, etc.) and installation of sealant shall be as specified and in accordance with manufacturer's printed instructions and recommendations.

C. Concrete, masonry, and other porous surfaces, and any other surfaces if recommended by manufacturer, shall be primed before installing sealants. Primer shall be installed with a brush that will reach all parts of joints to be filled with sealant.

D. Sealants shall be stored and installed at temperatures as recommended by manufacturer. Sealants shall not be installed when they become too jelled to be discharged in a continuous flow from gun. Modification of sealants by addition of liquids, solvents, or powders is not permitted.

E. Sealants shall be installed with guns furnished with proper size nozzles. Sufficient pressure shall be furnished to fill all voids and joints solid. In sealing around openings,

include entire perimeter of each opening, unless indicated or specified otherwise. Where gun installation is impracticable, suitable hand tools shall be provided.

F. Sealed joints shall be neatly pointed on flush surfaces with beading tool, and internal corners with a special tool. Excess material shall be cleanly removed. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Sealing shall be complete before final coats of paint are installed.

G. Comply with sealant manufacturer's printed instructions except where more stringent requirements are indicated on Drawings or specified.

H. Partially fill joints with joint backing material, furnishing only compatible materials, until joint depth does not exceed 1/2 inch joint width. Minimum joint width for metal to metal joints shall be 1/4 inch. Joint depth, shall be not less than 1/4 inch and not greater than 1/2 inch.

I. Install sealant under sufficient pressure to completely fill voids. Finish exposed joints smooth, flush with surfaces or recessed as indicated. Install non-tracking sealant to concrete expansion joints subject to foot or vehicular traffic.

J. Where joint depth prevents installation of standard bond breaker backing rod, furnish non-adhering tape covering to prevent bonding of sealant to back of joint. Under no circumstances shall sealant depth exceed 1/2 inch maximum, unless specifically indicated on Drawings.

K. Prime porous surfaces after cleaning. Pack joints deeper than 3/4 inch with joint backing to within 3/4 inch of surface. Completely fill joints and spaces with gun applied compound, forming a neat, smooth bead.

3.05 MISCELLANEOUS WORK

A. Sealing shall be provided wherever required to prevent light leakage as well as moisture leakage. Refer to Drawings for condition and related parts of Work.

B. Install sealants to depths as indicated or, if not indicated, as recommended by sealant manufacturer but within following general limitations:

1. For joints in concrete walks, slab and paving subject to traffic, fill joints to a depth equal to 75 percent of joint width, but not more than 3/4 inch deep or less than 3/8 inch deep, depending on joint width.

2. For building joints, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

3.06 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.07 CURING

A. Sealants shall cure in accordance with manufacturer's printed recommendations. Do not disturb seal until completely cured.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

# SECTION 09 9000

# PAINTING AND COATING

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Interior and exterior painting.

B. Following items shall not be painted:

1. Brass valves, chromium or nickel-plated piping and fittings.

2. Boiler control panels and control systems.

3. Fabric connections to fans.

4. Flexible conduit connections to equipment, miscellaneous name plates, stamping, and instruction labels and manufacturer's data.

5. Mechanical and electrical utility lines, piping and heating and ventilation ductwork in tunnels, under-floor excavated areas or crawl spaces, attic spaces and enclosed utility spaces.

6. Flag, floodlight, parking light poles and loudspeaker poles, metal stairs, handrails and chain-link fence with a galvanized finish, unless otherwise noted.

7. Structural and miscellaneous steel, open web steel joists and metal floor decking, which will not be exposed in final construction, shall have no finish other than one coat of shop primer.

8. Hardboard covering on tops and backs of counters and benches.

9. Brass, bronze, aluminum, lead, stainless steel and chrome or nickel-plated surfaces.

10. Non-metallic walking surfaces unless specifically shown or specified to be painted.

### 1.02 REGULATORY REQUIREMENTS

A. Paint materials shall comply with the Food and Drug Administration's (F.D.A.) Lead Law and the current rules and regulations of local, state and federal agencies governing the use of paint materials.

### 1.03 SUBMITTALS

A. List of Materials: Before submittal of samples, submit a complete list of proposed paint materials, identifying each material by distributor's name, manufacturer's name,

product name and number, including primers, thinners, and coloring agents, together with manufacturers' catalog data fully describing each material as to contents, recommended installation, and preparation methods. Identify surfaces to receive various paint materials.

B. Material Samples: Submit manufacturer's standard colors samples for each type of paint specified. Once colors have been selected, submit Samples of each color selected for each type of paint accordingly:

1. Samples of Paint and Enamel must be submitted on standard 8 ½" x 11" Leneta Opacity-Display Charts. Each display chart shall have the color in full coverage. The sample shall be prepared from the material to be installed on the Work. Identify the school on which the paint is to be installed, the batch number, the color number, the type of material, and the name of the manufacturer.

2. Elastomeric shall be submitted in duplicate samples of the texture coating. Samples will be not less than 2 ½ by 3 ½ in size and installed upon backing. Finished Work will match the reviewed Sample in texture.

3. Materials and color samples shall be reviewed before starting any painting.

C. For transparent and stained finishes, prepare samples on same species and quality of wood to be installed in the Work, with written description of system used.

1.04 QUALITY ASSURANCE

A. Certification of Materials: With every delivery of paint materials, the manufacturer shall provide written certification the materials comply with the requirements of this section.

B. Coats: The number of coats specified is the minimum number. If full coverage is not obtained with the specified number of coats, install additional coats as required to provide the required finish.

C. Install coats and undercoats for finishes in strict accordance with the recommendations of the paint manufacturer as reviewed by the Architect.

D. Paint materials shall comply with the following as a minimum requirement:

1. Materials shall be delivered to Project site in original unbroken containers bearing manufacturer's name, brand number and batch number.

2. Open and mix ingredients on premises in presence of the Project Inspector.

1.05 DELIVERY, STORAGE AND HANDLING

A. Storage and Mixing of Materials: Store materials and mix only in spaces suitable for such purposes. Maintain spaces clean and provide necessary precautions to prevent fire. Store paint containers so the manufacturer's labels are clearly displayed.

1.06 SITE CONDITIONS

A. Temperature: Do not install exterior paint in damp, rainy weather or until surface has thoroughly dried from effects of such weather. Do not install paint, interior, or exterior, when temperature is below 50 degrees F, or above 90 degrees F, or dust conditions are unfavorable for installation.

1.07 WARRANTY

A. Manufacturer shall provide a three year material warranty.

B. Installer shall provide a three year application warranty.

1.08 MAINTENANCE

A. Provide at least one gallon of each type, color and sheen of paint coating installed. Label containers with color designation indicated on Drawings.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

A. Furnish the products of only one paint manufacturer unless otherwise specified or required. Primers, intermediate and finish coats of each painting system must all be the products of the same manufacturer, including thinners and coloring agents, except for materials furnished with shop prime coat by other trades.

B. Factory mix paint materials to correct color, gloss, and consistency for installation to the maximum extent feasible.

C. Paint materials to be minimum "Architectural Grade".

D. Gloss degree standards shall be as follows:

| | | | |
|---|---|---|---|
| HIGH GLOSS | 70 and above | EGGSHELL | 30 to 47 |
| SEMI-GLOSS | 48 to 69 | SATIN | 15 to 29 |

2.02 MANUFACTURERS

A. Acceptable manufacturers, unless otherwise noted:

1. Dunn-Edwards Corporation Paints
2. Frazee Paints and Wall coverings
3. Vista Paints
4. Sherwin Williams
5. ICI Paints
6. Equal.

## PART 3 - EXECUTION

### 3.01 PREPARATION

A. Examine surfaces to receive paint finish. Surfaces which are not properly prepared and cleaned or which are not in condition to receive the finish specified shall be corrected before prime coat is installed.

B. New woodwork shall be thoroughly cleaned, hand sandpapered, and dusted off. Nail holes, cracks or defects in Work shall be filled. On stained woodwork, fill shall be colored to match stain. Filling shall be performed after the first coat of paint, shellac or varnish has been installed.

C. Plaster surfaces except veneer plaster shall be allowed to dry at least 3 weeks before painting. Veneer plaster shall be allowed to dry sufficiently to receive paint as determined by moisture meter tests.

D. Metal surfaces to be painted shall be thoroughly cleaned of rust, corrosion, oil, foreign materials, blisters, and loose paint.

E. Do not install painting materials to wet, damp, dusty, dirty, finger marked, rough, unfinished or defective surfaces.

F. Concrete surfaces shall be dry, cleaned of dirt and foreign materials and in proper condition to receive paint. Neutralize spots demonstrating effects of alkali.

G. Mask off areas where necessary.

### 3.02 APPLICATION

A. Backpainting: Immediately upon delivery to the Project site, finish lumber and millwork shall be backpainted on surfaces that will be concealed after installation. Items to be painted shall be backpainted with priming coat specified under "Priming".

B. Priming: New wood and metal surfaces specified to receive paint finish shall be primed. Surfaces of miscellaneous metal and steel not embedded in concrete, and surfaces of unprimed plain sheet metal Work shall be primed immediately upon delivery to the Project site. Galvanized metal Work and interior and exterior woodwork shall be primed immediately after installation. Priming of surfaces and priming coat shall be as follows:

1. Knots, Pitch and Sap Pockets: Shellac before priming.

2. Exterior Woodwork and Wood Doors: Prime with one coat of exterior waterborne emulsion wood primer.

3. Interior Woodwork: Where indicated to be painted, prime with one coat of waterborne wood primer.

4. Stain: Woodwork indicated to receive a stain and varnish finish shall be stained to an even color with water borne stain. On open-grained hardwood, mix stain with paste filler and completely fill pores in wood.

5. Galvanized Metal Work: Clean oil, grease and other foreign materials from surfaces. Install vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.

6. Unprimed Iron, Steel, and Other Uncoated Metals: Where specified to be painted, prime with one coat of metal primer.

7. Shop Primed Metal Items: Touch up bare and abraded areas with metal primer before installation of second and third coats.

8. Coats shall be installed evenly and with full coverage. Finished surfaces shall be free of sags, runs and other imperfections.

C. Allow at least 24 hours between coats of paint.

D. Rollers shall not be used on wood surfaces.

E. Each coat of painted woodwork and metal, except last coat, shall be sandpapered smooth when dry. Texture-coated gypsum board shall be sanded lightly to remove surface imperfections after first coat of paint has been installed.

F. Each coat of paint or enamel shall be a slightly different tint as required. Each coat of paint, enamel, stain, shellac, and varnish will be inspected by the IOR before next coat is applied. Notify the Project Inspector that such Work is ready for inspection.

1. Tinting Guideline: The first coat, primer/undercoat(s) to be untinted or tinted up to 50 percent lighter or darker (at the discretion of the installer) than the finish coat. The second coat (or third coat if a seal coat and undercoat have been specified) is to be factory tinted in the range of 10 percent to 15 percent lighter or darker (at the discretion of the installer) than the finish coat. The final coat is to be factory tinted to the required color selected. These tinting guidelines shall be provided on all surfaces receiving paint.

G. Do not "paint-out" UL labels, fusible links and identification stamps.

H. Paint Roller, brush and spray.

1. Only Paint rollers shall be used on interior plaster, drywall, masonry/plaster and plywood surfaces, nap shall not exceed one half inch in length.

2. First coat on wood overhang and ceilings shall have material applied by roller and then brushed out in a professional manner to leave surface free of imperfections. Finish coat may be sprayed.

3. Other surfaces shall have all coatings applied with brushes of proper size.

4. Spray work is permitted only on radiators, acoustic plaster, masonry and plaster.

I. Where ceilings are specified to be painted, beams, cornices, coves, ornamental features, plaster grilles, etc. shall be included.

J. Ceilings shall be white, including classrooms, storage rooms, offices, arcades, etc. Boiler room and fan room ceiling color shall match adjacent walls.

3.03 CLEANING

A. Remove rubbish, waste, and surplus material and clean woodwork, hardware, floors, and other adjacent Work.

B. Remove paint, varnish and brush marks from glazing material and, upon completion of painting Work, wash and polish glazing material both sides. Glazing material, which is damaged, shall be removed and replaced with new material.

C. Clean hardware and other unpainted metal surfaces with recommended cleaner. Do not furnish abrasives or edged tools.

3.04 SCHEDULE

A. Interior:

1. Woodwork, Painted: 3 coats.

   a. First Coat: As specified in this section under Priming.

   b. Second and Third Coats: Interior enamel, semi-gloss or gloss as indicated.

2. Woodwork, Stained and Varnished: 4 coats.

   a. First Coat: As specified in this section under Priming.

   b. Second, Third and Fourth Coats: Varnish, semi-gloss.

3. Wood Corridor doors: 4 coats.

   a. First Coat: As specified in this section under Priming.

   b. Second, Third, and Fourth Coats: Varnish, gloss.

4. Other Wood Doors: 4 coats.

   a. Varnished or painted as indicated.

   b. If varnished, same finish system as painted woodwork, with semi-gloss or gloss finish to match adjacent wall.

5. Miscellaneous Woodwork: 4 coats. Wood items including, but not limited to: stair treads and risers, handrails, rolling ladders, wood base and shoe, chair rails, counter tops and locker room benches.

   a. First Coat: As specified in this section under Priming.

   b. Second, Third and Fourth: Exterior varnish, gloss.

6. Casework: Interior surfaces of casework (except plastic laminate-faced casework) including top, edges and underside of shelving, poles, surfaces of

drawers (except fronts), interior surfaces of mailbox pigeonholes, and particle board.

a. First Coat: Waterborne stain.

b. Second and Third Coats: Satin varnish.

7. Plaster: 4 coats.

a. First Coats: Pigmented wall sealer.

b. Second coat: Enamel under coater.

c. Third and Fourth Coats – Interior enamel, semi-gloss or gloss as indicated.

8. Gypsum Board: 4 coats.

a. First Coat: Drywall sealer.

b. Second Coat: Enamel under coater.

c. Third and Fourth Coats: Interior enamel, semi-gloss or gloss as indicated.

9. Concrete: 3 coats.

a. First: Concrete sealer.

b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.

10. Concrete Block: 3 coats.

a. First: Concrete block filler.

b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.

11. Metal: Shall be cleaned, pre-treated and painted with 3 coats. Items to be painted include, but are not limited to: exposed structural and miscellaneous steel, railings and handrails, metal doors and frames, ladders, table and bench legs.

a. First Coat: Cycloaliphatic Amine Epoxy.

b. Second and Third Coats: Aliphatic Acrylic-Polyester Polyurethane.

B. Exterior:

1. Woodwork: 3 coats.

a. First Coat: As specified in this section under Priming.

b. Second and Third Coats: Exterior house and trim enamel.

2. Wood Doors: 3 coats.

   a. First Coat: As specified in this section under Priming.

   b. Second and Third Coats: Exterior gloss enamel.

3. Plaster and Stucco: 3 coats. Flat 100 percent acrylic.

   a. Prime Coat: Alkali resistant primer/sealer.

   b. Exterior 100 percent acrylic.

4. Concrete: 3 coats. Flat 100 percent acrylic.

   a. First Coat: Concrete sealer.

   b. Second and Third Coats: Exterior 100 percent acrylic.

5. Concrete Block: 3 coats. Flat 100 percent acrylic.

   a. First Coat: Concrete block filler.

   b. Second and Third Coats: Exterior 100 percent acrylic.

6. Metal: 3 coats. Shall be cleaned and pre-treated. Items to be painted include, but are not limited to: steel columns and miscellaneous steel items, railings and handrails gravel stops, metal doors and frames, hoods and flashings.

   a. First Coat: Cycloaliphatic Amine Epoxy.

   b. Second and Third Coats: Aliphatic Acrylic-Polyester Polyurethane.

C. Mechanical and Electrical Work:

1. Except where interior mechanical and electrical Work to be painted is specified to receive another paint finish, Work occurring in finished rooms and spaces shall be cleaned, pre-treated, and painted with 3 coats. Items to be painted include, but are not limited to: steel and copper piping, pipes, vents, fittings, ducts, plenums, miscellaneous supports and hangers, electrical conduit, fittings, pull boxes, outlet boxes, unfinished surfaces of plumbing fixtures, miscellaneous metal cabinets, panels, and access doors and panels.

   a. First Coat: As specified in this section under Priming.

   b. Second and Third Coats: Interior enamel, semi-gloss or gloss to match adjacent wall or ceiling finish.

2. Insulation and Taping on Pipes and Ducts: 3 coats.

   a. Finished Rooms:

      1) First Coat: Interior waterborne primer.

2) Second and Third Coats: Interior semi-gloss or gloss enamel to match adjoining wall or ceiling finish.

b. Building Exterior:

1) First Coat: Exterior waterborne primer.

2) Second and Third Coats: Exterior gloss enamel.

3. Inside surfaces of ducts, vents, dampers and louvers as far back as visible from room in which they open shall be painted with 2 coats of flat black paint.

D. Miscellaneous:

1. Outside Storage Units (wood or metal): 3 coats.

a. First Coat: As specified in this section under Priming.

b. Second and Third Coats: Exterior gloss enamel.

2. Exterior and interior surfaces of storage bins, and potting tables shall have 3 coats of acrylic stain.

3. Wood compost bins shall be finished with 3 coats of acrylic stain.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

# SECTION 09 9013

# PAINTING OF EXISTING FACILITIES

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Interior and exterior painting.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 2000 - Finish Carpentry.
3. Section 07 9200 - Joint Sealants.
4. Section 09 2423 - Cement Plaster and Metal Lath.
5. Section 09 2900 - Gypsum Board.

### 1.02 REGULATORY REQUIREMENTS

A. Workers will be trained in EPA's; Renovation, Repair and Painting (RRP), the lead-related construction course that satisfies the requirements specified in 40 CFR, Part 745, Section 745.90.

B. The Lead Related Construction Work, specified herein, shall be performed by a company, partnership, corporation, sole proprietorship or individual doing business, association, or other business entity; a Federal, State, Tribal, or local government agency; or a nonprofit organization, shall satisfy the requirements specified in 40 CFR, Part 745, Section 745.89, as a Lead-Safe Certified Firm.

C. Paint materials shall comply with Food and Drug Administration's (FDA) Lead Law and current rules and regulations of local, state and federal agencies governing use of paint materials.

D. Paint color requirements for CALOSHA: CALOSHA requires the following items be painted as prescribed:

1. Gas Mains and Valves shall be painted "gun metal gray" (medium gray)
2. Fire Valves and Raisers shall be painted OSHA's "safety red"

1.03 SUBMITTALS

A. Submit the following.

1. Submit a complete list of materials to be furnished stating supplier and distributor's names with product recommendations.

2. Submit manufacturer's standard color samples for each type of paint specified. Once colors have been selected, submit six samples of each color selected for each type of paint, on standard 8 ½ by 11 spray-out panel.

3. Before any coating is applied, submit to Project Inspector samples of each color to be used on contract. If more than one batch of material and color is to be used, samples from each batch shall be submitted.

B. Paint and Enamel Spray-Outs

1. Samples of Paint and Enamel shall be submitted on standard 8 ½ by 11 Leneta Opacity-Display Charts. Each display chart shall have color in full coverage. Sample shall be prepared using material from batch to be used on actual job. Identify school on which paint is to be used, batch number, color number, type of material, name of manufacturer and name of Contractor.

2. Furnish samples of colors to Project Inspector. Samples shall be kept on the job until painting is completed.

3. Contractor shall be responsible for finish color on surface to be painted; where different materials of same color are specified to be applied on same, or adjoining surfaces, final color match shall match color sample on those surfaces.

C. Elastomeric coating shall be submitted in duplicate samples of texture coating. Samples shall be not less than 2 ½-inch by 3 ½-inch in size and on adequate backing.

D. Materials and color samples shall be approved before a job start meeting will be scheduled.

1.04 QUALITY ASSURANCE

A. Certification of Materials: With every delivery of paint materials, manufacturer shall certify, on form supplied by Owner that materials comply with requirements of this Section.

B. Paint materials shall comply with applicable requirements of Food and Drug Administration's (FDA) Lead Law and SCAQMD.

C. Painters working on Lead related work shall be (DHS) Lead Certified by the State of California.

1.05 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to project site in original unbroken containers bearing manufacturer's name, brand number, batch number, and Safety Data Sheets.

B. Open and mix ingredients on premises in presence of Project Inspector. Immediately remove rejected materials from premises.

1.06 METAL STORAGE CONTAINER

A. Storage and Mixing of Materials: Store materials and mix only in spaces designated for purpose by Project Inspector. Keep such spaces clean and take necessary precautions to prevent fire. Hang out oily rags singly in open air. Stack paint containers so that manufacturer's labels are clearly displayed.

B. Paint, combustible materials, gasoline driven equipment, etcetera shall not be stored or left in any school building overnight.

C. In event that equipment and material storage sheds must be placed on asphalt pavement less than six months old, each wheel, leg or other supporting member shall be centered on a 4-foot by 8-foot by ¾ inch thick sheet of plywood. Shed shall be set down in such a manner as to prevent damage to pavement. Contractor shall be responsible for any damage to pavement caused by improper placement of shed.

1.06 ENVIRONMENTAL CONDITIONS

A. Temperature: Do not apply exterior paint in damp, rainy weather or until surface has dried from effects of such weather. Do not apply paint, interior or exterior, when temperature is below 50 degrees F., or above manufacturer's stated recommended temperature, or when dust conditions are unfavorable to proper workmanship.

1.07 WARRANTY

A. Manufacturer shall provide a three year material warranty from date of Substantial Completion.

B. Contractor warrants work executed and materials furnished under contract shall be free from defects of materials and application for a period of three years from date of Substantial Completion.

C. Elastomeric coating shall be warranted for a period of five years from date of Substantial Completion.

1.08 PROTECTION

A. Fire alarm boxes, fire sprinkler heads, smoke detectors and intrusion alarm systems shall be uncovered and available to perform function that it was designed for each and every night.

B. Pressure relief grilles with barometric damper leading to a corridor or an exterior shall be masked off before spraying and then uncovered immediately after spraying.

C. Conspicuously post sufficient "Wet Paint" signs continuously to alert public and school personnel to existing conditions until paint is completely dried.

D. Provide and maintain barriers, guards, lights, warning signs, etcetera for complete protection and as directed by the Project Inspector.

E. Do not impede emergency egress.

1.09 REMOVAL AND REINSTALLATION OF SECURITY GRILLES

A. Replace and secure at end of each working day protective security grilles. Every bolt shall be replaced properly using a washer, cut smooth and filed down.

B. Remove window grilles and anchoring devices prior to painting area behind grille.

C. Repair or replace grills, anchoring devices, and hardware damaged during removal and replacement process with material of same composition.

D. Reinstall grilles; anchoring devices and hardware shall be replaced with new hardware of same material. Installation of previously used or damaged hardware and anchoring devices shall not be permitted.

E. Provide hardware, specialty tools, and labor needed to remove and reinstall window grilles.

F. Paint security grilles that have graffiti or have been vandalized.

G. Do not leave any building or classroom unsecured. Grilles shall be reinstalled and rooms properly secured at end of each day.

H. Patch holes that exist prior to removal of grilles or that are exposed or created during removal.

I. Removal and Replacement

1. Grille and window sill shall be numbered prior to removal. Grille must be reinstalled to original location. Remove numbers upon reinstallation.

2. Window grilles may have been anchored in different ways according to building composition and grille type. Following is a list of different types

of anchors and methods of removal and installation. (Processes listed are not applicable to every situation. Use appropriate methods as needed, with prior consent of Project Inspector).

a. Nail In Anchor:

1) Removal: Use cold chisel to split aluminum head, pull out steel nail in center, and then pull out aluminum sleeve or grind off aluminum head to reveal nail, them remove nail. Touch up grille with approved spray cold galvanize where galvanize has been damaged from grinding.

2) Reinstallation: With grille flush to wall, insert anchor flush with mounting tab, and drive nail with hammer until secure. Bent nails will not be accepted.

b. Threaded Anchors

1) Removal: Grind off tack weld only, threaded stud shall remain in wall. Remove nut, washer, and grille. Touch up galvanizing damaged during grinding.

2) Reinstallation: Install grille without damaging anchor threads. Install new washer and nut, tack weld nut to tab, clean weld, and paint. Do not weld threads.

c. Carriage Bolts: Note: Extra long carriage bolts are a specialty item. Allow sufficient time to order.

1) Removal: Remove nut and washer and pull out bolt (do not reuse).

2) Reinstallation: Replace with new bolt of same size and minimum of 1 inch longer than bold removed. Install a new fender washer and nut. Tighten until grill is firmly against wall. Check to make sure window operates correctly. Cut off bolts flush with nut and de-burr bolt.

d. Lag Type Screws

1) Removal: Remove nut and washer and pull out bolt (do not reuse).

2) Reinstallation:

a) If existing hole is capable of receiving new screw: Replace with new lag, of same diameter, using 1 inch longer than those removed. Tack weld screws to grille.

b) If existing hole is damaged or otherwise compromised, a new placement of tab and screw is necessary. Remove existing tab, offset location of tab 2 inches, and drill correct size pilot hole into wood frame to avoid splitting wood. Replace with a new lag, of same length and diameter as removed. Tack weld screws to grill. Welds shall be cleaned and painted with cold galvanized paint.

c. Tamper Proof Screws

1) Removal: Remove nut and washer and pull out bolt (do not reuse).

2) Reinstallation:

a) If existing hole is capable of receiving new screw: Replace with new screw, of same diameter, using 1 inch longer than those removed.

b) If existing hole is damaged or otherwise compromised, a new placement of tab and screw is necessary. Remove existing tab, offset location of tab 2 inches, and drill correct size pilot hole into wood frame to avoid splitting wood. Replace with a new screw, of same length and diameter as removed. Welds shall be cleaned and painted with cold galvanized paint.

d. Pop Rivet-Steel, Aluminum, or Stainless Steel. Note: Extra long pop rivets are a specialty item. Allow sufficient time to order.

1) Removal: Drill out with proper size drill bit, do not increase hole size.

2) Reinstallation: Replace with new pop rivet, of same diameter and composition as rivet removed.

3. Grilles reinstalled in exact prior position. Do not use plastic anchors or toggle bolts. Grilles have been installed with expanded metal situated in a consistent directional manner and shall be reinstalled in same manner. Extra or oversized holes shall be repaired. If for any reason anchor will not securely hold, use next bigger size anchor and offset tab 2 inches and re-anchor as per OAR direction.

4. Repair damage that previously exists prior to removal or is done to existing concrete, brick, wood, or any other surface during removal. If welding is necessary, welder shall protect surfaces from damage and maintain a fire watch during welding and at least ½ hour after completion.

5. Do not change original type of anchor without prior approval from OAR and Project Inspector.

6. Comply with applicable lead and asbestos abatement requirements prior to removal of grilles. Only employees properly trained and certified shall be permitted to disturb building materials containing lead or asbestos.

1.10 MOVING EQUIPMENT

A. Perform handling and moving of furniture, equipment, casework, books, and supplies, or items impeding project and re-installing in their original location, except as otherwise directed by OAR. Library books shall be moved and re-shelved in same sequence and in same location from which they were removed, unless otherwise directed by OAR.

1.11 MISCELLANEOUS

A. Provide and maintain barriers, guards, lights, warning signs, etcetera for complete protection and as directed by the OAR. Provide access to doors and openings. Do not store equipment or material near openings or traffic lanes that could be hazardous during an emergency.

1.12 DEFINITION OF TERMS

A. Work shall include labor, material, equipment and scaffolding required for cleaning and preparation of surfaces to receive painters finish and for painting and varnishing, as herein specified. Perform work unless specifically noted otherwise.

B. Painting shall include complete preparation and finish or refinishing in accordance with requirements specified herein. Drywall shall be treated same as specified for plaster.

C. Wherever woodwork is specified to be refinished, it will include wood finish member (trim), movable cabinets with doors and center cut doors, windows and sash, screen doors, screens, sash poles, movable and fixed bulletin boards and chalkboards, etcetera.

D. Plastic, impregnated plywood, hardwood, metal, asbestos board (if painted), and mastic coated wood surfaces shall be treated in same manner as specified for "woodwork".

H. Whenever "Paint or Enamel" is referred to in these specifications, it shall be taken to mean types of waterborne materials and water reducible materials.

I. Whenever "edges" are referred to in these specifications, it shall be taken to mean every edges, (which include tops and bottoms).

1.13 SCAFFOLDING

A. Scaffolding shall be made available to Owner, without cost, to make repairs. Owner will coordinate its work with that of Contractor's to avoid delays to the work.

## PART 2 - PRODUCTS

### 2.01 PAINT MATERIALS

A. Factory mix paint materials to correct color, gloss, and consistency for installation to maximum extent feasible.

B. Paint materials shall be by one manufacturer.

C. Paint materials shall be "Premium Architectural Grade".

D. Acceptable manufacturers, unless otherwise noted:

1. Dunn-Edwards Corporation Paints
2. Vista Paints
3. Frazee Paints and Wall coverings
4. Sherwin Williams
5. ICI Paints
6. Equal

E. Gloss degree standards shall be as follows:

| | | | |
|---|---|---|---|
| High Gloss | 70 and above | Eggshell | 30 to 47 |
| Semi-Gloss | 48 to 69 | Satin | 15 to 29 |

## PART 3 – EXECUTION

### 3.01 REMOVE AND REINSTALL

A. Remove coat hooks, name plates, label frames, sash lifts, sash locks, pencil sharpeners, flag brackets, drawer handles and locks, window coverings, switch and receptacle plates, removable bulletin boards, mirrors, maps and thermometer. Reinstall all of the above after painting is completed.

B. Remove exposed nails, hooks, tacks, screws, staples and pins in surface to be painted and patch holes with a matching material. Remove interior and exterior obsolete screens, grille hangers, fasteners and patch holes.

C. Remove and reinstall Venetian blinds and channels, insuring security latches are secure. When removed, blinds and channels shall be marked with its location and reinstalled in the same location.

D. Contractor shall replace map and picture hooks as directed by the Project Inspector.

E. Paper labels shall be soaked off and glue residue from tape removed.

F. Remove metal or plastic room numbers, letters, signs, and, after painting is complete, clean and reinstall them neatly.

G. Sash locks shall be reset in accordance with instructions for locking doors and windows each night.

3.03 REPLACEMENT SCREWS AND HARDWARE

A. Hardware shall be replaced using new screws, of same diameter, but one size longer than those removed. Screws used must be of finish design and material to match hardware.

B. Remove paint from hardware, including paint from previous painting.

3.04 GENERAL PREPARATION OF EXISTING PAINTED SURFACES

A. Previously painted surfaces will be assumed to contain lead.

B. Trenching: Before any cleaning or sandblasting operation is started, soil at base of building shall be trenched to a depth of six inches and eight inches wide. After completing painting application and allowing sufficient drying time, trench shall be refilled.

C. Insure a consistently uniform horizontal, vertical and curved surface, with a maximum deformation of 1/8 inch in a five foot span. Apply a brown scrub coat and a fog coat.

D. Glass, fiberglass and polycarbonate on exterior shall be traced neat and clean with approximately, but no more than 1/16 inch overlay. Paint specks, smears or splatters shall be immediately removed and surface cleaned.

E. Miscellaneous Exterior Surfaces; Freestanding exterior school signs, windbreaks, baffles, benches, scoreboards, fences and gates (excluding chain link), decorative panels, interior and exterior surfaces of display cases, storage and supply cabinets, including both sides and edges shall be prepared and primed as specified under "Doors." They shall receive number of coats of paint as detailed under "Colors and Number of Paint Coats."

F. Examine surfaces to receive paint finish. Surfaces which are not properly prepared, and cleaned or which are not in condition to receive finish specified, shall be corrected before paint is applied. Painting shall not be done on existing painted surfaces until surfaces are approved by the Project Inspector.

G. Remove items fastened to existing painted surfaces and patch holes with a material, and re-fasten in original location upon completion of painting work.

H. Existing painted surfaces indicated to be painted, shall be prepared as follows:

1. Wood, plaster and metal surfaces shall be washed with TSP (tri-sodium phosphate) substitute to remove dirt, grease and other foreign materials and rinsed with clean water and then sand papered and dusted off. Surfaces shall have wax completely removed before washing, which includes base, shoe base, and concrete base.

2. a. Checked, cracked, blistered, scaled, peeling, and alligatored paint on wood and metal surfaces shall have paint removed down to original finished surface, then hand-sanded and dusted clean.

b. Surfaces shall then be considered as new work.

c. Woodwork must be hand sanded smooth after each and every coat, except last coat. Coats shall be free from dust, dirt or other imperfections.

d. Steel sash and aluminum sash to be painted must be steel-wooled and dusted off. Sash putty shall be hand sanded smooth and dusted off.

e. Remove lint and grease from screens, vents, hoods, etcetera that are to be painted.

3.05 OTHER SURFACE PREPARATION REQUIREMENTS

A. Existing painted surfaces shall be prepared and made ready to receive new coat of paint or other finish coating materials by any of following methods:

1. H.E.P.A. machine sanding: Checked, cracked, blistered, scaled loose, and alligator paint on wood and metal surfaces on exterior or interior of facilities shall be machine sanded to a smooth solid surface, dusted clean and then painted as specified. Power sanding shall be done with a H.E.P.A. vacuum sander and shall be used only when school is not in session, and students and staff are not on site.

2. Trenching: Before any cleaning or sandblasting operation is started, soil at base of building shall be trenched to a depth of six inches and eight inches wide. After completing painting application and allowing sufficient drying time, trench shall be refilled.

3. Hydro-washing: Exterior masonry and plaster on buildings, bungalows, pavilions, and appurtenances must be washed with a cleaner using hydro-washing equipment, or as directed by Project Inspector, to remove grease, dirt and foreign materials and then rinsed with clean water to remove residue. Surfaces must be allowed to dry for at least five days or as determined by Project Inspector. Care shall be taken to prevent water from entering buildings through vents, etcetera Immediately following hydro-washing, areas surrounding buildings must be rinsed down.

a. Exposed mastic, concrete, and/or plaster surfaces shall be cleaned with a cleaner, using hydro-cleaning equipment. This process is to remove dirt, foreign materials, grease, and oil and rinsed with clean water to remove residues.

b. Before hydro-washing efflorescence must be brushed off and surface treated with a 10 percent solution of Muriatic Acid, neutralized with a 10 percent solution of ammonia water and then rinsed with clean water.

c. Painted surfaces that will be directly or indirectly impacted by hydro-washing shall have paint stabilized to remove loose, flaky or peeling paint. Wood, metal, and other exterior non-masonry/stucco surfaces shall be primed where stabilization has occurred prior to application of cleaner and hydro-washing.

d. Hydro-washing is not intended to remove loose, flaky or peeling paint or paint chips. Water generated from cleaning and hydro-washing process that does not contain visible paint chips shall be directed to soil, such as a planted area, or collected and disposed in the sewer system.

e. At no time shall water from hydro-washing process be directed to a storm drain, be allowed to flow off Owner property to adjoining public or private property, or to flow across asphalt or cement concrete and allowed to dry.

f. If, during hydro-washing process, paint chips are generated with waste water work shall stop. Contractor shall install a system under and around area requiring washing sufficient enough to collect waste water generated. Waste water shall be stored in DOT approved barrels and visible paint chips separated from waste water. Paint chips shall be characterized to determine if waste is hazardous or disposed of assuming it is hazardous. Waste water shall be characterized to determine if it is hazardous and disposed of according to code. If water tests non-hazardous, water shall be removed from Owner's property.

g. Hazardous waste generated by this process requires being transported under a Uniform Hazardous Waste Manifest. Contractor shall ensure manifest is completed as required by code. OAR will sign manifest once it is accurately completed and prior to transport of waste off site.

4. Sandblasting: Shall be performed when school is not in session and when students are not present. Premises shall be left in a clean condition and ready for use by occupants by end of any day prior to beginning of school session. Work shall be coordinated with Project Inspector and the OAR. Only wet blasting shall be allowed. Masonry or stucco surfaces shall be sandblasted to remove mastic, paint and other materials to original plaster brown coat or formed concrete surface. Rinse with clean water to remove residue. Adjacent surface, plants and shrubs shall be protected from damage due to sandblasting operations.

a. Immediately upon completion of sandblasting operation, roof, gutters and areas around buildings, etcetera shall be cleaned of sand and debris resulting from sandblasting operation. No sand or debris shall be hosed or swept into drains.

b. Metal surfaces including decorative metal and fencing requiring sandblasting shall be sandblasted to white metal and primed same day with a metal primer per manufacturer's recommendation.

5. Sandblasting and Pressure Washing of materials containing asbestos or lead are abatement activities and will only be performed by companies and individuals with prior Facilities Environmental Technical Unit (FETU) approval.

## 3.06 CRACKS AND VOIDS

A. Voids between wall and ceiling surfaces and wood or metal trim or scribed edges where finish exists or is specified to be applied and including picture molding, must be filled with putty, filler or latex sealing compound.

B. Areas where finish plaster coat is loose must have that portion removed to a solid surface. Surfaces that are broken, cracked, or damaged and areas where finish plaster coat has been removed must be coated with compatible bonding agent. Surface will then be given a cement plaster finish coat consisting of one-part Plastic Portland Cement to three parts sand to match existing finish. Cracks shall be "V-eed" out, filled, finished flush with and textured to match adjoining surfaces, per Owner Representative's approval.

C. Neutralize walls showing effects of alkali.

## 3.07 FILLER ON SIDING AND WOODWORK

A. Checked and cracked portions of siding and woodwork (after surrounding areas have been prepared as specified above) shall be primed, smoothed with an exterior filling compound and then sanded smooth when dry. Filled areas must be spot primed. Filler shall not be used on handball walls or basketball backstops.

## 3.08 SEALING SASH, DOOR FRAMES

A. Sealant that will interfere with proper application of waterproof coating shall be removed. Seal around door and window frames, flashing, vents, separations between masonry or plaster and adjoining surfaces, etcetera, with a sealant compound recommended by manufacturer of coating to be used. Sealing and filling shall be done with sufficient pressure to force material to base of opening.

## 3.09 MASTIC REPAIR AND ELASTOMERIC REPAIR

A. Surface must be clean, firm and free of oil, wax and chalk. Mildew must be killed. Surface must be rinsed and allowed to dry.

B. Use primers as recommended by manufacturer for each substrate.

C. May be applied with airless spray equipment, using a 22 to 34 orifice tip and do not apply when surface or air temperature is below 50 degrees F.

D. Apply elastomeric with a ½ inch to 1 ½-inch roller cover or an air-atomized spray texture pump system. Do not over-roll.

E. Spreading rate:

| | | | |
|---|---|---|---|
| Fine texture: | Approx. Mil thickness | Wet | 18 Mils |
| | at 80 square feet per gallon | Dry | 9 Mils |
| Medium texture: | Approx. Mil thickness | Wet | 18 Mils |
| | at 60 square feet per gallon | Dry | 9 Mils |
| Heavy texture: | Approx. Mil thickness | Wet | 39 Mils |
| | At 40 square feet per gallon | Dry | 26 Mils |

NOTE: Coverage will vary depending upon texture desired and surface. Direction will be given by an Owner representative.

F. Dry time: To touch: 1 to 1 ½ hours

To re-coat: 24 hours

G. Finish will be uniform in texture and free of imperfections.

H. Elastomeric coatings will receive at least two coats of paint.

I. Hairline cracks: Two coats of elastomeric coating to bridge hairline cracks.

J. Small to medium cracks and imperfections: elastomeric coating to fill and span cracks up to 1/32 inch. Cracks 1/32 inch width or greater shall be treated with an elastomeric sealant (recommended by paint manufacturer) prior to applying elastomeric coating.

K. Medium to large cracks and imperfections: Cracks from 1/32 inch to 1/8 inch shall be treated with a brush-grade elastomeric sealant applied in a 2-inch wide band; crowned at center and feathered at edges to conceal repair.

L. Large cracks: Cracks 1/8 inch to ½ inch shall receive a urethane sealant (recommended by paint manufacturer), "rake out" crack to conform to manufacturer's specifications and applied as directed for medium to large cracks.

M. Cracks, holes and damaged spots larger than ½ inches: Damaged areas shall be given a cement plaster finish coat consisting of one-part plastic Portland cement to three-parts plaster sand to match existing finish. When finished, it shall be flush with and match existing texture of adjoining surface.

N. Texture match: Crack repairs shall be finished to match texture of adjoining surfaces, per Project Inspector's approval. Hand held plaster hopper guns may be used. Exercise care to ensure that areas finished by hand held plaster machines

match in color, texture and thickness to adjoining surfaces. A compatible bonding agent shall be used.

## 3.10 REPAIR OF PLASTER

A. Exterior areas, where finish plaster coat is loose, shall have that portion removed to a solid surface. Surfaces that are broken, cracked, or damaged and areas where finish plaster coat has been removed shall be coated with compatible bonding agent. Surface will then be given a cement plaster finish coat consisting of one-part Plastic Portland Cement to three parts plaster sand to match existing finish. Cracks shall be "veed-out", filled, finished flush with and textured to match adjoining surfaces, per Project Inspector's approval.

1. If existing plaster was a machine applied, dash coat, apply final application of finish coat over patched areas by machine to match existing adjacent machine texture. Use a finish plaster material with a bonding admixture mixed according to manufacturer's recommendation.

2. Cracks, holes, and damaged spots larger than ½ inch, see 3.09.

B. Exterior plaster designated to be painted shall receive three coats. First coat shall be sealer. Second and third coats shall 100 percent acrylic gloss enamel unless otherwise indicated.

C. Interior plaster patching shall receive four coats. First coat shall be pigmented sealer. Second coat shall be enamel undercoat. Third and fourth coats shall gloss or semi-gloss enamel as indicated.

## 3.11 REPAIR OF SPALLING CONCRETE

A. Remove surface contamination, broken and spalled concrete to a sound concrete base. Concrete shall be removed to a depth of one-half inch minimum around rebar. Sides of areas to be repaired shall be straight, not tapered or sloped.

B. Spalled or loose concrete shall be removed using an electric or compressed air chipping hammer.

C. Clean exposed rebar by sandblasting, remove debris and dust and treat steel with a sealant compatible to patching materials same day. Project Inspector shall approve sealant application prior to any patching materials being applied.

D. Repair concrete to match existing concrete surfaces using Sika Top 123 Gel Mortar, DAP Concrete Patch, Quikrete Fast-Setting Concrete, or equal.

E. Sealant and patching materials shall be applied by qualified applicator.

## 3.12 SPRAYING MASONRY/CEMENT PLASTER

A. Masonry/plaster material must be a 100 percent acrylic flat paint, color as directed. Material must be applied in strict conformity to manufacturer's directions. There must be at least 24 hours drying time between first coat which shall be factory tinted 10 percent to 15 percent lighter (or darker) in color than

finish coat. Manufacturer shall be acquainted with conditions of surfaces to be refinished and provide written specifications for the job including special primers or additives needed for adhesion sealing of first coat of paint and general performance of materials. Finished surface must be uniform and free of imperfections. Each coat applied to surface must be sprayed using "Cross-Off" method of application by spraying horizontally with a 50 percent overlap on returns and doubling back with a vertical stroke with a 50 percent overlap on returns.

B. After painting of masonry/plaster, replace (stencil) security numbers per plot plan. See Owner representative for locations.

3.13 STAINED AND VARNISHED SURFACES

A. Where existing varnish has been removed and woodwork is to be enameled, woodwork shall be primed as specified under "Priming" and then given three coats. First coat of enamel undercoat, second and third coats of gloss or semi-gloss enamel.

B. Interior woodwork having a stain and varnish finish shall have areas where painter's finish has been removed, build-up to match adjoining finish with stain, filler for open wood grained wood and varnish. Exposed surfaces of woodwork shall be given two coats of interior gloss varnish, and one coat of interior varnish, semi-gloss finish or as specified herein. Between coats of varnish, surfaces shall be sanded with #220 sandpaper or steel-wool and dusted clean.

C. Where exterior gloss varnish for finish coat is specified, method of build-up shall be as specified above, however exterior gloss varnish shall be used in lieu of interior varnish. When following items are to receive varnish, three coats of exterior gloss varnish shall be used on: window stools, sash, screens, exterior doors/frames, wood handrails, balustrade caps, chalk rails, toilet stall doors, fixed benches, sash poles, stair treads, risers, bleachers, base and base shoe.

D. Remove stains from varnished surfaces before refinishing.

E. Colored varnish is prohibited.

3.14 SASH PUTTY

A. Loose sash putty must be removed and replaced. Rough, uneven or otherwise deteriorated sash putty shall be sanded smooth or re-puttied.

B. Sash putty and sealing compound shall be painted with same number of coats as specified for woodwork.

3.15 PUTTY

A. Holes, open joints of siding, woodwork and sash glazing shall, after surrounding areas have been prepared as specified above, be knife puttied. On stained woodwork, putty must be colored to match stain. Puttying shall be done after first coat of paint or varnish has been applied. Latex sealant may be used on open joints and woodwork. Putty and/or sealant shall be spot primed before finish coat

is applied. Putty or latex sealant shall not be used on handball walls or basketball backstops.

## 3.16 FILLER ON SIDING AND WOODWORK

A. Checked and cracked portions of siding and woodwork (after surrounding areas have been prepared as specified above) shall be primed, smoothed with an exterior filling compound and then sanded smooth when dry. Filled areas must be spot primed. Filler shall not be used on handball walls or basketball backstops.

## 3.17 MIXING AND APPLICATION

A. Colors of coatings shall be as directed by Project Inspector.

B. Three coats of paint shall be applied as follows:

1. First coat: primer or undercoat, shall be white.

2. Second coat shall be factory tinted in range of 10 percent to 15 percent lighter or darker than finish coat.

3. Third coat shall be factory tinted to color selected, but allowing for tint variations in more than one color for application to different surfaces. Color combinations in rooms and for surfaces shall be varied in accordance with color letter.

C. Any number of colors may be used on any portion of work. Owner reserves right to change colors before work is started in an area or on a particular surface.

D. Various colors may require additional coats of paint complete coverage. No additional allowances will be made. Contractor is responsible for consulting color letter and knowing color and coverage.

E. Surfaces to be finished and each coating shall be separately inspected by Project Inspector and checked for mill thickness. The requirements are two mils each coat wet and three mils dry after three coats. Notice that such work is ready for inspection shall be given to Project Inspector. Should such notice not be given before succeeding coat is put on, finish applied shall be removed or an additional coat shall be applied, as directed by Project Inspector. Allow at least one day drying time between coats for exterior work or as directed by Project Inspector for proper drying.

F. Roof work to be painted Q8-38T Birch Gray.

## 3.18 PAINT ROLLERS, BRUSH AND SPRAY

A. Paint rollers may be used on interior plaster, drywall, masonry, stucco and plywood surfaces, nap not to exceed 1/2 inch in length.

B. First coat on wood overhang and ceilings must have material applied by roller and then must be brushed out in a professional manner to leave surface free of imperfections. Finish coat may be sprayed.

C. Other surfaces shall have coatings applied with brushes of proper size.

D. Spray work shall be permitted only on radiators, acoustic plaster, acoustic tile, fiberboard, wood fiber acoustical units, masonry and plaster or as directed by Project Inspector.

3.19 PRIMING

A. Surfaces from which paint finish have been removed down to original wood or metal surfaces shall be primed as follows:

1. Wood shall be sealed or primed with a non-water borne material on both sides and edges. Wood completely sealed with a non-water borne material shall be top coated with a water borne material as specified herein. Finish material (water borne) shall be compatible with non-water borne primer per manufacturer's recommendations. Hardwood shall be filled and stained to an even color.

2. Galvanized Metal: Clean oil and foreign material from surfaces. Apply vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.

3. Ferrous and non-ferrous metal: Use a primer for ferrous and non-ferrous metal.

3.20 FIRE AND LIFE SAFETY EQUIPMENT

A. Cal-OSHA requires the following equipment be painted as follows:

1. Gas Mains and Valves shall be painted "gun metal gray" (medium gray)

2. Fire Valves and Raisers shall be painted OSHA's "safety red"

3.21 DOORS

A. Painted or refinished exterior wood or metal must be finished on both sides and edges with three coats of paint consisting of first coat of primer, second coat and third coat of exterior high gloss enamel.

B. Where doors open into rooms or spaces having different finishes, communicating doors must have edges finished according to industry standard or as directed by Project Inspector.

1. Strike edge of door shall be same color as inside face of door.

2. Hinged edge of door shall be same finish as outside face of door.

C. Exterior hardwood doors and frames where varnish finish has been removed shall be built-up to match adjoining finish with stain, filler and one coat of exterior varnish. Then surfaces, including edges must be given specified number of coats of exterior varnish as detailed under "Stain and Varnish Finish."

3.22 PORCH, STAIRS AND HANDRAILS

A. Unpainted, painted and mastic coated porch floors, treads, risers and thresholds of building shall be prepared as specified herein and painted with two coats of a non-skid porch and deck paint.

B. Handrails must be finished same as specified for exterior wood doors using exterior gloss enamel.

3.23 THRESHOLDS

A. Painted thresholds to be prepared, primed, and receive two coats of a non-skid porch and deck paint.

B. Natural finished wood thresholds to be prepared and receive three coats of a high gloss varnish.

3.24 INTERIOR WOODWORK

A. Wood surfaces shall be prepared to receive new finish as specified under Preparation of Surfaces, 3.04 and Priming, 3.19

3.25 ENAMEL FINISH

A. Interior woodwork having an existing enameled finish must have areas where painter's finish has been removed and where spackling has been done in repairing defects in surface, built-up with undercoat. Wood surfaces shall then be given one coat of undercoat, a second coat and third coat of finish paint to match room finish. Paint shall be applied as specified under "Colors and Number of Coats."

B. Unpainted plaster surfaces to receive an enamel finish, must receive four coats of paint. First coat of pigmented sealer, second coat of enamel undercoat, third and fourth coats of gloss or semi-gloss enamel as specified herein.

C. Previously painted interior surfaces must have patching and places where painted finish has been removed, built up with one coat of a pigmented sealer. Then entire surface including patching shall be given one coat of an enamel undercoat, a second and third coat of gloss or semi-gloss enamel as specified herein.

3.26 CABINETS

A. Cabinets without doors, cabinets with glass doors and pegboard doors shall have interiors finished to match surrounding or adjacent work, unless interior has a stained finish.

B. Cabinets having solid panel doors must have exposed parts of cabinet and surfaces of doors finished to match room finish. Shelf edges shall be finished same as room finish.

3.27 PLYWOOD WALLS

A. Interior plywood walls having an existing stain finish must have exposed plywood joints machine sanded to remove projecting edges and prepared as follows:

B. Voids between wall surfaces and wood or metal trim or battens, and nail holes must be filled with putty, sealant, or a exterior filler, sanded smooth when dry and dusted clean.

C. Interior walls must be sanded smooth, brushed off and finished with three coats of paint. First coat of enamel undercoat, second and third coats of semi-gloss enamel.

D. Exterior plywood shall be cleaned and finished with three coats. First coat shall be undercoat. Second and third coats shall be gloss enamel. Exterior plywood may be sprayed if it is then back-rolled.

## 3.28 INTERIOR PLASTER AND DRYWALL WORK - WALLS, CEILINGS, ETCETERA

A. Where ceilings are specified to be painted, beams, cornices, coves, ornamental features, staff work, plaster grilles, etcetera shall be included.

B. Ceilings shall be white, unless otherwise noted. Includes classrooms, storage rooms, offices, arcades, etcetera. Boiler room and fan room ceiling color shall match adjacent walls.

C. Where walls are specified to be painted, columns, staff work, piers, returns, reveals, soffits of stairs, both sides of stair railings, soffits and reveals of windows and other openings shall be included.

D. Grease, ink spots and marks of indelible pencils shall be completely removed by use of water and abrasive soap powder without injury to finished surface.

E. First coat may be thinned per paint manufacturer's recommendation with a thinner prepared specifically for material used. Coats shall be flowed on freely. First coat must be prepared so as to stop suction, and should any dead spots appear, they shall be touched up before next coat is applied. The last coat shall be a uniform surface, free of defects.

## 3.29 AREAS REQUIRING ENAMEL

A. Interior and Exterior Enamel – Gloss

Woodwork, walls and ceilings (except acoustic tile or acoustic plaster or as otherwise specified herein) in following areas:

1. Physical Education and Gym Buildings.

2. Cafeteria: Except student and teachers' dining rooms.

3. Shops.

4. Miscellaneous Rooms: Toilet rooms, custodian closets, storerooms, boiler and mechanical rooms.

5. Kitchen Complex: Color; Eastwind – Fill and seal cracks and voids.

B. Interior and Exterior Enamel – Semi-Gloss

Woodwork, walls and ceilings (except acoustic tile or acoustic plaster or as otherwise specified herein) in following areas:

1. Administrative offices.

2. Faculty lounges and auditoriums.

3. Walls and surfaces in rooms or areas specified to receive an enamel finish and not herein specified to receive a Gloss Enamel finish, shall have a finish coat of Semi-Gloss Enamel.

C. Interior masonry, brick and concrete surfaces having an existing painter's finish shall be finished same as specified for interior plaster and drywall. Concrete pan ceilings may be sprayed as directed by Project Inspector.

## 3.30 UNPAINTED METAL

A. Unpainted bronze, brass, copper work, window grilles, stairways, handrails, chain-link fences, stainless steel, open metal shelving, porcelain metal faced cabinets and aluminum will not be painted, unless otherwise specified.

## 3.31 PAINTED METAL

A. Exposed structural steel, miscellaneous/ornamental iron, sheet metal work, guards, steel sash, gates, painted aluminum, basketball rims, etcetera shall have surfaces cleaned and prepared as specified. The areas from which original painter's finish has been removed shall be spot primed with metal primer to match adjoining surfaces and then surfaces shall be given a prime coat of metal primer, second and third coats as specified. Copper pipe shall be painted with one coat of enamel undercoat per manufacturer's recommendation, a second and third coat of enamel as specified.

B. Painted ornamental iron rails and gates, metal ceilings (metal decking, etcetera) stairs, pipe columns, and pipe rails shall be prepared and finished as specified herein. Metal decking and metal roll-up doors may be sprayed.

C. Exterior surfaces (except bottom) of exterior metal storage container, including both sides of door(s) and edges shall be prepared, primed and painted. Exterior metal storage container(s) must be sprayed.

## 3.32 METAL COVERED DOORS, RADIATORS

A. Metal Covered Doors: Bare metal must be primed with a metal primer. Doors and edges shall then be painted with one coat of enamel undercoat, a second coat and third coat of exterior gloss enamel as specified.

B. Fly screens and hardware cloth of copper, bronze or galvanized wire must be painted with one coat of exterior enamel.

C. Radiator guards must be removed, painted with three coats of enamel to match adjoining surface and replaced after radiators have been painted

3.33 LIGHT FIXTURES

A. Exterior/interior light fixtures (other than plated or bronzed) and bells to be primed and then painted with two coats of an enamel to match adjoining surface. Bell identification plates must have paint removed and be kept clean.

B. Metal stacks and kilns must, after preparation, receive two coats of aluminum paint or a heat resistant material. Minimum required heat resistant coating shall be rated to not less than 700 degrees F.

C. Cafeteria equipment: Metal work in cafeteria, kitchen and serving counters in student and faculty dining rooms having an existing aluminum paint finish must be cleaned as specified and given two coats of an aluminum paint.

3.34 FLAG AND LIGHT POLES

A. Clean by wire-brushing and sanding to remove foreign debris, loose paint, rust, etcetera from pole, platform, steps, cage area and mechanical fixtures related to those areas. After removing loose paint, feather-edge sand surrounding areas of existing finish. Remove dust. Exclude electrical fixtures.

B. Spot-prime with a quick-dry metal primer.

C. Apply by brushing first and second coat of aluminum paint per manufacturer's time recommendation for re-coating.

E. Rolling or airless spraying is not permitted on flag and light poles.

3.35 METAL SHOWERS AND DRESSING ROOMS

A. The exterior and interior surfaces of metal shower stalls and dressing rooms in locker and shower rooms to be cleaned of rust, dirt, grease and loose materials. Where painters finish has been removed, area to be built-up with a coat of rust preventive primer and then surfaces shall be given first, second and third coats as specified under "Areas requiring enamel."

3.36 PAPER TOWEL BOXES

A. Metal boxes for paper towels, toilet paper and metal sanitary boxes, must be enameled with two coats of gloss white enamel.

3.37 METAL SURFACES

A. Clean by wire-brushing and sanding to remove foreign debris, loose paint, rust, etcetera. After removing loose paint, feather-edge sand surrounding areas of existing finish. Remove dust.

B. Exterior bare metal surfaces shall be primed with a metal primer then painted with a first coat of enamel undercoat, then a second coat and third coat of exterior gloss enamel.

C. Hardware having a painted finish shall have paint removed. Doors closers shall be finished with a leather brown or aluminum paint. Aluminum paint shall be applied in sanitary areas such as cafeterias, dining rooms and toilet rooms. Leather brown (N-2501) paint shall be used in other areas.

3.38 METAL LOCKER FINISH

A. Following items in physical education and gymnasium buildings, (including related physical education buildings, such as locker rooms, field houses, etcetera and buildings having lockers or like equipment) must be washed with a silicone wax remover, rinsed and have scratches, marks and defacements "feathered out." Then surfaces must be given one coat of a primer and two finish coats of a gloss metal enamel finish. Surfaces must be free from sags, runs, over-spray, etcetera.

1. Interior and exterior surfaces of faculty and students' metal lockers, metal shelving for drawers of wire baskets and drawer type lockers or as specified.

2. Plated hardware, locks, name plates and number tags shall be masked off and adjoining surfaces shall be protected while spraying. If locks are to be removed, they shall be removed and reinstalled by Owner.

3.39 PAINTING OF MECHANICAL WORK

A. Exposed heating, ventilating, air conditioning, plumbing, electrical equipment, apparatus, piping, ducts, coverings, etcetera shall be cleaned, prepared and painted as specified herein for that item.

1. In finished areas, these items must be finished with one coat of primer and two coats of enamel to match adjoining wall or ceiling finish as specified herein.

B. Radiator branches, risers, returns, radiators, supports and other types of heating equipment in finished spaces shall be finished with three coats of paint to match adjoining finish as specified herein. Gas steam radiators shall be disconnected and reconnected by Owner.

C. Register faces and grilles, unless plated, must be given three coats of paint to match adjoining finish as specified.

D. Ventilators and interior sheet metal ducts must be treated and finished as specified for interior metal work.

E. Coverings on pipes in finished rooms must be finished same as adjoining wall or ceiling surfaces. Do not break surface of any wrapped pipes.

F. Labels on fire alarm systems, bells, pulls must be covered and kept intact. Fire alarm bells and pulls to be painted red gloss paint.

G. Covering on boilers, tanks, pipes, etcetera in boiler room and heater room must be primed and then finished with gloss enamel.

H. Valves, pipe hangers, flanges, unions, drain pipes, soil lines, exposed blow-off pipes, boiler fronts, smoke boxes, breeching, iron boiler bases, metal stacks, water column/pipe connections, damper regulators, manholes, safety valve connections, boiler appurtenances, etcetera, located in boiler room must be painted with two coats of a boiler paint as recommended by paint manufacturer.

I. Pumps, fans, fan housing, belt guards, including supports, motors, or other equipment, cover plated to sump pump, tank, manhole covers/rings mounted in floors including conduits and piping in boiler or fan rooms must be primed and then finished with two coats of gloss enamel as specified herein.

J. Mechanical work not specifically mentioned must be painted as specified for other work of same character.

K. Finished bronze, brass fittings, plated work, name plate and fusible links and chains must be cleaned of paint.

L. Pressure relief grilles with barometric dampers leading to a corridor or to exterior must be masked off before spraying any material.

M. Automatic sprinkler valves, gas meters and water meters must be painted as specified herein.

## 3.40 ELECTRICAL CABINETS

A. Front side of doors and exposed lip around doors to electrical cabinets in finished areas must be finished same as walls.

## 3.41 ACOUSTICAL PLASTER, TILE, FIBERBOARD

A. Acoustical plaster shall be cleaned to remove dust before painting.

B. Acoustical plaster shall be sprayed with One full Coat of Pigmented Sealer and then with two coats of Vinyl Wall paint, using "cross-off" method of spraying horizontally with a 50 percent overlap on each stroke and then doubling back with a vertical application with a 50 percent overlap on each stroke.

C. Acoustic tile, wood fiber units, and fiberboard shall receive not less than two coats of a fire retardant paint with a flame spread rating of not more than seventy-five feet on acoustical tile as evaluated by a tunnel test and shall be currently recognized by State Fire Marshals Office. Fire retardant shall be applied in strict conformity to manufacturer's directions. The above surfaces shall be sprayed using "cross-off" method. Before fire retardant coating is applied, ceiling shall receive one full coat of pigmented sealer. Kitchens shall receive two coats of gloss finish after receiving one full coat of a pigmented sealer.

## 3.42 CORK AND FIBERBOARD TACK BOARDS

A. Unpainted cork board panels used in connection with chalkboards or bulletin boards shall be finished with two coats of vinyl wall paint, factory tinted to match wall color and brushed on. Where cork strips are inset in head trim on chalkboards, cork shall be either varnished or enameled to match wood trim.

B. Painted cork board and unpainted or painted fiberboard panels shall be finished with two coats of vinyl wall paint.

C. Where cork or fiberboard has been painted with water-soluble paint, this water-soluble paint shall be washed off and allowed to dry. Surface shall then be painted as described above.

## 3.43 CHALKBOARDS

A. Chalkboards (including portable chalkboards) shall be washed with a strong solution of a cleaner as per manufacturer's recommendation, rinsed with clear clean water to remove chalk dust and allowed to dry. Fill joints and repair defects such as cracks and holes with paste wood filler colored with paint to match chalkboard. After filler has hardened sufficiently, repaired spots shall be sanded smooth to level of adjacent surfaces.

B. Apply two coats of chalkboard paint. Paint shall be liquid slate green as manufactured by Cal-Western, Rust-Oleum, Valspar, or equal. Sand between coats with #180 wet-or-dry sandpaper. Paint shall be rolled with a ¼ inch nap and brushed out.

C. After final coat, entire surface must be finished smooth with #400 wet or dry sandpaper.

D. Finished board must present a surface free of defects and brush marks and shall meet approval of Project Inspector.

E. Do not paint natural slate chalkboards.

## 3.44 LETTERING

A. Lettering and numerals on glass, fiberglass, plaster, and surfaces to be refinished shall be reproduced in original locations and will be of size, color and design as directed by Project Inspector and OAR. An experienced sign painter shall do lettering.

## 3.45 HARDWARE AND AUTOMATIC DOOR CLOSERS

A. Hardware having a painted finish must have paint removed. Doors closers must be finished with a leather brown or aluminum paint. Aluminum paint shall be applied in sanitary areas such as cafeterias, dining rooms, toilet rooms. Leather brown (N-2501) paint shall be used in other areas. Where both sides of doors are specified to be painted, door closers shall be included.

## 3.46 GAS FIRED UNITS

A. Gas fired units, which need to be disconnected and reconnected, and/or any unit that must be shut down, re-ignited and tested will be done by Owner personnel.

## 3.47 CLEANING

A. Glass, polycarbonate and fiberglass on interior and exterior where painting has been done shall be cleaned of paint and varnish. Glass, fiberglass and polycarbonate that are scratched or damaged by painting work, shall be replaced with material to match original.

B. Finished bronze, copper, brass fittings, plated work, name plate and fusible links and chains shall be cleaned of paint.

C. Before applying finish coat of material to exterior sash with security grilles, Contractor shall clean window panes with a cleaner.

D. Dispose of debris, waste or unused materials, off site. Use of school dumpsters is strictly prohibited.

E. Remove paint from hardware, including paint from previous painting.

F. Contractor shall free sash and leave it in an easy operating condition.

G. Glass, fiberglass and polycarbonate on exterior shall be traced neat and clean with no more than 1/16 inch overlay. Paint specks, smears or splatters shall be immediately removed and surface cleaned.

H. Rooms, Buildings, and Campuses must be cleaned of paint debris, including dust caused by painting project to approval of Project Inspector and OAR.

## 3.48 POST OCCUPANCY WORK

A. Two months after substantial completion, OAR will arrange a date and time when the Contractor must return to the site to check and free sashes that were painted so they are in proper operating condition.

END OF SECTION

# SECTION 10 1100

# VISUAL DISPLAY UNITS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Wall mounted marker boards.
2. Tack boards.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 09 9000 - Painting and Coating.

### 1.02 SUBMITTALS

A. Shop Drawings: Shop Drawings to indicate gages, profiles, sections of materials, details of construction, hardware, methods of attachment and/or anchoring, as applicable for specified materials.

B. Samples: Submit the following:

1. Three- inch by 5-inch marker board Samples, provide manufacturer's full range of colors.
2. Three- inch by 5-inch sliding tack board Samples, provide manufacturer's full range of colors and patterns.
3. Three- inch by 5-inch sliding bulletin board Samples, provide manufacturer's full range of colors.

C. Product Data: Submit manufacturer's technical data, product specifications, installation instructions, and other pertinent information as applicable for each product or material specified.

D. Test Reports: Submit certified laboratory test reports as applicable to indicate compliance with specified requirements.

### 1.03 QUALITY ASSURANCE

A. Manufacturer shall have been regularly engaged in the business of manufacturing markerboards for at least five years.

B. Comply with requirements and recommendations of applicable portions of Porcelain Enamel Institute - PEI 2.

### 1.04 PRODUCT HANDLING

A. Deliver materials to the Project site with manufacturer's labels intact and legible.

B. Protect marker boards before, during and after installation.

1.05 JOB CONDITIONS

A. Sequencing, Scheduling:

1. Coordinate with related Work of other sections including gypsum board and tackboards.

2. Do not install markerboards until paint is installed to surfaces concealed behind them.

1.06 SPECIAL PROJECT WARRANTY

A. Manufacturer shall provide a 50 year material warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. W.E. Neal Slate Co.

B. ABC School Equipment.

C. Claridge Inc.

D. Equal.

2.02 SYSTEM PERFORMANCE

A. System shall be comprised of factory assembled markerboards, in configurations and sizes indicated on the Drawings or as specified herein.

B. Laminations of panel components shall be by face sheet manufacturer.

2.03 MATERIALS

A. Wall-Mounted Marker boards

1. Dry marker boards shall be porcelain enamel steel manufactured to exceed the performance specifications for porcelain enamel S104 of the Porcelain Institute. Markerboards shall be capable of supporting papers by means of magnets. The writing surface shall resist wear and damage from shock and abrasion and shall not dent, shatter or crack. The surfaces shall retain original color, writing, and erasing qualities and shall not become glossy or shiny in normal use. The gloss variation of a surface shall not exceed three units when measured by a 45 degree gloss meter in accordance with the Porcelain Enamel Institute Bulletin 1-18 Gloss Test for Porcelain Enamels and ASTM C346.

2. Steel: Base metal shall be high quality enameling iron or steel of low metalloid and copper content, especially manufactured and processed for temperatures

over 1,400 degrees F. used in coating porcelain on steel units for Architectural purposes; minimum 24 gage.

3. Facing Surfaces:

   a. Board surfaces shall consist of the following:

      1) Primer coat, 0.0025 inch minimum thickness.

      2) Vitreous-porcelain writing surface coating of 0.0025 inch minimum thickness.

      3) The reverse side of the steel base sheet shall receive a ground coat of 0.0005 inch thickness and a spray coat of silicon.

      4) The panel edges at butt joints shall be porcelain enamel.

      5) Fuse cover and ground coats to the steel at the manufacturer's standard firing temperature, but at least 1,250 degrees F.

4. The dry marker board surfaced steel shall be factory laminated to 7/16 inch thick fiberboard core. A moisture blocking backing sheet shall be provided.

   a. Fiberboard Core shall be #45 pound particle board.

   b. Moisture Barrier Backer Sheet shall be minimum .015 aluminum or 28 gauge galvanized steel. Backer sheet shall be factory laminated to the core under pressure.

5. Lamination: The surface facing and the backing shall be bonded to the core material by means of a special flexible adhesive developed for this purpose with no unbonded area. The face and back shall not be removable without rupturing the core material. Panels shall not delaminate under normal use.

6. Joints: Where vertical joints occur, a 14 gage continuous concealed steel spline shall be fitted tightly into grooves in the core material. Factory rabbet to produce a smooth butt joint. Do not furnish exposed trim.

7. Edge Trim:

   a) Alloy 6063-T5, extruded, anodized satin finish aluminum.

8. Chalktray: Furnish manufacturer's standard continuous flat-ribbed or box-type aluminum chalktray with stained front and cast plastic end closures for each chalkboard and markerboad.

   a. Extend chalk tray to end of both vertical edges of the board.

   b. On flat-rib tray, provide 3/4 inch radius on corners and polish at ends.

9. Map Rail: Furnish map rail at the top of each unit, complete with the following accessories:

a. Display rail: Provide continuous cork display rail 2-inch wide, as indicated, integral with the map rail. Extend display rail to end of both vertical edges.

b. End stops: Provide one end stop at each end of the map rail.

c. Map hooks: Provide two map hooks with flexible paper holder clips for each 8 feet of map rail or fraction thereof.

d. Roller Map Bracket: Provide two for each 8 feet of map rail or fraction thereof.

D. Tack boards:

1. Tackwall panels shall consist of single-face layer of cloth-backed vinyl film, factory-bonded to 1/2 inch wood fiberboard backing; weight of vinyl film to be 20 ounces per lineal yard. Panel edges shall be beveled and wrapped; ends shall be square and unwrapped. Color as selected by Architect.

a. Vinyl film shall comply with FS CCC-W-408 A, Type 1; backing shall comply with FS LLL-1-535B, Class A. Finished panel shall have a Fire Hazard Classification of Class II in accordance with ASTM E84 tunnel test, as administered by California State Fire Marshal approved testing laboratory.

2. Adhesive shall be as recommended by manufacturer.

E. Flagpole Holder: Provide one per classroom where marker boards are provided.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Install markerboard, trim, map rail and marker tray in accordance with manufacturer's directions. Fasteners for assembly of trim and frame units shall be truss head aluminum or stainless steel self-tapping screws with double cadmium-plated finish.

B. Install panels after finish painting of wall surfaces has been completed and paint is cured. Install panels level, plumb and neatly assembled. Before Substantial Completion, trim shall be cleaned of dirt, finger-marks, and other foreign material.

C. Install panel guides, spacers, and panels at media wall cabinets.

### 3.02 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

### 3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

111001

END OF SECTION

# SECTION 10 1400
# SIGNAGE

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Interior and exterior accessibility, identification, directional and informational signs.
2. Parking signs.
3. School Name and Address Sign.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 08 1113: Hollow Metal Doors, Windows and Frames.
3. Section 08 1416: Wood Doors.
4. Division 09: Finishes.
5. Section 14 2423: Hydraulic Elevators.
6. Section 32 1313 - Site Concrete Work.

### 1.02 REFERENCES

A. ASTM International:

1. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
4. ASTM D4802 - Standard Specification for Poly (Methyl Methacrylate) Acrylic Plastic Sheet.

### 1.03 SUBMITTALS

A. Product Data: Submit material descriptions, finishes and color charts for each type of sign.

B. Shop Drawings: Submit Shop Drawings indicating sign style, lettering, overall dimensions and quantities. Submit floor plans showing locations for each sign.

C. Material Samples: Submit three samples illustrating full size sample sign, of type, style and color specified.

D. Manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

A. Pre-Installation Conference: Notify OWNER when signs are ready for installation. Arrange for conference at site. Do not proceed with installation until ARCHITECT'S approval of specific locations and methods of attachment has been obtained.

B. Provide signs from one manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site and protect from damage. Store until immediately prior to installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products of following manufacturers are acceptable and are the basis for intended design and quality.

1. H. Toji and Company.
2. Karman Ltd., Architectural Signs.
3. Vomar Products Inc.
4. ASI-Modulex, Inc.
5. Mohawk Sign Systems, Inc.
6. Accent Signage Systems.
7. The Gruenke Company.
8. Equal.

2.02 MATERIALS AND FABRICATION

A. Interior Sign Materials:

1. Substrate Panel: 1/8 inch minimum thick, integrally colored or clear, back foiled and back painted acrylic plastic, or laminated acrylic. Conforming to ASTM D4802; non-glare (matte), UV stable, suitable for interior and exterior use.

   a. Corners shall be radius.

   b. Edges shall be square and eased.

   c. Colors as selected by ARCHITECT from manufacturer's custom color range.

2. Aluminum Extrusions: In conformance to ASTM B221.

3. Fasteners:

   a. Stainless steel tamper-proof screws and plastic anchors.

   b. Signs mounted on fire-rated doors shall be secured with adhesive. Adhesives and sealants shall comply with the limits for VOC content.

B. Exterior Sign Materials:

1. Sign: ASTM B209 aluminum sheet, 0.080 inch thick with rounded corners of at least 1/8 inch radius and eased edges. White figure on a blue background; non-glare, high contrast signs. The blue shall be equal to color number 15090 in Federal Standard 595B.

2. Post: 2 by 2 inch galvanized steel tubing, weighing minimum of 4.31 pounds per foot and conforming to ASTM A500, Grade B, 3/16 inch thick wall thickness.

3. Concrete Post Footings: Refer to Section 32 1313, Site Concrete Work.

4. Fasteners: Stainless steel carriage bolts with tamper resistant nuts.

C. Characters and Symbols: Computer cut raised characters and graphics shall be cut from 1/16 inch integrally colored acrylic. Raised characters and graphics shall be inlaid 1/32 inch minimum into first surface of sign background, secured with adhesive so it cannot be removed without the use of tools. Raised characters and graphics shall have beveled, eased or rounded edges. Non-tactile text and graphics shall be applied to the second surface, and background color shall be applied to the second surface and protected with film or an additional backplate. Pictograms and other symbols including the International Symbol of Accessibility, which are included on signs with raised characters and Braille, are not required to be raised.

## 2.03 COMMUNICATION ELEMENTS AND FEATURES

A. Raised Characters Raised characters shall comply with CBC 11B-703.2.

1. Character Type: Characters on signs shall be raised 1/32 inch minimum above their background and shall be sans serif uppercase characters duplicated in Braille. Characters and Braille shall be in a horizontal format.

2. Character Height: Character height measured vertically from the baseline of the character shall be 5/8 inch minimum and 2 inch maximum based on the height of the uppercase letter "I".

3. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the letter "I".

4. Stroke Thickness: Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character.

5. Character and Line Spacing shall be in conformance to CBC 11B-703.2.7 and 11B-703.2.8.

6. Character Placement: Shall be placed in accordance to Paragraph 2.03, C below.

B. Visual Characters: Visual characters shall comply with CBC Section 11B-703.5. Characters shall be conventional in form, and shall be uppercase or lowercase or a combination of both, as indicated on the drawings. Characters shall not be italic, oblique, highly decorative, or of other unusual forms.

1. Finish and Contrast: Characters and their backgrounds shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or a dark characters on a light background.

2. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase of the letter "I".

3. Character Height: Minimum character height shall comply with CBC Table 11B-703.5.5.

4. Height from Finish Floor or Ground: Visual characters shall be a 40 inches minimum above the finish floor or ground

5. Stroke Thickness: Uppercase letter "I" shall be 10 percent minimum and 20 percent maximum of the height of the character.

6. Character and Line Spacing: Shall be in accordance to CBC 11B-703.5.8 and 11B-703.5.9.

C. Braille: Contracted Grade 2 Braille, conforming to CBC 11B-703.3. Braille characters shall be inlaid optically correct acrylic Raster beads into computer drilled holes in the panel surface.

1. Dimensions and Capitalization: Braille dots shall have a domed or rounded shape and shall comply with CBC Table 11B-703.3.1.The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.

2. Position: Braille shall be positioned below the corresponding text in a horizontal format, flush left or centered. If text is multi-lined, Braille shall be placed below the entire line of text. Braille shall be separated 3/8 inch minimum and 1/2 maximum from any other tactile characters and 3/8 inch minimum from raised borders and decorative elements.

D. Pictograms: In conformance to CBC 11B-703.6. Pictograms shall have a field height of 6 inches minimum. Characters and Braille shall not be located in the pictogram field.

1. Finish and Contrast: Pictograms and their field shall have a non-glare finish. Pictograms shall contrast with their field with either a light pictogram on a dark field or a dark pictogram on a light field.

2. Text Descriptors: Pictograms shall have text descriptors located directly below the pictogram field, and shall comply with CBC 11B-703.2, 11B-703.3 and 11B-703.4.

E. International Symbol of Accessibility (ISA): Shall comply with CBC 11B-703.7 and CBC Figure 11B-703.7.2.1. The ISA shall consist of a white figure on a blue background. The blue color shall be approximate to FS. 15090 in Federal Standard 595C.

F. Mounting Locations and Height: Signs with tactile characters shall be as indicated on the drawings and in conformance to CBC 11B-703.4.

1. Mounting Locations:

a. Identification signs for rooms and spaces shall be located on the wall adjacent to the latch side of the door, as one enters the room or space.

b. Signs that identify exits shall be located at the exit door when approached in the direction of egress travel.

c. Signs containing tactile characters shall be located so that a clear floor space 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

d. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.

e. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located at the inactive leaf.

f. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door.

g. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall.

2. Mounting height above finish floor or ground: Tactile characters on signs shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest Braille cells and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the highest line of raised characters.

## 2.04 ROOM IDENTIFICATION SIGNS

A. Room Identification Sign Types:

1. Room Identification Sign with Changeable Insert: 7 inches high by 9 inches wide, minimum, with 4 inches high by 9 inches wide window for name and title removable insert. Locate room name immediately below window, and centered above room number. Room name shall be raised characters 3/4 inches high minimum, and room number 1 inch minimum; and shall be accompanied with Braille indicators.

2. Room Identification Sign with Room Name and Room Number: 7 inches high by 9 inches wide, minimum. Room name shall be raised characters 3/4 inches high minimum, and room number 1 inch minimum; and shall be accompanied with Braille indicators.

3. Room Number Sign: 7 inches wide by 4 inches high; room number, 1 inch high minimum, raised character, accompanied by Braille indicator immediately bellow.

B. Room Identification Sign Requirements:

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Raised Characters and Proportions: Refer to paragraph 2.03.A.

3. Braille: Refer to paragraph 2.03.C.

4. Mounting Location and Height: Refer to paragraph 2.03.F.

## 2.05 RESTROOM SIGNAGE

A. Multiple-Occupancy restrooms shall be provided with geometric symbols and wall mounted pictograms with text descriptors.

B. Geometric Symbols:

1. Doorways leading to toilet rooms shall be identified by a geometric symbol complying with CBC Section 11B-703.7.2.6.

2. Male Restroom Door Symbol: 1/4 inch thick equilateral triangle with edges 12 inches long, with vertex pointing upward, the triangle symbol shall contrast with the door, either light on a dark background or dark on a light background. A male silhouette shall appear within the equilateral triangle in contrasting color to it.

3. Female Restroom Door Sign: 1/4 inch thick circle 12-inch diameter, the circle symbol shall contrast with the door, either light on a dark background or dark on a light background. A female silhouette shall appear within the equilateral triangle in contrasting color to it.

4. "All Gender" Restroom Door Sign (Single occupancy restrooms): 1/4 inch thick circle, 12-inch diameter with a 1/4 inch thick equilateral triangle with the vertex pointing upward superimposed on the circle and within the 12-inch diameter. Triangle and circle shall be of contrasting colors; the circle symbol shall contrast with the door. A female and male silhouettes shall appear within the equilateral triangle in contrasting color to it, and the word "restroom" shall appear on the bottom part of the circle in contrasting color to it.

5. Edges and Vertices on Geometric Symbols: Shall be eased or rounded at 1/16 inch minimum, or chamfered at 1/8 inch maximum. Vertices shall be radiused between 1/8 minimum and ¼ inch maximum.

6. Location and Mounting Height: Symbols shall be mounted at 58 inches minimum and 60 inches maximum above the finish floor or ground surface measured from the centerline of the symbol. Where a door is provided the symbol shall be mounted within one inch of the vertical centerline of the door.

C. Room Identification for Multiple-Occupancy Restrooms: Provide a 16 inch long by 6 inch tall room identification sign, including a pictogram of the International Symbol of Accessibility on a side. Restroom names shall be "Women" and "Men". Characters, Braille, pictograms and mounting locations and height shall be in conformance to Article 2.03.

D. Room Identification for Single-Occupancy Restrooms: Provide a 16 inch long by 6 inch tall room identification sign, including a pictogram of the International Symbol of Accessibility on a side. Text descriptor shall be "All Gender Restroom". Characters, Braille, pictograms and mounting locations and height shall be in conformance to Article 2.03.

2.06 RAISED CHARACTER AND BRAILLE EXIT SIGNS

A. Tactile Exit Sign Types:

1. "EXIT".

2. "EXIT STAIR DOWN".

3. "EXIT RAMP DOWN".

4. "EXIT STAIR UP".

5. "EXIT RAMP UP".

6. "EXIT ROUTE".

7. "TO EXIT".

8. "EXIT WITH ALARM", on exit doors with an alarm.

9. "EXIT ONLY" or "EXIT STAIR ONLY", on exit doors and stair exit doors which lock from outside and does not allow a return.

B. Sign Requirements:

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Raised Characters and Proportions: Refer to paragraph 2.03.A.

3. Braille: Refer to paragraph 2.03.C.

4. Mounting Location and Height: Refer to paragraph 2.03.F.

A. Tactile Floor Designation Sign in Stairways: Shall be located at the landing of each floor level, placed adjacent to the door on the latch side, to identify the floor level. At the exit discharge level, the sign shall include a raised five-pointed star located to the left of the identifying floor level. The outside diameter of the star shall be the same as the height of the raised characters.

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Raised Characters and Proportions: Refer to paragraph 2.03.A.

3. Braille: Refer to paragraph 2.03.C.

## 2.07 ACCESSIBILITY ENTRANCE SIGNS AND PATH OF TRAVEL DIRECTIONAL SIGNS

A. Entrance Sign: Provide at each building entrance an International Symbol of Accessibility sign. Signs shall be visible to persons along approaching pedestrian ways.

B. Directional Signs: Provide where indicated on the drawings with arrow indicators and International Symbol of Accessibility.

C. Signs shall be mounted on wall with lower edge between 48 inches and 60 inches above ground surface or finish floor. Pole mounted, overhead and projecting signs shall have the lower edge at least 80 inches from the ground surface or finish floor.

D. Sign shall comply with the following requirements.

1. Directional Signs: Refer to paragraph 2.03.B.

2. Symbol of Accessibility: Refer to paragraph 2.03.E.

E. No Smoking Sign: Provide at each building entrance. Reverse cut white vinyl sign with 4 1/2-inch high no smoking symbol, mounted on glass entry doors. Under No Smoking symbol, place words "No Smoking", ½ inch high minimum, San Serif upper and lower case characters.

2.08 PARKING SIGNS

A. Tow-Away Sign: 18 inches by 24 inches with rounded corners. Black graphics on white background, with lettering not less than 1 inch high. Sign to read: "UNAUTHORIZED VEHICLES PARKED IN DESIGNATED ACCESSIBLE SPACES NOT DISPLAYING DISTINGUISHING PLACARDS OR SPECIAL LICENSE PLATES ISSUED FOR PERSONS WITH DISABILITIES WILL BE TOWED AWAY AT THE OWNER'S EXPENSE. TOWED VEHICLES MAY BE RECLAIMED AT [Insert location] OR BY TELEPHONING (213) 625-6631".

B. Parking Space Identification Sign: 12-inch by 18-inch with rounded corners. White reflectorized graphic on dark blue background, and shall display an 8-inch high International Symbol of Accessibility per paragraph 2.03.E.

1. Additional language or an additional sign below the International Symbol of Accessibility shall state I "Minimum Fine $250".

2. Signs identifying van accessible parking spaces shall contain additional language or an additional sign with the designation "Van Accessible".

C. Signs shall be mounted on posts at head of each accessible parking with lower edge 80 inches minimum above ground surface, or mounted on walls at a minimum height of 60 inches from ground surface.

2.09 OCCUPANT LOAD SIGNS

A. Provide maximum occupancy load signs. Post in a conspicuous place near the main exit or exit access doorway from the room or space of rooms and areas indicated in the drawings.

B. Minimum size: 4 inches high by 8 inches wide, 7/8 inch high letters, 1 inch high numerals.

C. Sign to read: "MAXIMUM OCCUPANCY LOAD XXX". XXX - Indicate occupant load shown on drawings.

2.10 EMERGENCY GAS SHUT OFF SIGN

A. Exterior Signs: Painted aluminum, suitable for outdoor use, with pre-drilled mounting holes.

1. Sign Size: Minimum 4 inches high by 8 inches wide.

2. Color: Subsurface white text, red background.

3. Character Height: One inch high.

4. Text:

a. Building gas shut-off valve(s): "BUILDING EMERGENCY GAS SHUT-OFF VALVE."

2.11 LADDER TO ROOF SIGN

A. 1/8 inch thick acrylic.

1. Sign Size: Minimum 4 inches high by 8 inches wide.

2. Color: Subsurface white text, red background.

3. Character Height: One inch high.

4. Text: "LADDER TO ROOF".

2.12 FIRE SPRINKLER RISER ROOM SIGN

A. Locate one sign at each fire sprinkler riser room door as indicated in drawings.

B. Text: Sign to read "Fire Sprinkler Riser Inside", white characters, 1 inch high on red background.

C. Sign Requirements:

1. Raised Characters and Proportions: Refer to paragraph 2.03.B.

2. Braille: Refer to paragraph 2.03.C.

3. Mounting Location and Height: Mounted on the door, refer to paragraph 2.03.F.

2.13 EVACUATION PLANS

A. 1/8 inch thick acrylic sign consisting of a floor plan depicting the building layout. The words "EVACUATION PLAN" shall be included at the top of the plan in minimum 3/4 inch high characters. Interior spaces shall be indicated by shading and corridor shall be prominent and displayed in white. Sign shall provide emergency procedures information and instructions to be followed in the event of an emergency, and shall be printed with a minimum of 3/16-inch high non-decorative lettering providing a sharp contrast to the background. Emergency procedures information shall include, but not be limited to the following:

1. Viewer location symbol, "YOU ARE HERE" in the plan. Plan shall be oriented in each sign as required to correspond with the users view.

2. Location of exits with arrows leading to them.

3. Location of fire extinguishers.

4. Fire department emergency telephone number 911.

B. Mount signs so that bottom edge is no more than 48 inches from the finish floor, and within close proximity to the building, stair or elevator entrance. The reader must be able to approach the sign without encountering any obstacle.

C. Evacuation Plans Requirements:

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Character Height and Proportions: Refer to paragraph 2.03.B.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts condition of existing surfaces.

### 3.02 METHODS OF INSTALLATION

A. Interior Identification Signs and Interior Directional Signs:

1. Fasten to wall with four tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.

2. When concealed installation is specified, install backplate to wall as above. Fasten sign to backplate with very high-bond double-faced tape.

3. For installation on glass, fasten sign to glass with very high bond double faced tape. On opposite side of glass, anchor matching backplate to glass with very high-bond double-faced tape.

B. Geometric Signs: Geometric toilet room signs shall be fastened to doors with three tamper-proof oval-head counter-sunk screws.

C. Exterior Post Mounted Directional Signs: Size of required footing shall be as indicated on the drawings. Fasten sign with tamperproof stainless steel bolts.

D. Exterior Wall Mounted Identification Signs and Directional Signs:

1. Aluminum signs: Fasten to wall with 4 tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.

a. Cement Plaster, Brick, or Masonry: Provide plastic anchors. For signs greater than 640 square inches use Leadwood Screw Anchors, concrete fasteners 1WSA 10112, or equal.

b. Chain Link Fence: Fasten with 9 gage hog rings, King Hughes Fasteners 5150DG50, or equal, with 11/16 inch opening at each corner of sign.

c. Wrought Iron Fence: Install at each corner with 3/16 inch stainless steel rivets.

2. Acrylic signs: Install backplate to wall as indicated above. Fasten sign to backplate with high-bond double-faced tape and silicone.

E. Exterior Building Sign:

1. Each letter shall be furnished with a minimum of three cast mounting lugs on backside, drilled and tapped to receive installation bolts.

2. Letters shall be installed according to manufacturer's method PMC-1. Letters shall be installed ¾ inch away from wall surface, by an aluminum sleeve spacer.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.04 PROTECTION

A. Protect Work of this section until Substantial Completion.

3.05 EQUIPMENT SIGNAGE

A. PROVIDE SIGNAGE AS REQUIRED BY CFC 509 AND CBC 914.2.

# SECTION 10 2123

# CUBICLE AND SHOWER CURTAINS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Shower Curtains: Shower Locker Rooms and Special Education Classrooms.

B. Related Requirements:

1. Division 01 - General Requirements.

### 1.02 REFERENCES

A. Design Requirements:

1. Shower curtains shall be colorfast, washable, mildew resistant, anti-static, anti-microbial, and dimensionally stable.

2. Shower curtains shall be inherently and permanently flame-resistant and shall bear manufacturer's label indicating flame-resistance.

B. Regulatory Requirements:

1. Provide certificates indicating the fabrics have been flame-proofed in accordance with requirements of the laws of the State of California and the City or County of Los Angeles and rules of the State Fire Marshal. Flame proofing shall of a quality to withstand multiple washings without destroying its properties.

### 1.03 SUBMITTALS

A. Provide the following submittals in accordance with Division 01:

1. Material Samples: Submit manufacturer's standard color Samples of each type of fabric proposed for installation.

2. Certificates: Submit certification materials have been flame proofed as required by regulatory authorities having jurisdiction.

3. Manufacturer's Installation Instructions: Submit manufacturer's conditions and limitations of use. Include instructions for installation.

4. Manufacturer's Maintenance Data: Provide manufacturer's care instructions for cleaning and maintaining curtains.

1.04 QUALITY ASSURANCE

A. Qualifications of Installer: Work shall be performed by installers with a minimum of five years experience installing work of similar scope and complexity.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Tubular Specialties Manufacturing.

B. InPro Corporation.

C. A.R. Nelson.

D Salsbury Industries (Mailboxes.com)

E. Equal.

2.02 MATERIALS

A. Carrier, Nylon Drop Hooks, and Connector Cord: Nylon wheeled carrier, with 18-inch nylon drop and hook, and with 1/8-inch polypropylene eyeleted connector cord. Hooks to be spaced 6 inches on center.

B. Curtain: Staph-CHEK Linen, Herculite Fabrics, A. R. Nelson, or equal. Machine washable curtain with anti-microbial and flame resistant properties.

2.02 FABRICATION

A. Curtain Size: Minimum width to be 15 percent longer than cubicle track. Height to be determined by floor to ceiling height with curtain hanging on 18-inch drop hooks and finished approximately 12-inch above the floor.

B. Grommets: Rust proof grommets, placed 6-inch on center, on reinforcing tape.

C. Fabric Color: To be selected by Architect from full range of manufacturer's standard colors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the Work before installation. Proceed with installation only after unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install shower rods and curtains in accordance with manufacturer's installation instructions to provide an installation that is plumb, level, and complete.

B. Hang curtains straight and even, employing hand sewing of seams and hems as necessary for a carefully matched installation with even hems, smooth operation and quiet mechanism movement.

C. Install curtains to prevent abrasion damage caused by rubbing the track and/or adjacent surfaces.

D. Upon completion, draperies and equipment shall be left in noiseless and in proper operating condition.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

# SECTION 10 4413

# FIRE EXTINGUISHERS AND CABINETS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Fire Extinguishers and Cabinets.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 04 2200 - Concrete Unit Masonry.
3. Section 06 1000 - Rough Carpentry.
4. Section 09 2900 - Gypsum Board.

### 1.02 SUBMITTALS

A. Shop Drawings: Indicate materials, sizes, anchorage, and installation details.

B. Product Data: Submit manufacturer's product literature, indicating product characteristics.

C. Material Samples: Submit manufacturer's standard cabinet color Samples for selection by Architect.

### 1.03 QUALITY ASSURANCE

A. Installer shall be manufacturer trained and certified to install the Work of this section.

### 1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's wrapping to protect items.

B. Store items in a dry, enclosed area.

## PART 2 - PRODUCTS

### 2.01 FIRE EXTINGUISHERS AND CABINETS

A. Location: Fire extinguisher cabinets and fire extinguishers shall be installed where indicated on Drawings or as required by authorities having jurisdiction.

B. Manufacturer: Fire extinguishers and cabinets shall be manufactured by one of the following:

1. Potter-Roemer.

2. J. L. Industries.

3. Larsen's Manufacturing.

4. Modern Metal Products.

5. Waltrous.

6. Amerex (fire extinguishers).

7. Equal.

C. Fire Extinguisher Type: Provide a legally appropriate rechargeable fire extinguisher for every fire extinguisher cabinet and as otherwise indicated.

1. Classrooms, Corridors and Offices, Cabinet mounted:

a. Type ABC multi-purpose dry chemical with UL rating 2A:10B:C, 5 pound size, also with red glossy polyester coated steel cylinder, pressure gage, hose and horn. Maximum Height: 15 ¼-inch. Maximum Cylinder Diameter: 4 ½-inch.

4. LAN Rooms, Bracket mounted:

a. Type Halotron 1, EPA approved "Clean Agent" with UL rating 5B:C, 5 pounds size, with red glossy polyester coated steel cylinder, discharge nozzle and bracket. Maximum Height: 15 ¼-inch. Maximum Cylinder Diameter: 6-inch. Provide 16 gage steel bracket by same manufacturer as extinguisher.

5. Electrical, Boiler, Fan, Heating Rooms, bracket mount:

a. Type $CO_2$, carbon dioxide gas, with UL rating 5B:C. 10B:C, (5 pounds with red glossy polyester coated aluminum cylinder, hose and horn. Maximum Height, (not exceed): 17 ¾-inch. Maximum Cylinder Diameter, (not to exceed): 5 ¼-inch.

D. Fire Extinguisher Requirements:

1. Design Specification:

a. Finish: Corrosion and impact resistant red epoxy.

b. Valve Stem Assembly: Metal, reusable, connects to cylinder by threaded pipefitting, aluminum or steel siphon tube, and shatter resistant plastic face gage.

c. Gage (if applicable) to Indicate: "Recharge," "fully charged (195 PSI)," and "over charge."

d. Pull Pin: Metal, reusable and securely fastened to unit with metal, aluminum chain or very heavy plastic line approximately 4 ½-inch long.

e. Mechanical Operation: Pistol grip, heavy duty metal handle (plastic not permitted), and shall be operated by a grip and squeeze lever.

2. Manufacturer Identification/Information: Manufacturer's name, date manufactured, model number, U.L. approval seal and number, contents operating instructions, Fire Marshall approval, etcetera shall be identified on the Fire Extinguisher.

3. Warning and First Aid Label: Fire extinguisher must indicate all standard warnings concerning breathing, eyes, skin and ingestion. Provide emergency and first aid procedures.

4. Repair Parts: The manufacturer and/or their representative shall maintain within the Los Angeles Metropolitan Area an adequate stock of replacement parts, available for immediate delivery.

5. Warranty:

a. Manufacturer shall provide a five year material warranty.

b. Installer shall provide a five year installation warranty.

6. Material Safety Data Sheet: Provide an MSDS sheet with every shipment.

E. Fire Extinguisher Cabinet: Potter-Roemer cabinets are listed as the standard of quality, products by other listed manufacturers are acceptable.

1. Fully recessed cabinet: Provide fully recessed, square trim edge cabinet with ½ inch projection:

a. Potter-Roemer Fire Extinguisher Cabinet 7020:

1) Door Style: either DVL (Duo Vertical Panel with lock) or E (Center Break Glass with lock), glass to be clear tempered safety glass.

2) Cabinet Door and Frame: Cold rolled steel electrostatically applied, thermally fused polyester coating with recoatable white finish.

3) Identification Lettering: Cabinet door to be furnished with die cut lettering indicating "FIRE EXTINGUISHERS" in contrasting color to cabinet finish, and either vertical or horizontal lettering depending upon door style.

2. Semi-recessed cabinet: Provide semi-recessed, square trim edge cabinet with 1 1/4 inch to 2-inch projection:

a. Potter-Roemer Fire Extinguisher Cabinet 7022:

1) Door Style: either DVL (Duo Vertical Panel with lock) or E (Center Break Glass with lock), glass to be clear tempered safety glass.

2) Cabinet Door and Frame: Cold rolled steel with electrostatically applied, thermally fused polyester coating with recoatable white finish.

3) Identification Lettering: Cabinet door to be furnished with die cut lettering indicating "FIRE EXTINGUISHERS" in contrasting color to cabinet finish, and either vertical or horizontal lettering depending upon door style.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Installation shall be in accordance with manufacturer's recommendations.

B. Cabinets shall be installed plumb and level, where indicated on Drawings, at heights required by authorities having jurisdiction.

### 3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

### 3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

**SECTION 10 51 26**
**PLASTIC LOCKERS AND BENCHES**

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Solid plastic lockers and locker room benches.

1.2 RELATED SECTIONS

A. Division 06 Section "Rough Carpentry" for locker anchorage.

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
2. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. US Federal Government:

1. U.S. Architectural & Transportation Barriers Compliance Board. Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG).

C. GREENGUARD Environmental Institute (GREENGUARD):

1. GREENGUARD certified low emitting products.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets for each type of product indicated include fabrication details, description of materials and finishes.

1. Product Test Reports: When requested by Architect, provide documentation indicating compliance of products with requirements, from a qualified independent testing agency.

B. Shop Drawings: Include overall locker dimensions, floor plan, elevations, sections, details, and attachments to other work. Include choice of options with details.

C. Samples for Selection: Furnish samples of manufacturer's full range of colors for initial selection.

D. Samples for Approval: Furnish a physical sample of the material in the selected color.

1. Size: 6 by 6 inch (102 by 102 mm) in type of finish specified.

1.5 INFORMATIONAL SUBMITTALS

A. Installation instructions.

B. Warranty: Sample of special warranty.

1.6 MAINTENANCE SUBMITTALS

A. Operation and Maintenance Data.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in the manufacture of plastic lockers. Manufacturers seeking approval must submit the following in accordance with Instructions to Bidders and Division 01 requirements:

1. Product data, including test data from qualified independent testing agency indicating compliance with requirements.
2. Samples of each component of product specified.
3. List of successful installations of similar products available for evaluation by Architect.
4. Submit substitution request not less than 15 days prior to bid date.

B. Installers Qualifications: An experienced Installer regularly engaged in the installation of lockers for a minimum of 3 years.

C. Source Limitations: Obtain plastic lockers and trim accessories from single manufacturer.

D. Accessibility Requirements: Comply with requirements of ADA/ABA and with requirements of authorities having jurisdiction.

E. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 100 or less.

2. Smoke-Developed Index: 450 or less.

F. Indoor Environmental Quality Certification: Provide certificate indicated that products have been certified under the following programs, or a comparable certification acceptable to Owner:

1. GREENGUARD Indoor Air Quality Certified.
2. GREENGUARD Certified for Children and Schools.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver plastic lockers to the site until the building is enclosed and HVAC systems are in operation. Deliver plastic lockers in manufacturer's original packaging. Store in an upright condition. Protect plastic lockers from exposure to direct sunlight.

B. Ship plastic lockers fully assembled.

C. Lift and handle plastic lockers from the base not the sides.

1.9 WARRANTY

A. Special Manufacturer's Warranty: 20 year against rust, delamination or breakage of plastic parts under normal use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of Bradley Corporation, Menomonee Falls, WI 53051, (800)272-3539, fax (262)251-5817; Email info@BradleyCorp.com; Website www.bradleycorp.com.

1. Provide basis of design products or comparable products of one of the following approved manufacturers:

a. [Specifier: Insert name of manufacturer of comparable product.]
b. Submit requests for substitution in accordance with Instructions to Bidders and Division 01 General Requirements.

B. MATERIALS

1. High Density Polyethylene (HDPE): 30 percent pre-consumer recycled content polyethylene thermoplastic formed under high pressure into solid plastic components.
2. High Density Polyethylene (HDPE): 100 percent pre-consumer or post-consumer recycled content polyethylene thermoplastic formed under high pressure into solid plastic components.
3. Stainless-Steel Sheet: ASTM A 666, Type 304.
4. Fasteners: Tamper-Resistant Fasteners: Stainless steel torx-head screws.

a. Locker Connectors: No. 10-24 sex bolts.
b. Anchors: Type and size required for secure anchorage.
c. Drilled-in-place Masonry Anchors: Minimum 1/4 by 1-3/4 inch (6 by 44 mm) screws.

2.2 STANDARD PLASTIC LOCKERS

A. Basis-of-Design Product: **Bradley LENOXLOCKER**.

B. Locker Configuration: One Tier.

C. Locker Dimensions

1. Height, Nominal: 72 inch (1829 mm).
2. Width: 12 inch (305 mm).
3. Depth: 18 inch (457 mm).

D. Material: HDPE plastic, 30 percent recycled material.

E. Sides, Tops, Bottoms, Dividers, and Shelves: 3/8 inch (10 mm) thick HDPE plastic with smooth finish.

F. Locker Shelves: 3/8 inch (10 mm) HDPE plastic, mortised into sides and back.

G. Locker Tops: Flat top.

H. Doors: Fabricate from a single piece 1/2 inch (13 mm) HDPE plastic.

1. Doors and Frame: 1/2 inch (13 mm) thick HDPE plastic with matte texture finish with cross-hatch mesh pattern.

2. Logo on Door: Indicate accessible lockers.
3. Handle: ADA/ABA Compliant handle fabricated from injection molded plastic.
4. Locks: Standard hasp.

5. Hinges: Continuous piano hinges, .05 inch/18 gauge (1.27 mm) thick type 304 stainless steel fabricated to wrap around edges of door and frame and attached with stainless steel tamper-resistant screws.

a. Finish: Powder coated to match color of locker.

6. Latch Bar: Full-height latch bar constructed of 1/2 inch (13 mm) HDPE plastic secured to locker with stainless steel tamper-resistant screws.

I. Color: As selected by Architect from manufacturer's full range.

J. Accessories:

1. Coat Hooks: Black polycarbonate double hook.
2. End Panels: 1/2 inch (13mm) thick, with color and finish matching locker body.
3. Filler Panels: 1/2 inch (13 mm) HDPE filler panel, with color and finish matching locker body, attached with 3/8 inch (10 mm) thick HDPE solid plastic angle bracket.
4. Wall Hooks: Black powder coated, cast zinc hook two per locker.
5. Number Plate: White acrylic with black film coating, laser etched with number specified. Provide one per locker.
6. Locker Base: 1 inch (26 mm) solid HDPE plastic, with black or finish matching locker body, 4 inch high.
7. Coat Rod: Schedule 40 PVC with plastic pole sockets and stainless steel tamper-resistant screws.

2.3 PEDESTAL BENCH

A. Basis-of-Design Product: **Bradley LENOXPEDESTAL.**

B. Pedestal Bench Dimensions

1. Length: as shown on drawings.
2. Width: 12 inch (305 mm) and 24 inch (610 mm).
3. Height: 18-1/2 inch (470 mm).

C. Materials:

1. Bench Top: 1-1/2 inch (39 mm) thick HDPE plastic, 30 percent recycled material, with matte texture finish.
2. Pedestal: Black anodized aluminum with welded aluminum flanges top and bottom.

D. Color: As selected by Architect from manufacturer's full range.

2.4 LOCKER FABRICATION

A. Fabricate locker box from a single sheet of HDPE solid plastic with corners fused together. Weld frames and shelves to box assembly. Provide all welded construction of locker parts without dovetail slots or metal fasteners. Add welded gussets in single tier full height lockers.

B. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

C. Hardware Attachment: All hinges, handles, hasps, hooks, latch bars, and locks attached with tamper-resistant screws.

D. Provide ventilated panels where indicated.

E. Continuous Base: Set toe clearance 3 inch (76 mm) from locker front. Notch end caps for ease of installation.

F. Continuous Sloping Tops: Fabricated in lengths indicated, without visible fasteners at splice locations; and finished to match lockers.

G. Filler Panels: Fabricated in unequal leg angle shape; finished to match lockers.

H. Finished End Panels: Fabricated with 1/2 inch (13 mm) wide edge dimension, configured to conceal fasteners and holes at exposed ends of plastic lockers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lockers in climate controlled environment, shielded from direct sunlight.

B. General: Install on floor or other firm support. Install level, plumb, and true.

1. Position locker base per approved shop drawing. Using fasteners provided by manufacturer, anchor base sections to the floor.
2. Attach filler pieces to lockers with male-female sex bolts.
3. Position first locker according to submittal layout. Square and plumb the locker using concealed shims. Secure the locker to the wall at the top and bottom of the locker. Position second locker next to first, square and plumb to align the tops and bottoms; and temporarily clamp lockers together. Drill four holes through the sides of the lockers and connect lockers using sex bolts provided by manufacturer.

C. Accessories: Fit exposed connections of trim, fillers, and closures together to form tight, hairline joints, with concealed fasteners and splice plates furnished by locker manufacturer. Install as indicated on approved shop drawings.

1. Coat Hooks: Attach with at least two fasteners.
2. Coat Rods: Attach at height indicated.
3. Identification Plates: Identify plastic lockers with approved identification numbers. Attach plates to each locker door.
4. Filler Panels: Attach with concealed fasteners.
5. Sloping Tops: Attach sloping-tops to plastic lockers, with closures at exposed ends.
6. Finished End Panels: Attach at ends indicated.

D. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, spaced as indicated. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

3.2 FINAL CLEANING

A. Clean locker interior and exterior surfaces.

B. Remove packaging and construction debris and legally dispose of off-site.

END OF SECTION

# SECTION 11 5213

# PROJECTION SCREENS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Manually operated projection screens.
2. Electrically operated projection screens.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 09 2216 - Non-Structural Metal Framing.
3. Section 09 2900 - Gypsum Board.
4. Section 09 5113 – Acoustical Panel Ceilings.
5. Electrical: Division 26.

### 1.02 SUBMITTALS

A. Shop Drawings: Submit details for installation, attachment, and electrical requirements.

B. Product Data: Submit manufacturer data indicating model and size of units.

C. Installation Instructions: Submit manufacturer's installation instructions.

D. Certification: Submit GREENGUARD certification for conformance to UL 2818.

### 1.03 QUALITY ASSURANCE

A. Coordinate installation of ceiling mounted recessed screens with ceiling installation.

B. Conduct a pre-installation meeting on Project site to review procedures, details and interfacing with adjacent materials and finishes.

C. Screen fabric shall be GREENGUARD certified for Chemical Emissions for Building Materials, Finishes and Furnishings in conformance to UL 2818.

D. References:

1. UL 2818 - Standard for Chemical Emissions for Building Materials, Finishes and Furnishings.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened undamaged packaging with identification labels intact.

B. Store protected from exposure to harmful weather and in dry, ventilated conditions at temperature less than 80 degrees F.

C. Handle projection screens with care in order to prevent damage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Da-Lite Screen Co., specified as basis of design.

B. Draper Inc.

C. Elite Screens Inc.

D. Stewart Filmscreen Corp.

E. Equal.

2.02 MANUALLY OPERATED PROJECTION SCREENS

A. Heavy duty, manually operated retractable projection screen mounted on ball bearing rigid steel spring roller.

B. Screen Case: Steel or aluminum case sized to suit projection screen and furnished with end caps concealing roller ends. Steel case shall be powder coated painted, white or black, as selected by ARCHITECT.

C. Screen:

1. Nominal Diagonal / Aspect Ratio: 109 inches, 16:10.

2. Approximate Viewing Area Dimensions: 57-1/2 inches high by 92 inches wide.

3. Surface: Matte white, flame retardant, mildew resistant, washable fiberglass fabric with black borders.

D. Accessories:

1. Installation Hardware:

a. Surface Mounted: Manufacturer's mounting brackets and fasteners for attachment to framing through wall or ceiling.

b. Recessed: Manufacturer's hanger rods, angles, brackets and fasteners for attachment to underside of structure.

2. Recessed Projection Screens Trim Kit: Integral trim or manufacturer's ceiling trim flange surrounding the perimeter of the screen case.

3. Pull Rod: One manufacturer's standard pull rod for each projection screen.

E. Products:

1. Ceiling or Wall Mounted: Da-Lite Screen Co., Model C, or equal.

2. Recessed: Da-Lite Screen Co., Advantage manual with CSR with integral ceiling trim.

2.03 ELECTRICALLY OPERATED PROJECTION SCREENS

A. Electrically operated UL listed retractable, with rigid metal roller. Motor, 3-wire type, with automatic thermal overload protection, integral interlocking gears, capacitator, electric brake, and preset adjustable limit switches for the up and down positions. Projection screens shall bear UL label.

1. Voltage and Frequency: 115 V, 60 Hz.

2. Electric Controls: Wall mounted switch with integral junction box incorporated into screen housing.

B. Screen Case:

1. Steel or aluminum case sized to suit projection screen and furnished with end caps concealing roller ends. Steel case shall be powder coated painted, white or black, as selected by ARCHITECT.

2. Bottom of case shall be furnished with piano type hinges and connected to drive mechanism so that it opens and closes automatically with lowering and raising of screen.

C. Screen:

1. Nominal Diagonal / Aspect Ratio: 109 inches, 16:10.

2. Approximate Viewing Area Dimensions: 57-1/2 inches high by 92 inches wide.

3. Surface: Matte white, flame retardant, mildew resistant, washable fiberglass fabric with black borders.

D. Accessories:

1. Installation Hardware: Manufacturer's mounting brackets and fasteners for attachment to wall or ceiling.

a. Surface Mounted: Manufacturer's mounting brackets and fasteners for attachment to framing through wall or ceiling.

b. Recessed: Manufacturer's hanger rods, angles, brackets and fasteners for attachment to underside of structure.

2. Recessed Projection Screens Trim: Manufacturer's integral trim or manufacturer's ceiling trim flange surrounding the perimeter of the screen case.

E. Products:

1. Ceiling or Wall Mounted: Da-Lite Screen Co., Cosmopolitan, or equal.

2. Recessed: Da-Lite Screen Co., Cosmopolitan with recess kit, or Equal.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Install screens according to manufacturer's installation instructions and Shop Drawings.

B. The finished installation shall be free from damage, blemishes or other defects impacting appearance or operation, with operating panels in alignment with adjacent ceiling, and be uniform in plane and appearance.

### 3.02 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

### 3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

# SECTION 11 5215

## VIDEO / MULTIMEDIA PROJECTOR MOUNTING PLATES

### PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Provide and install video/multimedia mounting plates for OFOI projector. Coordinate with related Work for proper location of projector mounts and distance to screen based on the projector used.

B. Related Requirements:

1. Division 01 - General Requirements
2. Section 09 2900 – Gypsum Board.
3. Section 09 5113 – Acoustical Panel Ceilings.
4. Section 11 5213 – Projection Screens.
5. Division 26 – Electrical.

1.02 SUBMITTALS

A. Submit Shop Drawings indicating locations, dimensions, and anchoring details.

B. Submit Product data and installation instructions.

1.03 QUALITY ASSURANCE

A. Coordinate installation of mounting plates with ceiling, electrical and data work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Project site in original sealed packages.

B. Handle in a manner to prevent damage during storage and installation.

1.05 WARRANTY

A. Manufacturer shall provide a 5 year material warranty.

B. Installer shall provide a two year installation warranty.

### PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Video/Multimedia Projector Ceiling Mount Plate with all associated hardware as manufactured by Peerless Industries, Bretford, Chief, or equal.

1. Suspended Ceiling Attachment Plate: Peerless Model CMJ 455 Variable Position Suspended Ceiling Plate.

2. Hard Lid Ceiling Attachment Plate: Peerless Model ACC 570 Round Structural / Finished Ceiling Plate.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Install per manufacturer's installation instructions.

B. Place ceiling tray and filler tray into ceiling opening. Attach ceiling tray to filler tray with four bolts. Hook turnbuckles into ceiling tray.

C. Mounting plates shall be suspended from structural members by wires, at an angle of 15 degrees. If needed, angle may be increased up to 45 degrees. Use eye-bolts for connections to wood joists, expansion anchors for concrete and tie-wires to open web metal joists. Wires shall be fastened with at least six turns as tightly as possible.

D. Connect wires to turnbuckles with at least six tight turns. Tension the wires by adjusting the turnbuckles.

### 3.02 ADJUSTING

A. Adjust turnbuckles as needed so projector mounting plates are set flush with ceiling.

### 3.03 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

### 3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

# SECTION 12 2113

# WINDOW BLINDS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Window vertical blinds and accessories.

B. Related Requirements:

1. Division 01 - General Requirements.

### 1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings including plans, elevations, and fastening details.

B. Product Data: Submit manufacturer's data and catalog cuts.

C. Material Samples: Submit manufacturers color Samples and catalog cuts.

### 1.03 QUALITY ASSURANCE

A. Qualifications of Manufacturer: Manufacturer shall have been regularly engaged in the business of manufacturing vertical blinds for five years.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

A. Century Blinds Inc. Contract

B. Hunter Douglas Contract.

C. Levolor Contract.

D. Equal

### 2.02 VERTICAL BLINDS

A. Materials:

1. Headrails shall be 6063-T5 aluminum alloy. Headrail shall have a high quality ivory baked enamel finish or clear anodized finish.

2. Carriers shall be a 7/16" polyacetal plastic body and shall traverse on rolling self-lubricating plastic wheels aligned in channel runway. Carriers shall have a self- aligning mechanism designed to prevent damage to the vanes or carriers when over-rotated. Carrier stems shall be molded clear non-yellowing polycarbonate. Carriers shall be attached to each other with a nylon strap. Stem

of carriers shall be centered allowing headrail to be reversed. Spacing of vanes shall be 3 1/8" (for 3 1/2" vanes).

3. Rotation System shall be wand operated and use a lead carrier control unit. Traverse shall be controlled by a fiberglass wand attached to the lead control unit (also used for rotation).

4. Pinion (tilt rod) shall be four pronged 6063 T5 aluminum alloy.

5. Vanes shall be made of 100% PVC with UV inhibiters. Vane material shall meet NFPA-701 federal fire rating. 3 ½" vanes shall be 22 gage.

6. Valance shall consist of a curved vane fitted into valance channel with square corners and continuous dust cover. Valance shall be attached to headrail using acetyl plastic clips.

7. Installation brackets shall be made of zinc plated steel. Headrail mounting clips shall be made of spring steel. Installation hardware shall facilitate easy installation and removal of headrail. Provide extension brackets where required by field conditions.

8. Blinds shall be manufactured in full compliance of ANSI/WCMA Standards.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Verify that openings are ready to receive Work.

B. Ensure that structural blocking and supports are installed and suitable for attachment and support of Work.

### 3.02 INSTALLATION

A. Install blinds as detailed in locations indicated. Furnish and install necessary parts and perform adjustments required to provide a complete, rigid and properly operating installation. Corners and surfaces shall be free from burrs and sharp edges.

B. Unless otherwise indicated, blinds shall be top-suspended, installed singly over each sash and between jambs or mullions, heads set flush with wall or trim, and shall not interfere with operation of sash or sash hardware. Where recessed installation is not indicated, blinds shall be installed over the casing, overlapping casings not less than 1 3/8-inch at sill, 1 ¾-inch at jambs and one inch at top.

C. Brackets shall securely fasten head rails and shall provide for easy removal of head rails. Blinds shall be securely fastened by sheet metal screws through back into head rails at side channels.

D. Brackets shall be fastened with galvanized or cadmium-plated pan-head all-purpose screws, oval-head wood screws, toggle bolts or appropriate fasteners.

### 3.03 INSTALLATION TOLERANCES

A. Maximum Variation of Gap at Perimeter: 1/4 inch.

B. Maximum Offset from Level: 1/8 inch.

3.04 ADJUSTMENT AND CLEANUP

A. Adjust for smooth operation.

B. Before Substantial Completion, clean the blinds in accordance with manufacturer's recommendations.

C. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 26 0000

GENERAL PROVISIONS

PART 1 - GENERAL

A. The general contract provisions apply to this section and take precedent over this section in case of conflict.

1.1 GENERAL PROVISIONS

A. This division supplements the applicable requirements of other divisions.

1.2 DEFINITIONS

A. For the purposes of Division 260000, the following definitions apply:

1. Provide: Furnish and install.
2. Indicated: As shown on the drawings or specified herein.
3. Circuit Designation: Panel designation and circuit number, i.e., LA-13.
4. Approved equal: Approved by the engineer of record as equal in his sole determination.

1.3 SCOPE OF WORK

A. The Specifications for Work of Division 260000 include, but are not limited to the following sections:

26 0000–General Provisions
26 0030–Tests and Identification
26 0050–Basic Electrical Materials and Methods
26 0060–Minor Electrical Demolition for Remodeling
26 0080–Technical Services Division Start-Up Service
26 0111–Conduits
26 0112–Plug-In Strips
26 0114–Cable Trays
26 0115–Wireways
26 0116–Wire Basket Cable Trays
26 0118–Duct Bank
26 0120–Conductors
26 0122–Medium Voltage Cables
26 0130–Electrical Boxes
26 0133–Terminal Cabinets

26 0140–Wiring Devices
26 0142–Nameplates and Warning Signs
26 0163–Distribution Panelboards
26 0164–Branch Circuit Panelboards
26 0170–Disconnects
26 0190–Support Devices
26 2450–Grounding
26 2480–Motor Starting Equipment and Wiring
26 2510–Lighting Fixtures
26 4721–Fire Alarm and Detection System
26 4745–Networking & Data Communications
26 4750–Cabling and Distribution System
26 4901–General Control Devices
26 4920–Motor Control

B. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this division, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all divisions for related work required to be included as work under this division.
2. General provisions for electrical work.
3. Site observation including existing conditions.

C. Related Work Specified Elsewhere but included in the scope of work:

1. Motors and their installation.
2. Control wiring and conduit for heating, ventilating and air conditioning.

D. Work Not In Contract (N.I.C.):

1. Telephone instruments.

E. Coordination

1. The following supplements are additional General Requirements pertaining to work of this Division. Provisions of Division 1 - General Requirements shall remain in effect.
   a) Coordinate work of various sections of Division 26 and 27.
   b) Coordinate work of this Division 26 with work of Divisions 2 through 25.

## 1.4 REFERENCE STANDARDS

A. American National Standards Institute (ANSI).

B. Association of Edison Illuminating Companies (AEIC).

C. Electrical Testing Laboratories (ETL).

D. Illuminating Engineering Society (IES).

E. Institute of Electrical and Electronic Engineers (IEEE).

F. Insulated Cable Engineers Association (ICEA).

G. National Electrical Manufacturers Association (NEMA).

H. National Fire Protection Association (NFPA).

I. Underwriters Laboratories, Inc. (UL).

J. California State Fire Marshal (CSFM).

K. California Energy Commission (CEC) Title 24.

## 1.5 QUALITY ASSURANCE

A. Regulations: All the electrical equipment and materials, including their installations, shall conform to the following applicable latest codes and standards:

1. California Electric Code, Latest Adopted Edition (NEC), 2014 unless a more current version has been adopted.
2. Local and State Fire Marshal.
3. Occupational Safety and Health Act (OSHA).
4. Requirements of the Serving Utility Company.
5. Local Codes and Ordinances.
6. Requirements of the Office of the California State Architect (OSA).
7. California Administrative Code, Title 8, Chapter 4, Industrial Safety Orders.
8. California Administrative Code, Title 24.
9. County of Ventura Codes and Regulations.

B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply. In instances where plans and specifications are at variance or conflict the most restrictive requirement shall apply. Contractor shall be responsible for all his associated work and materials and also the work and materials of related or affected trades.

C. Contractor's Expense: Obtain and pay for all required bonds, insurance, licenses, and pay for all taxes, fees and utility charges required for the electrical work.

D. Testing and Adjustment:

1. Perform all necessary tests required to ascertain that the electrical system has been properly installed, that the power supply to each item of equipment is correct, and that the system is free of grounds, ground faults, and open circuits, that all motors are rotating in the proper directions, and such other tests and adjustments as may be required for the proper completion and operation of the electrical system. Contractor shall provide a copy of all test reports to prove these tests have been performed.

2. If, during the course of testing, it is found that system imbalance is in excess of 20%, rearrange single-pole branch circuit in lighting and receptacle panels to bring system balance to within 20% on all phases. Record all such changes on the typewritten panelboard schedule and submit a summary of changes to the Engineer on the record drawings.

## 1.6 SUBMITTALS

A. Procedure: In accord with the Submittal Section.

B. Shop drawings: Detailed shop drawings for the following equipment:

1. Distribution panelboards.
2. Branch circuit panelboards.
3. Circuit breaker.
4. Cable trays and accessories.
5. Switchboards.
6. Ground fault protection.
7. Fire alarm system.
8. Motor control centers.
9. Contactors and cabinet.
10. Low voltage cabling riser diagram

C. Product data: Detailed manufacturer's data for:

1. Cable tray.
2. Cabinets.
3. Concrete pull boxes.
4. Disconnects.
5. Individually mounted circuit breakers.
6. Transformers.
7. Lighting fixtures and associated equipment including control.
8. Electric door strikes.
9. Audio systems.

D. Test results for the following:

1. Fire alarm system.
2. Circuit breakers.
3. Grounding systems.
4. Cables.

E. Include sufficient information to indicate complete compliance with Contract Documents. Include illustrations, catalog cuts, installation instructions, drawings, and certifications. On each sheet show manufacturer's name or trademark.

F. Operating, maintenance, and instruction data for:

1. Switchboards.
2. Ground fault protection.
3. Alarm and detection.
4. Audio equipment.

G. Instruction materials:

1. Provide at the time of personnel instruction period three bound copies of instruction manuals for the systems as listed in Subparagraph 1.04.A.4.f.
2. Include the following (minimum) information in each copy of instruction manual:
   a) Manufacturers' names and addresses including phone numbers.
   b) Serial numbers of items furnished.
   c) Catalog cuts, exploded views and brochures, complete with technical and performance data for all equipment, marked to indicate actual items furnished and intended use.
   d) Recommended spare parts.

## 1.7 OWNER'S PERSONNEL INSTRUCTIONS

A. Prior to completion of the contract, and at the Owner's convenience, instruct verbally and demonstrate to the Owner's personnel, the operation of the systems as listed under operating, maintenance, and instructional data and/or emergency generator, automatic transfer switch and fire alarm annunciator panel.

## 1.8 CLEANING

A. Clean exterior surfaces and interiors of equipment and remove all dirt, cement, plaster and other debris. Protect interior of equipment from dirt during construction and clean thoroughly before energizing.

B. Clean out cracks, corners and surfaces on equipment to be painted. Remove grease and oil spots so that paint may be applied without further preparation.

1.9 PROJECT RECORD DOCUMENTS - Prepare the following and submit to the engineer before final acceptance:

A. Mark Project Record Documents daily to indicate all changes made in the field.

1. In addition to general requirements of Project Record Drawings, indicate on drawings, changes of equipment locations and ratings, trip sizes, and settings on circuit breakers, alterations in raceway runs and sizes, changes in wire sizes, circuit designations, installation details, one-line diagrams, control diagrams and schedules.

B. Use green to indicate deletions and red to indicate additions.

1. Use the same symbols and follow the same drafting procedures used on the Contract Drawings.

C. Locate dimensionally off of contract drawings all underground conduit stubbed-out for future use, underground feeder conduits, and feeder pull box locations using building lines by indicating on the Project Record Drawings.

D. At the completion of underground conduit installation provide underground conduit record documents to owner's representative.

E. Two copies, in binder form, of all test results as required by these specifications - 260030.

F. Two copies of local and/or state code enforcing authorities final inspection certificates.

G. Two copies, in binder form, of electrical equipment cut sheets, manufacturer's installation instructions, warranty certificates, and product literature for all products utilized on project.

1.10 SERVICE INTERRUPTIONS AND UTILITY

A. Coordinate with the Owner the interruption of services necessary to accomplish the work.

B. Coordinate with the utility company all work associated with power and communications distribution systems and service entrance equipment.

C. Electrical contractor shall supply temporary power for all trades.

1.11 MINIMUM SPECIFICATION REQUIREMENTS (ALL WORK OF DIVISION 260000)

A. As a minimum Specification requirement, all materials and methods shall comply with applicable governing codes.

## 1.12 PENETRATION SEALING

A. Seal penetration through exterior walls and fire rated walls, floors, ceilings, and roofs with 3M Firestopping materials of fire rating capacity rated per architectural plans and UBC or prevailing building code requirements.

## 1.13 PLACING EQUIPMENT IN SERVICE

A. Do not energize or place electrical equipment in service until all interested parties have been duly notified and are present or have waived their rights to be present. Where equipment to be placed in service involves service or connection from another contractor of the owner, notify the owner in writing when the equipment will be ready for final testing/connection and schedule to the owner's satisfaction of this service connection. Notify the owner two weeks in advance of the date the various items of equipment will be complete.

## 1.14 OWNER-FURNISHED ITEMS

A. Pick up Owner-furnished items and handle, deliver, install, and make all final connections.

1. Assume responsibility for the items when consigned at the storage facility or in the field in accord with requirements of the Contract Documents.

## 1.15 ELECTRIC ITEM LOCATION

A. Electrical drawings are generally diagrammatic. Verify equipment sizes with shop drawings and manufacturers' data and coordinate location layout with other trades. Notify owner and engineer of any changes of location requirements prior to installation and obtain engineer's written acceptance for all changes/revisions.

## 1.16 DEMOLITION

A. Scope: Provide and perform demolition, preparatory and miscellaneous work as indicated and specified, complete.

B. Principle Items of Work:

1. Demolition and removal of existing electrical conduit, wiring and equipment required to complete the project.
2. Preparation of the existing building to receive or connect the new work.
3. Miscellaneous demolition, cutting, alteration, and repair work in and around the existing building necessary for the completion of the entire project.
4. Disconnecting and reconnection of electrical equipment as required by the construction modifications.

C. Existing Conditions: Make a detailed survey of the existing conditions pertaining to the work. Check the locations of all existing structures, equipment and wiring (branch circuiting and controls). Provide at bid time any exclusions for existing conditions work.

D. Salvage and Disposal: All removed material other than items to be reused shall be returned to the owner or disposed of in accordance with instructions from the owner's representative. Disposal shall be done in accordance with EPA and governing body requirements and regulations. Contractor shall pay all fees and charges for disposal.

## 1.17 ELECTRICAL WORKMANSHIP REQUIREMENTS

A. It is required that all electrical construction of this Contract be performed by journeyman electricians. All journeyman electricians shall have a minimum of 4 years of apprenticeship training and hold a valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards. This is intended to mean that a person who does not hold a valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards will not be permitted to do electrical work of any kind that involves new construction, nor make repairs, alterations, additions, or changes of any kind to any existing system of electrical wiring, apparatus, equipment, light, heat, or power.

B. Contractor may employ electrical helpers or apprentices on any job of electrical construction, new or existing, when the work of such helpers or apprentices is performed under direct and constant personal supervision of a journeyman electrician holding a valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards.

1. Each journeyman electrician will be permitted to be responsible for quality of workmanship for a maximum of eight helpers or apprentices during any same time period, provided the nature of work is such that good supervision can be maintained and quality of workmanship achieved is the best, as expected by Owner and as implied by the latest edition of the California Electrical Code (National Electrical Code with State of California amendments).

2. Before each journeyman electrician commences work, deliver to Owner at project site a photocopy of journeyman's valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards.

C. All electrical systems shall be installed in a neat and workmanlike manner per National Electrical Code requirements and ANSI approved NEIS National Electrical Installation Standards.

1.18 DESIGN CHANGES AFTER AWARD OF BID

A. When a change in the quantity or size of conductors is made, the conduit size will remain in accordance with that indicated in the original contract drawings rather than the drawing symbol conduit table. When code permits, provide conductor insulation 'THWN' where required to maintain conduit fill conformance with the National Electrical Code.

1.19 MATERIAL AND EQUIPMENT SUBSTITUTION

A. Where two or more trade names or manufacturers are mentioned, selection shall be made from the group listed for use in the base bid. The order in which names are listed is not intended to be any indication of preference.

B. Where a single manufacturer, product or trade name is stated, that manufacturer, product or trade name shall be used in the base bid. The use of other manufacturers, products or trade names will be considered by the engineer of record (unless that product is indicated for no substitution) only if submitted as alternate items at the time of bidding, with evidence of equality and a statement of net price difference as compared to the specified item. After approval by the engineer of record, the architect and owner reserve the right to review such submittals and to determine the acceptability for use.

C. Equipment other than that specified will be accepted only when written approval is given by the engineer of record and architect, in accordance with Division 1.

D. The contractor shall be held responsible for all physical changes in piping, equipment, etc. resulting from equipment substitution and likewise bear any increased cost of other trades in making said substitution. Approval by the architect of equipment other than that specified does not relieve this contractor of this responsibility.

1.20 REQUESTS FOR INFORMATION

A. The contractor shall submit all requests for information (RFI's) typewritten on the attached form.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

LUCCI & ASSOCIATES, INC.
CONSULTING ELECTRICAL ENGINEERS
3251 Corte Malpaso # 511, Camarillo, CA 93012
Voice: 805-389-6520 Fax: 805-389-6519

# REQUEST FOR INFORMATION (RFI)

**RFI Number:** _____

Project Name: _____ Bid/Project No. _____

Requested By: _____ Date: _____

Issued To: _____

CC: _____

_____ Drawing Number Detail _____ Specification Section _____ Page

**YOUR RESPONSE TO THE FOLLOWING REQUEST FOR INFORMATION IS REQUESTED ASAP**

**REQUEST FOR INFORMATION:**

**CONTRACTOR'S COMMENTS:**

**RESPONSE:**

**Potential Cost Impact:**_____ **Schedule Impact:**_____ **Urgent:**_____ **Additional Pages Attached:**_____

**THE FOLLOWING RESPONSE IS PROVIDED FOR CLARIFICATION PURPOSES ONLY - THIS IS NOT A CHANGE ORDER!**

_____ **Date:** _____
*Engineer's Signature*

**By:**

_____ _____ _____
*Name* *Title* *Organization*

SECTION 26 0030

TESTS AND IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Tests and identification.

1.2 SUBMITTALS

A. In accord with Section 260000.

B. All test values.

1.3 DEFINITION

A. Circuit designation: This term is construed to mean panel designation and circuit number; i.e., LA-13.

1.4 TESTS AND ADJUSTMENTS

A. Prior to energizing, test all systems. Test to ensure systems are:

1. Free from short circuits and grounds.

2. Free from mechanical and electrical defects.

B. Circuit breakers (main and feeder circuits that are adjustable only): Testing and adjustments of circuit breakers shall be made by Owner-approved independent testing firm. Testing firm shall meet the criteria for full membership of the International Electrical Testing Association (NETA).

1. Visual and mechanical inspection:

a) Compare nameplate data with Drawings and Specifications.

b) Inspect circuit breaker for correct mounting.

c) Operate circuit breakers to ensure smooth operation.

d) Inspect case for cracks or other defects.

e) Verify tightness of accessible bolted connections and/or cable connections by calibrated torque-wrench method in accord with manufacturer's published data.

f) Inspect mechanism contacts and arc chutes in unsealed units.

2. Electrical tests:

a) Perform a contact-resistance test.

b) Perform an insulation-resistance test at 1000 volts dc from pole-to-pole and from each pole-to-ground with breaker closed and across open contacts of each phase.

c) Perform adjustments for final settings in accord with coordination study supplied by Owner.

d) Perform long-time delay time-current characteristic tests by passing 300% rated current through each pole separately with ground fault functions defeated.

e) Determine short-time pickup and delay by primary current injection.

f) Determine ground-fault pickup and time delay by primary current injection. This test shall be done after short time and instantaneous testing are complete.

g) Determine instantaneous pickup current by primary injection using run-up or pulse method.

h) Verify correct operation of any auxiliary features such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free, and anti-pump function.

3. Test values:

a) Record all test values "as-found" and "as-left" conditions and provide certified copies to Owner.

b) Compare microhm or millivolt drop values to adjacent poles and similar breakers. Investigate deviations of more than 25%. Investigate any value exceeding manufacturer's recommendations.

c) Insulation resistance shall not be less than 100 megohms.

d) Trip characteristic of breakers shall fall within manufacturer's published time-current characteristic tolerance band, including adjustment factors. Circuit breakers not within tolerance band shall be tagged defective.

C. Adjust all installation and equipment for their intended use and rating as defined in manufacturer's specifications and test procedures.

1. Contractor recognizes and understands that the show and character lighting, electronic control equipment, special effects, etc., must have a minimum 4-week adjustment period, occurring after installation and verification of said equipment, for each area or facility. Contractor shall provide appropriate personnel (i.e., electricians, carpenters, laborers) as necessary to support Owner during this adjustment period. Adjustment is defined as orientation of adjustable lighting fixtures, installation of color filters to any lighting fixtures requiring same, location adjustment 6 ft., control system setting including programming of control functions, system debugging (i.e., cross-wiring). Contractor shall assume day and night activities during the adjustment period.

D. Adjust transformer taps under full load operating conditions, to provide nominal operating voltages at the loads.

E. Hi-Pot test procedures:

1. Test 25 pair, 10 pair, or 4 pair, multi-conductor cables installed in conduit, in the following manner and in presence of Owner:

a) Special Owner-furnished equipment: Hi-Pot Cable Tester & Adapters Model 500.

b) Perform visual inspection to verify:

1) Proper cable identification tags are installed.

2) Connector is installed properly and screws and clamps properly tightened.

3) Elco connector is keyed correctly.

c) Continuity and Hi-Pot:

1) Using the Hi-Pot cable tester and all necessary adapters:

(a) Set tester on 1500 VDC, S.C. (short continuity), 50 pos.

(b) Hook up cable to "Y" adapter if testing a cable in a conduit or tray.

(c) Attach turnaround Elco test plug to opposite end of cable to be tested.

(d) Attach ground lead of tester to center metal hold-down screw of Elco connector.

(e) Push reset button until tester dial points to zero. Release reset button.

(f) Press start button. Tester will step through all pairs and stop at bottom half of dial. This is because when using the turn-around plug, tester is checking 2-pair runs.

d) Error indication:

1) No-error dial will make 1/2 revolution and stop. Press reset button. Tester will step to top position.

2) Fault lights "short" or "open" dial will stop at a pin location indicated on face plate of dial. See chart on side of unit to give correct pin assignments. Press start buttons. Tester will step on through. If another "short" or "open" is found, tester will halt again.

e) Fault correction:

1) When a fault is indicated, remove both connector shells of cable under test and check indicated pins.

2) Repair fault using procedure steps as specified in Section 16121, paragraph "Repairing damaged pin-wire assembly."

f) Marking of accepted cable:

1) Record acceptance of all cables on inspection copy of cable schedule provided by Owner's representative, and submit in accord with Section 260010.

2) Place inspection stamp of Owner or dot sticker with initials on either white cable tag indicating cable assembly, or on connector shell.

F. Ground systems:

1. Visual and mechanical inspection: Verify ground system is in compliance with Drawings and Specifications.

2. Electrical tests:

a) Perform fall-of-potential test or alternative in accord with IEEE 81 on the main ground electrode or system.

b) Perform point-to-point tests to determine resistance between main ground system and all major electrical equipment frames, system neutral, and/or derived neutral points.

3. Test values:

a) Resistance between main ground electrode and ground shall be no greater than 10 ohms. Additional rods shall be installed and bonded to grounding system and driven to a depth of 50 ft. or refusal, whichever comes first.

b) Investigate point-to-point resistance values which exceed 0.5 ohm.

c) Record all test values and provide certified copies to Owner.

G. Cables:

1. Make insulation resistance tests on all power cables, using a self-contained instrument such as the direct-indicating ohmmeter of the generator type, or "megger" such as manufactured by J.G. Biddle Company, or Owner-approved equivalent. Insulation resistance values shall be at least 75% of shop test records.

   a) Apply the following test voltages for 1 minute, except where specified otherwise herein, in accord with procedure recommended by manufacturer of test equipment and as specified herein.

| Minimum Rated Circuit Voltage | Megger Voltage (DC) | Megger Reading |
|---|---|---|
| 600 volts | 500 volts | 600 kilohms |
| 1000 volts | 500 volts | 1 megohm |
| 15,000 volts | 1000 volts | 15 megohms |

2. Record all test values and provide certified copies to Owner.

3. Replace cables not meeting specified resistance values.

H. Miscellaneous tests:

1. Wiring: check all control circuits for continuity and conformance with wiring diagrams furnished by Owner and manufacturers.

2. Polarity tests: Make continuity and polarity tests on all current and potential transformers to determine whether polarity is as indicated on drawings, and the circuit is continuous.

3. Phasing tests: Identify phases of all switchgear and power cables by stenciling switchgear and tagging cables with approved tags, so that phases can be identified for connecting to proper phase sequence.

## 1.5 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates on all electrical distribution equipment shown on single-line diagram, and on control panels, dimmer panels, terminal cabinets, and separately mounted circuit breakers, disconnects, and starters.

B. Provide equipment and circuit designation on nameplates with minimum letter and plate sizes as indicated.

C. Provide engraved plastic nameplates with 1/4 in. minimum height letters indicating:

1. Circuit designation at branch overcurrent devices in distribution panelboards, switchboards, and motor control centers.

2. Circuit designation of panel, equipment-controlled or device-controlled on disconnect switches and on circuit breakers, starters, and controls which are individually enclosed.

3. Voltage rating and circuit designation of all outlets larger than 120V, 20A rating and more than 2 poles.

4. Designation of control and terminal cabinets including CUTC, as indicated.

5. Designation of each contactor and relay in control cabinets.

6. Designate area controlled for each dimmer in dimmer cabinet or rack.

7. Circuit designation at all ground fault detectors and ground fault test receptacles.

8. Equipment designation on front of switchboards, distribution panelboards, branch circuit panelboards, and load centers.

D. Secure nameplates with at least two rivets. Cementing and adhesive installation is not acceptable.

E. Provide two copies of a typewritten directory for each branch circuit panelboard, showing each circuit and its use. Attach one copy to panelboard door and deliver the other copy to Owner.

F. Provide caution label on branch circuit panelboards with integral control compartments. Caution label shall be red with white letters reading "CAUTION, EXTERNAL CONTROL VOLTAGE CIRCUIT WITHIN THIS PANEL."

G. Conductor identification:

1. Feeders: Identify with the corresponding circuit designation at over-current device and load ends, at all splices, and in pull boxes.

2. Branch circuits: Identify with corresponding circuit designation at overcurrent device and at all splices.

3. Control wires: Identify with indicated number and or letter designation at all terminal points and connections, including manufacturer pre-wired control sections and cabinets.

4. Alarm and detection wires: Identify with indicated wire and mnemonics numbers at all connections, terminal points, and coiled conductors within cabinets for future termination by Owner.

5. For identification of conductors, use heat shrinkable white marking sleeves such as Brady Permasleeve with type written identification.

END OF SECTION

SECTION 26 0050

BASIC ELECTRICAL MATERIALS & METHODS

PART 1 - GENERAL

1.1 DESCRIPTION: Division 1 applies to this Section. This Section contains general requirements for the Sections in Division 26.

A. Related Work Not in Division 26: Refer to individual Division 26 Sections.

1.2 QUALITY ASSURANCE:

A. Codes: Entire installation shall comply with requirements of authorities having jurisdiction.

B. Permits: Contractor shall pay for all permits required by work under this Division.

C. Inspections: Contractor shall arrange for all inspections and correct non-complying installations.

1.3 SUBMITTALS: Refer to Division 1 for procedures.

A. Material and Equipment: Prior to start of work, 6 copies of a list of all materials and equipment covered by Division 26 shall be submitted for approval. Contractor shall allow ample time for checking and processing and shall assume responsibility for delays incurred due to rejected items. No installation of material concerned shall be made until such written approval has been obtained. Approval of materials and equipment shall in no way obviate compliance with the Contract Documents. Each item proposed shall be referenced to the applicable Section, Page, and Paragraph of Division 26. For each item proposed, give name of manufacturer, trade name, catalog data, and performance data.

B. Equipment Layout Drawings: Submit "Equipment Layout Drawings" for each equipment room or area containing equipment items furnished under this Division. Layout Drawings shall consist of plan view of room, to scale, showing projected outlines of all equipment, complete with dotted line indication of all required clearances including all those needed for removal or service. Location of all conduit and pull boxes shall be indicated.

C. Service Manuals: Refer to Submittal Section. Indexed Service Manuals shall be submitted which shall include test reports, service instructions, and renewal parts lists of all equipment.

1. Submission and Information: Service Manuals shall be submitted for approval at least 30 days before final inspection. The following

information together with any pertinent data, shall be included in Service Manual:

a. Renewal part numbers of all replaceable items.

b. Manufacturer's cuts and rating data.

c. Serial numbers of all principal pieces of equipment.

d. Supplier's name, address, and phone number.

e. Final settings for all breakers, relays, and control devices (See Section 26032).

2. Copies: Four (4) copies of approved Service Manual shall be delivered on or before date required.

D. Record Drawings: Prepare and submit in accordance with requirements. Contractor shall make notations, neat and legible, daily as the work proceeds. Drawings shall be available for inspection at all times and kept at the job site. All buried conduit and/or indicated future connections outside any building shall be located both by depth and by accurate measurement from a permanently established landmark such as a building or structure.

E. Seismic Calculation: Refer to Article 3.01 herein.

F. Spare Parts: Conform to the Submittal Section. Deliver following spare parts to Owner and obtain receipts. Submit at same time as Operating Instructions:

1. Spare fuses; 1 set for each combination fuse breaker.

2. Spare pilot light lamps of each type used on project, in quantity of 10%, but not less than 2%.

3. Overload heater elements; 2 sets for each size used on project.

G. Special Tools: If any part of the equipment furnished under Division 26 requires a special tool for assembly, adjustment, resetting, or maintenance thereof and such tool is not readily available on the commercial tool market, it shall be furnished with the equipment as a standard accessory and delivered to the Owner.

H. Maintenance Paint: One (1) can of touch-up paint shall be delivered to Owner for each different color factory finish which is to be the final finished surfaces of the product.

1.4 DRAWINGS:

A. Diagrammatic Drawings: For purposes of clarity and legibility, drawings are essentially diagrammatic although size and location of equipment is drawn to scale wherever possible, Contractor shall make use of data in all the Contract Documents and verify information at building site.

B. Routing of Conduit and Piping: The drawings indicate required size and termination of conduits and raceways. It is not intent to indicate all necessary offsets and it shall be the responsibility under this Division to install conduit in such a manner as to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and make all equipment requiring inspection, maintenance and repair accessible without extra cost to the Owner.

C. Coordination with Other Trades: Check with other Divisions of the Specifications so that no interference shall occur and in order that elevations may be established for the work. Installed work which interferes with the work of other trades shall be removed and rerouted at the discretion of the Architect.

1.5 DAMAGE AND REPAIRS:

A. Emergency Repairs: Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding Contractor's warranty or relieving Contractor of his responsibility during warranty period.

B. Responsibility for Damage: Contractor shall be responsible for damage to grounds, buildings, or equipment due to work furnished or installed under this Division 26.

1.6 PROTECTION, CARE, AND CLEANING:

A. Protection: Provide adequate protection for finished parts of materials and equipment against physical damage from any cause during progress of work and until final completion. Sensitive electrical equipment shall not be installed until major construction is completed.

B. Care: During entire construction, properly cap all lines and equipment to prevent entrance of sand and dirt. Protect equipment against moisture, plaster, cement, paint or work of other trades by covering with polyethylene sheets.

C. Cleaning: After installation is completed, clean all systems as follows in addition to requirements specified:

1. Field Painted Items: Clean exterior of conduits, raceways, piping and equipment exposed in completed structure; removing all rust, plaster, cement and dirt by wire brushing. Remove grease oil and similar materials by wiping with clean rags and suitable solvents.

2. Factory Finished Items: Remove grease and oil on all factory finished items such as cabinets and controllers, and leave surfaces clean and polished.

D. Connection: Prior to energizing, check all electrical connection hardware and torque where necessary.

PART 2- PRODUCTS

2.1 PRODUCTS: Products and materials shall be as specified in the pertinent Sections of Division 26.

2.2 MATERIALS AND EQUIPMENT: Wherever possible, all materials and equipment used in installation of this work shall be of same manufacturer throughout for each class of material or equipment. Materials shall be new and bear UL label, wherever subject to such approval. Comply with ANSI, IEEE and NEMA standards, where applicable.

PART 3 - EXECUTION

3.1 SEISMIC REQUIREMENTS: Electrical equipment for emergency systems shall be braced to withstand the lateral forces that result from earthquakes. Under Work of Division 26, submit seismic calculations stamped and signed by a registered California structural engineer confirming size, number, and location of required anchoring hardware. Electrical equipment vendors shall furnish weights together with dimensions and the center of gravity location for all emergency electrical equipment for this purpose.

3.2 GENERAL LATERAL BRACING REQUIREMENTS: As shown on Drawings. Additional bracing requirements shall conform to specific requirements shown on Drawings or in other Sections of Division 26. Anchorages for equipment subject to thermal expansion and movement shall conform to manufacturer's recommendation and intent of general bracing requirements. When general and specific bracing requirements enumerated above are in conflict with referenced standards, the most stringent requirements shall govern.

3.3 EXCAVATION AND BACKFILL: Perform all excavation and back fill required to install Work of Division 26, both inside and outside. Perform all excavation and backfilling in accordance with Division 2.

A. Excavation: Bury conduits outside building to a depth of not less than 24" (or as required by Code) below finish grade, unless noted otherwise.

B. Backfilling: Do not backfill until after final inspection and approval of conduit installation by all legally constituted authorities and recording of the buried items on the Record Drawings.

3.4 CUTTING AND PATCHING:

A. Cutting of Existing Structural Work: Holes in existing slabs and concrete walls shall be cored to the minimum size required. The Contractor shall submit Drawings showing dimensioned sizes and locations for all such holes to Architect for approval before cutting. Where required for conduit installation, slabs on grade shall be saw-cut to minimum required width; submit cutting Drawings to the Architect for approval before cutting.

B. Patching: Holes or chases shall be patched to match adjacent surfaces.

3.5 CONCRETE WORK: Concrete construction required for the Work of Division 26 shall be provided under the Work of Division 26.

3.6 PAINTING: Finish painting of electrical equipment will be as specified in Division 9, unless equipment is herein specified to be furnished with factory applied finish coats. Equipment to be field painted shall be furnished with a factory applied prime coat.

A. Touch-Up: If factory finish on any equipment furnished under Division 26 is damaged in shipment or during construction of building, the equipment shall be refinished by Contractor to satisfaction of Architect.

B. Concealed Equipment: Uncoated cast-iron or steel that will be concealed, or will not be accessible when installations are completed, shall be given one heavy coat of black asphaltum before installation.

3.7 OPERATING INSTRUCTIONS: Contractor to provide services of an experienced Engineer to instruct Owner in operation of entire installation. Instructional period shall be during normal work day hours. This instruction period may be simultaneous with compliance tests.

3.8 COMPLIANCE TESTS: Conduct such tests of all portions of installation as may be necessary to ensure full compliance with the Drawings and Specifications. Tests shall be made in the presence of the Owner. Costs of test shall be borne by Contractor and Contractor shall provide all instruments, equipment, labor and materials to complete all the tests. Tests may be required on any item between installation of Work and the end of 1 year warranty period. Should these tests develop any defective materials, poor workmanship or variance with requirements of Specifications, Contractor shall make any changes necessary and remedy any defects at his expense.

A. All Feeders: Measure and record as follows:

1. 600 volt conductors shall be tested with 500 volt megger to ground on each phase. megger to be on test for one minute before any readings are taken. The minimum values on all feeders shall be 100,000 OHMS.

2. Copies of the certified test readings shall be transmitted to Owner.

3.9 SYSTEM ACCEPTANCE:

A. Final Review: The Contractor shall request a final review prior to system acceptance after:

1. Completion of installation of all systems required under the Contract Documents.

2. Submission and acceptance of operating and maintenance data.

3. Completion of identification program.

B. Acceptance: Is contingent on:

1. Completion of final review and correction of all deficiencies.

2. Satisfactory completion of acceptance tests demonstrating compliance with all performance and technical requirements of Contract Documents.

3. Satisfactory completion of training program and submission of manuals and Drawings required by Contract Documents.

3.10 PRELIMINARY OPERATION: The Owner reserves the right to operate portions of the electrical system on a preliminary basis without voiding the warranty or relieving the Contractor of his responsibilities.

3.11 CLEAN-UP: Conform to the Submittal Section. Upon completion and at other times during progress or Work, when required, remove all surplus materials, rubbish, and debris resulting from Work of Division 26.

END OF SECTION

SECTION 26 0060

MINOR ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Owner and Architect/Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect and make safe all electrical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with Utility Company and Owner's representative.

C. Provide temporary wiring and connections to maintain required existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area when outage affects business operation.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and local fire service at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service and new system is accepted. Disable system only to make switchovers and connections. Notify Owner and Telephone Utility Company at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

G. Existing Security System: Maintain existing system in service until new system is complete and ready for service and new system is accepted. Disable system only to make switchovers and connections. Obtain permission from the Owner and security company at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

## 3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of this Section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply and re-label devices as spares.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Disconnect and remove abandoned conduit.

J. Repair adjacent construction and finishes damaged during demolition and extension work.

K. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

L. Extend existing installations using materials and methods compatible with existing electrical installations, and in compliance with new project specifications.

M. Modify existing as-built drawings to note changes.

## 3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, and broken electrical parts.

## 3.5 INSTALLATION

A. Install relocated materials and as required by this section and Owner's representative.

END OF SECTION

SECTION 26 0111

CONDUITS

PART 1 - GENERAL

A. The general provisions apply to this section.

1.1 WORK INCLUDED

A. Conduits; including:

1. Rigid steel conduit.
2. Intermediate metal conduit (IMC).
3. Electrical metallic tubing (EMT).
4. Rigid aluminum conduit.
5. Polyvinyl chloride conduit (PVC).
6. Flexible metal conduit.
7. Liquid-tight flexible metal conduit.

1.2 DEFINITION

A. Conduit: This term shall be construed to mean conduit and conduit fittings; and tubing and tubing fittings.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Support material: Section 260190.

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION - ALL MATERIALS SHALL BE MANUFACTURED IN THE USA.

A. Rigid Steel Conduit: Hot-dipped galvanized or sherardized including the threads, manufactured in accordance with ANSI C80.1 and UL6.

1. Threaded, hot-dipped galvanized or sherardized fittings manufactured in accordance with ANSI C80.4.

B. Intermediate Metal Conduit: Hot-dipped galvanized including the threads, manufactured in accordance with UL 1242.

C. Electrical Metallic Tubing: Manufactured in accordance with ANSI C80.3 and UL 797.

1. Provide compression fittings in walls, ceiling spaces or exposed construction areas.

2. Provide compression (water tight) fittings in damp areas or areas exposed to weather.

D. Rigid Aluminum Conduit: Manufactured in accordance with ANSI C80.5.

1. Threaded fittings, manufactured in accordance with ANSI C80.4.

E. Polyvinyl Chloride Conduit: Schedule 40 and schedule 80, manufactured in accordance with ANSI C33.91, UL 651, and Nema TC-2.

1. Cemented type fittings of the same manufacturer as the conduit.

F. Polyvinyl Chloride Conduit: Type EB, heavy wall, manufactured in accordance with ANSI C33.91, UL651, and Nema TC-8.

1. Cemented fittings of the same manufacturer as the conduit.

G. Flexible Metal Conduit: Hot-dipped galvanized steel, manufacturer in accordance with UL 1.

1. Squeeze type, malleable iron, cadmium plated, straight and angle connectors for all sizes and twist-in connectors for 1/2-inch and 3/4-inch flexible metal conduit.

H. Liquid-Tight Flexible Conduit: Hot-dipped galvanized with liquid-tight vinyl jacket.

1. Liquid-tight fittings.

## PART 3 - EXECUTION

### 3.1 USE

A. EMT for all exposed and concealed work except as indicated in Paragraphs B, C, D, E, F, and G.

B. Rigid steel, IMC, or rigid aluminum conduit in areas where exposed conduit could be subject to physical damage or where conduit is exposed and conductor phase to ground voltage exceeds 300 volts.

C. Rigid aluminum conduit may be used for all feeder runs exposed or concealed in stud walls and spaces above suspended ceilings.

D. PVC Conduit:

1. Schedule 40 for runs below grade in direct contact with earth.
2. Schedule 40 in concrete floors, walls or roofs.

E. Flexible Conduit (steel only permitted):

1. For connection to equipment subject to vibration, maximum length 18 inches. In wet locations use liquid-tight flexible conduit.
2. For connection to lighting fixtures above suspended ceilings. Lengths limited to 72 inches.
3. Install ground conductors in all flexible conduits.

F. Where 3/4-inch conduit runs are concealed in walls or ceilings and these runs are through wood studs and wood joists, flexible steel conduit may be used up to a maximum length of 6'0".

G. All risers shall be PVC coated RGS with bushings.

H. In concrete or below grade use conduit not smaller than 1 inch. Maximum size in concrete slab: 1 inch. Run larger sizes under slab.

I. Use long sweep elbows with minimum radius 10 times nominal conduit diameter for all telephone and communication runs.

## 3.2 INSTALLATION

A. Provide conduit support and bracing in accordance with the latest published SMACNA guidelines.

B. Perform excavating, trenching, backfilling, and compacting as specified in Division 2.

C. Minimum cover for runs below finished grade outside buildings: 24 inches except where noted or required by the serving utility. Minimum cover for conduit in concrete floors, walls or roof: 1/3 thickness of slab. Minimum cover under building slabs is 12-inches.

D. Minimum separation from uninsulated hot water pipes, steam pipes, heater flues or vents: 6 inches. Avoid running conduit directly under water lines.

E. Protect inside of conduit from dirt and rubbish during construction by capping all openings with plastic caps intended for the purpose.

F. Provide conduit bodies for exposed conduit runs at junctions, bends or offsets where required. Do not use elbows or bends around outside corners of beams, walls or equipment. Make conduit body covers accessible.

G. Make conduit field cuts square with saw and ream out to full size. Shoulder conduits in couplings.

H. Run a minimum of one 3/4-inch empty conduit for every three single pole spare circuit breakers, spaces or fraction thereof and not less than two 3/4-inch conduits from every flush mounted panel to an accessible space above the ceiling and below the floor.

I. Make conduit projections from covered areas to areas exposed to the weather watertight by proper flashing. Extend flashing a minimum of 6 inches in all directions from conduit.

J. Where conduit is to remain empty, install polypropylene or nylon pull-line 3/16" minimum diameter from end to end with tag at each end designating opposite terminations.

K. Run conduit parallel and at right angle to building lines, when visible in finished construction.

L. Cap conduits indicated to be stubbed-out underground using glued-on PVC caps intended for this purpose.

M. Install a coupling flush with the floor on all conduits stubbed up through floors on grade.

N. Make no bends with a radius less than 12 times the diameter of the cable it contains nor more than 90 degrees. Make field bends with tools designed for conduit bending. Heating of metallic conduit to facilitate bending is not permitted.

O. Where conduit installed in concrete or masonry extends across building construction joints, provide expansion fittings as manufactured by O.Z.; Crouse-Hinds; Appleton; or equal, with approved ground straps and clamps.

P. Concrete Wall or Slab Penetrations: All core drilling, sleeves, blockouts or other penetrations must be approved by the Structural Engineer prior to installation.

1. Space sleeves and core drills to insure a minimum dimension of 3 times the nominal trade diameter of the largest adjacent conduit between sleeves or core drills.

2. Use blockouts for concentrations of conduits in a confined area.

Q. Do not penetrate walls with flexible conduit where subject to physical damage. Use recessed box with extension ring for transition from interior to exterior of wall.

R. All homeruns shown shall be run to the panel indicated independently of all other homeruns. Provide pull points so as not to exceed total bends of 360 degrees between them unless otherwise indicated.

S. At switchboards, manholes and floor standing distribution panelboards, provide insulated throat bushings or bell ends on all non-metallic conduit entries and bushings on all metallic conduit entries.

T. Provide bushings on all conduit terminations sized 1" and larger.

U. Provide weatherproof boxes and connectors for all exposed parking structure raceways and boxes.

V. Provide bell ends on all conduits into pullboxes and manholes, seal all conduits after conductors are pulled.

W. Cap all unused conduits with end cap. Do not tape.

X. All Fire Alarm Conduits shall be painted red.

END OF SECTION

SECTION 26 0118

DUCT BANK

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Metal conduit.
2. Duct.
3. Manholes.

B. Related work:

1. Section 31 2000 Earthwork.
2. Section 31 2333 Trenching and Backfilling.
3. Section 03 3300 Cast-In-Place Concrete.
4. Section 22 0510 Plumbing Piping.

### 1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Ductbank:

1. Basis of Measurement: By the lineal foot, for each configuration.
2. Basis of Payment: Includes purchase, delivery, and installation of duct, fittings, supports, and accessories, and for trenching, concrete encasement, and backfill.

B. Manhole:

1. Basis of Measurement: Per unit.
2. Basis of Payment: Includes purchase, delivery, and installation of manhole.

### 1.3 References

A. Section 01 4500 - Quality Control: Requirements for references and standards.

B. ANSI C80.1 Rigid Steel Conduit, Zinc Coated.

C. ASTM A48 Gray Iron Castings.

D. ASTM C857 - Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.

E. ASTM C858 - Underground Precast Concrete Utility Structures.

F. ASTM C891 - Installation of Underground Precast Utility Structures.

G. ASTM C1037 - Inspection of Underground Precast Utility Structures.

H. IEEE C2 National Electrical Safety Code.

I. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

J. NEMA TC 2 Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80).

K. NEMA TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.

L. NEMA TC 6 PVC and ABS Plastic Utilities Duct for Underground Installation.

M. NEMA TC 9 Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.

N. NEMA TC 10 PVC and ABS Plastic Communications Duct and Fittings for Underground Installation.

O. NEMA TC 14 Filament Wound Reinforced Thermosetting Resin Conduit and Fittings.

P. NFPA 70 National Electrical Code.

Q. UL 651A - Type EB and A PVC Conduit and HDPE Conduit.

1.4 Submittals for Review

A. Section 01 3300 - Submittals: Procedures for submittals.

B. Product Data: Provide for metallic conduit or nonmetallic conduit, all manhole accessories, fittings and supports.

C. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for precast manholes.

1.5 Submittals for Information

A. Section 01 3300 - Submittals: Submittals for information.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 Submittals for Closeout

A. Project Record Documents: Record actual routing and elevations of underground conduit and duct, and locations and sizes of manholes.

1.7 Qualifications

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience, and with service facilities within 100 miles of Project.

1.8 Regulatory Requirements

A. Conform to requirements of NFPA 70 and IEEE C2.

B. Products: Listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.9 Field Measurements

A. Verify that field measurements are as indicated.

B. Verify routing and termination locations of duct bank prior to excavation for rough in.

C. Verify locations of manholes prior to excavating for installation.

D. Duct bank routing is shown in approximate locations unless dimensions are indicated. Route as required to complete duct system.

E. Manhole locations are shown in approximate locations unless dimensions are indicated. Locate as required to complete ductbank system.

PART 2 - PRODUCTS

2.1 Rigid Steel Conduit

A. Rigid Steel Conduit: ANSI C80.1.

B. Fittings: NEMA FB 1, steel.

2.2 Plastic Conduit

A. Rigid Plastic Conduit: NEMA TC 2, Schedule 40 and 80 PVC, with fittings and conduit bodies to NEMA TC 3.

B. Rigid Plastic Underground Conduit: UL 651A, Type A PVC, High-density polyethylene, Schedule 40.

2.3 Plastic Duct

A. Plastic Utilities Duct: NEMA TC 6; ABS Type DB.

B. Plastic Utility Duct Fittings: NEMA TC 9.

C. Plastic Communications Duct and Fittings: NEMA TC 10, Type DB.

2.4 Precast Concrete Manholes

A. Description: Precast manhole designed in accordance with ASTM C858,comprising modular, interlocking sections complete with accessories.

B. Loading: ASTM C857, Class A-16, A-12, A-8 or A-0.3 as required.

C. Shape: Square or Rectangular with truncated corners and as indicated.

D. Riser Casting: 12 inch, with manhole step cast into frame.

E. Frames and Covers: ASTM A48; Class 30B gray cast iron, 30 inch size, machine finished with flat bearing surfaces. Provide cover marked electric or telephone as appropriate.

F. Duct Entry Provisions: Window knockouts.

G. Duct Entry Locations: As indicated.

H. Duct Entry Size: As indicated.

I. Cable Pulling Irons: Use galvanized rod and hardware. Locate opposite each duct entry. Provide watertight seal.

J. Cable Rack Inserts: Minimum load rating of 800 pounds (365 kg). Locate at 3 feet on center.

K. Cable Rack Mounting Channel: 1 1/2 x 3/4 inches steel channel, 48 inch length. Provide cable rack arm mounting slots on 1 1/2 inch centers.

L. Cable Racks: Steel channel, 1 1/2 x 3/4 x 14 inches, with fastener to match mounting channel.

M. Cable Supports: Porcelain clamps and saddles.

N. Manhole Steps: Polypropylene plastic manhole step with 1/2 inch steel reinforcement. Cast steps at 12 inches on center vertically.

O. Ladder: Aluminum, rung, 2-foot length, with top hook to engage manhole step in riser casting. Provide one ladder for each manhole.

P. Sump Covers: ASTM A48; Class 30B gray cast iron.

Q. Source Quality Control: Inspect manholes in accordance with ASTM C1037.

2.5 Accessories

A. Underground Warning Tape: 4 inch wide plastic tape, detectable type, colored yellow with suitable warning legend describing buried electrical lines.

PART 3 - Execution

3.1 Duct Bank Installation

A. Quality Control Section: Manufacturer's instructions.

B. Install duct to locate top of ductbank at depths as indicated on drawings.

C. Install duct with minimum slope of 4 inches per 100 feet. Slope duct away from building entrances.

D. Cut duct square using saw or pipe cutter; de burr cut ends.

E. Insert duct to shoulder of fittings; fasten securely.

F. Join nonmetallic duct using adhesive as recommended by manufacturer.

G. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

H. Install no more than equivalent of three 90 degree bends between pull points; provide additional pull boxes as field conditions require.

I. Provide suitable fittings to accommodate expansion and deflection where required.

J. Terminate duct at manhole entries using end bell.

K. Stagger duct joints vertically in concrete encasement 6 inches minimum.

L. Use suitable separators and chairs installed not greater than 4 feet on centers.

M. Band ducts together with standard commercial racking before backfilling with sand slurry.

N. Securely anchor duct to prevent movement during concrete placement.

O. Place concrete under provisions of Section 03300. Use mineral pigment to color concrete red.

P. Provide minimum 3-inch concrete cover at bottom, top, and sides of ductbank.

Q. Provide two No. 4 steel reinforcing bars in top of bank under paved areas.

R. Connect to existing concrete encasement using dowels.

S. Connect to manhole wall using dowels.

T. Provide suitable pull string in each empty duct except sleeves and nipples.

U. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.

V. Backfill trenches under provisions of Section 31 2333.

W. Interface installation of underground warning tape with backfilling specified in backfill Section. Install tape 6 inches below finished surface.

3.2 Pre-Cast Manhole Installation

A. Quality Control Section: Manufacturer's instructions.

B. Excavate for manhole installation under the provisions of Section 02222.

C. Install and seal precast sections in accordance with ASTM C891.

D. Install manholes plumb.

E. Use precast neck and shaft sections to bring manhole cover to finished elevation.

F. Attach cable racks to inserts after manhole installation is complete.

G. Install drains in manholes and connect to site drainage system or if approved by engineer to 4 inch (DN100) pipe terminating in 1 cu yd crushed gravel bed.

H. Dampproof exterior surfaces, joints, and interruptions of manholes after concrete has cured 28 days.

I. Backfill manhole excavation under the provisions of backfill Section.

END OF SECTION

SECTION 26 0120

CONDUCTORS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Conductors; for power, lighting, sound, communication and control, including conductors for general wiring, flexible cords and cables, and ground conductors.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals: Section 260000.

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION

A. Conductors for General Wiring: Thermoplastic insulated rated for 600V manufactured in accordance with UL 83.

1. Provide 3/4 hard drawn copper conductors. Provide solid conductor for #12 AWG and smaller. Provide stranded conductors for #10 AWG and larger.

B. Conductor Connectors for General Wiring:

1. Sizes No. 14 to No. 8: Splice with insulated spring wire connectors.

a) Ideal No. 451, 455 and 453.

b) Minnesota Mining: Types Y, R, G, and B.

c) Buchanan No. B1, B2 and B4.

2. Size No. 6 or Larger, Copper: Splice and terminate with compression or pressure type connectors and terminal lugs.

C. Provide connector sealing packs for all area lighting and exterior box splices which require complete protection from dampness and water.

1. Scotchlok No.'s 3576, 3577 and 3578, by 3M Company.

PART 3 - EXECUTION

3.1 USE

A. Conductors for General Wiring:

1. Minimum 75 degrees C temperature rated insulation on conductors, except use minimum 90 degrees C temperature rated insulation on conductors in conduits exposed on roof, or where required due to ambient temperature.

2. Stranded conductors at motors, audio video and other applications where subject to vibration.

3. Minimum size conductors for power and lighting #12 AWG, except where noted.

4. Minimum size conductors for control circuits #14 AWG stranded with THHN/THWN insulation.

B. Use flexible cords and cables for connection of special equipment as indicated. Length not to exceed 72 inches.

C. Ground Conductors:

1. Provide an insulated green ground conductor for all branch circuit wiring where indicated.

2. Bare copper conductor may be used.

a) Install ground conductors in all non-metallic conduits as required by code. Install ground conductors in all motor branch circuits and all feeders. Where ground conductor size is not indicated, provide size as required for an equipment ground conductor by the National Electrical Code.

b) Install ground conductors in all flexible metal conduits.

D. Install XHHW – 2, 90°C copper conductors for all underground installations unless noted otherwise on the plans.

E. Install for all dimmers, stranded THHN/THWN – 2 copper 90°C conductors with dedicated neutrals.

3.2 INSPECTION

A. Check conduit system for damage and loose connections, replace damaged sections.

B. Check for caps at conduit openings. Make sure that inside of conduit is free of dirt and moisture.

C. Pull mandrel, one size smaller than the conduit, through entire length of all underground conduits prior to conductor installation.

## 3.3 INSTALLATION

A. Conductors for General Wiring:

1. Color code conductors insulation as follows:

| CONDUCTOR | SYSTEM 208Y/120 | VOLTAGE 480Y/277 |
|---|---|---|
| Phase A | Black | Brown |
| Phase B | Red | Orange |
| Phase C | Blue | Yellow |

2. For conductors #6 AWG or larger, permanent plastic colored tape may be used to mark conductor in lieu of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.

   a) Provide color tape on each end and at all terminal points and splices on wire enclosed in conduit.

   b) Provide color tape every 3 feet on wire not enclosed in a listed wireway.

3. When pulling conductors, do not exceed manufacturer's recommended values.

4. Use polypropylene or nylon ropes for pulling conductors.

B. Insulate splices with plastic electrical tape: Scotch No. 33+, Tomic No. 1T, or equal.

C. Terminate all control wires with terminal lugs on terminal boards not designed with pressure plates. If splices are needed, use same procedure, installing a terminal board in a junction box for protection.

D. All splices or connections shall be compression type Thomas & Betts or Burndy, no split bolt connections are allowed.

## 3.4 IDENTIFICATION

A. Feeders: Identify with the corresponding circuit designation at over-current device and load ends, at all splices and in pull boxes.

B. Branch Circuits: Identify with the corresponding circuit designation at the over-current device and at all splices and devices.

C. Control Wires: Identify with the indicated number and/or letter designation at all terminal points and connections.

D. Alarm and Detection Wires: Identify with the indicated wire and zone numbers at all connections, terminal points, and coiled conductors within cabinets.

E. Conductors Terminated By Others: Indicate location of opposite end of conductor, i.e., Pull Box-Room 101.

F. For identification of conductors, use heat shrinkable white marking sleeves such as Brady Permasleeve with type written identification.

G. Circuit designation is construed to mean panel designation and circuit number, i.e., LA-13.

END OF SECTION

SECTION 26 0130

ELECTRICAL BOXES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Boxes; including:

1. Outlet boxes.
2. Pull and junction boxes.
3. Cabinets.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals: Section 260000.

B. Support Material: Section 260190.

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION

A. Outlet Boxes:

1. Pressed Steel Boxes: Knockout type, hot-dipped or electro-plate galvanized.
2. Cast Iron Boxes: Hot-dipped or electro-plate galvanized with threaded hubs.
3. Cast Iron Conduit Bodies: Hot-dipped or electro-plate galvanized with threaded hubs.
4. Cast copper free aluminum conduit bodies with threaded hubs.
5. Covers for Pressed Steel Boxes: Hot dipped or electro-plate galvanized.
6. Outlet boxes manufactured in accordance with UL 514.

B. Pull and Junction Boxes:

1. Sheet steel, hot-dipped or electro-plate galvanized, or prime coated and a final coat of manufacturer's standard enamel or lacquer finish. Manufactured in accordance with UL 50.

   a) Where exposed to weather, provide raintight hubs for conduits entering the boxes, top and sides only.

2. Floor Boxes:

   a) Single gang, similar to Hubbell #B-2536.

   b) Covers:

      1) Combination, similar to Hubbell #S-2525.

      2) Duplex receptacle, similar to Hubbell #S-3925.

   c) Carpet flange, similar to Hubbell #S-3075 thru #S-3079.

   d) Hubs: Provide hubs as required to suit the conduit arrangement.

3. Pre-Cast Concrete Pull Boxes: As manufactured by Jensen Pre-Cast or Utility Vault and shown on drawings.

4. High impact resistant PVC boxes: As manufactured by Carlon, Sedco, or R & G Sloan.

C. Cabinets: Sheet metal, prime coat and final coat of manufacturer's standard enamel or lacquer finish. Manufactured in accordance with UL 50.

1. Control Cabinet: NEMA 1 enclosure, door with butt hinges and flush handle latches.

   a) Provide with removable steel back panel.

2. Terminal Cabinets: NEMA 1 enclosure, door with concealed hinges and spring catch type flush cylinder locks. Key locks alike, provide two keys with each lock.

3. Provide engraved plastic nameplates with 1/2" minimum height letters indicating designation of control and terminal cabinets as shown on the drawings.

   a) Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

## PART 3 - EXECUTION

### 3.1 USE

A. Outlet Boxes:

1. Ceiling Outlet Boxes: Not less than 4" octagonal by 2" deep.
2. FDD cast iron or cast aluminum device boxes and conduit bodies with metal covers for exposed conduit installation. Provide gasket for covers in wet areas.
3. Intercom, Microphone and TV Outlet Boxes: Not less than 4-11/16" square x 2-1/8" deep.
4. Provide floor boxes with quantity of gangs as required for power, communication or control as indicated. Use boxes with barriers where required. Provide carpet flanges in carpeted areas.

B. Pull and Junction Boxes:

1. Use sheet steel boxes NEMA Type 1 for indoor and NEMA Type 3R for outdoor installation, except as follows.
2. Use pre-cast concrete boxes for boxes flush in finish grade where requiring a nominal capacity greater than 144 cubic inches, where located in vehicular traffic areas, or where indicated.
3. Use polyvinyl chloride (PVC) boxes flush in finish grade when the nominal internal volume is less than or equal to 144 cubic inches or where indicated.
4. Use cast iron boxes for boxes flush in slab on grade.

## 3.2 INSTALLATION

A. Provide 3/8" fixture studs in wall bracket and ceiling boxes.

B. Provide covers suitable for the fixtures or devices used.

C. Make outlet box covers flush with finished surfaces.

D. Close unused open knockouts with knockout seals.

E. Provide 1" deep plaster rings on recessed outlet boxes installed in areas where concrete will be exposed after construction is complete.

F. Where boxes are concealed in exposed concrete unit masonry, use square cornered types or boxes fitted with rings of sufficient depth for the box to be recessed completely within cavity of block or tile. Install box to insure that ring fits an opening sawed out of the masonry, so that no mortar is required to fill between ring and construction.

G. Provide a 6" base of compacted crushed rock under pre-cast concrete pull boxes.

H. Adjust floor boxes so they are level with top of finished floors.

I. Provide pull boxes and junction boxes in all branch circuit and feeder runs as indicated. Do not provide pull boxes unless they are indicated or required by the Electrical Code.

3.3 IDENTIFICATION

A. Junction Boxes: Use permanent black marker, 2" high lettering, and on each cover plate indicate the power source and circuits contained within that junction box.

END OF SECTION

SECTION 26 0133

TERMINAL CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION: Division 1 and Section 260050 apply to this Section. Provide terminal cabinets for signal and communications terminals, complete.

A. Related Work Not In This Section:

1. Outlet, pull, and junction boxes.

2. Panelboards for lighting and power.

PART 2 - PRODUCTS

2.1 MATERIALS: Cold rolled sheet steel, with hinged door and cylinder lock keyed to match panelboard cabinets.

2.2 DESIGN: To suit applicable system requirements; surface or flush-mounting as shown; knockouts as required. Design to match panelboard cabinets.

2.3 FABRICATION: One-piece, die-formed or continuously welded, and assembled in factory.

2.4 FINISH: Baked enamel on a suitable primer; color as specified elsewhere, required by standards, or as directs.

2.5 INTERIORS: Provide 5/8" plywood (fire resistant) backing in all signal and communications terminals.

PART 3 - EXECUTION

3.1 INSTALLATION: Secure and substantial, cabinets attached to building walls or structure.

3.2 IDENTIFICATION: Provide identification nameplates; of engraved bakelite; riveted or screwed to each cabinet. Take text from Drawings and as approved by Architect.

END OF SECTION

SECTION 26 0140

WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Wiring devices.

1.2 Related Work Specified Elsewhere

A. Identification: Section 260030.

B. Boxes: Section 260130.

1.3 Submittals

A. In accord with Section 260010.

1.4 Definition

A. Wiring devices: This term includes all wall switches, pushbuttons, receptacles, and plates used for general purpose installation.

PART 2 - PRODUCTS

2.1 Material and Fabrication

A. Wall switches:

Quiet toggle type, 20A – 120/277 VAC rated, with terminal screws to take up to No. 10 AWG conductors:

| | SPST | DPST | 3-WAY | SPST KEY SWITCH LOCK | 4-WAY |
|---|---|---|---|---|---|
| Arrow-Hart | 1991-I | 1992-I | 1993-I | 1991-L | 1994-I |
| Bryant | 4901-I | 4902-I | 4903-I | 4901-L | 4904-I |
| General Electric | GE5951-2 | GE5952-2 | GE5953-2 | GE5951-OL | GE5954-2 |
| Hubbell | 1221-I | 1222-I | 1223-I | 1221-L | 1224-I |
| Pass & Seymour/ Legrand | 20AC1-I | 20AC2-I | 20AC3-I | 20AC1-L | 20AC4-I |

Momentary contact type, 20A-120/277V, two-circuit, three-position, center off:

| | |
|---|---|
| Arrow-Hart | 1995-I |
| Bryant | 4921-I |
| General Electric | GE5935-2 |
| Hubbell | 1557-I |
| Pass & Seymour/Legrand | 1250-I |

Passive infrared wall switch sensors: Ivory, 180° field of view, adjustable time out and ambient light, 1200 sq. ft. Coverage, 120 VAC, 60 Hz, 1500W. Maximum load, incandescent and fluorescent. As manufactured by Hubbell No. AT1201 or Owner- approved equivalent by Leviton or Pass & Seymour.

Fan speed controllers: AC unit rated 15A - 120V used to control up to twelve 56 in./52 in./48 in. ceiling fans or up to twenty 42 in. fans on a single circuit. Rinaudo's Reproductions No. 22394.

B. Passive infrared motion switching system:

1. Ceiling mount sensor, white, 500 sq. ft. coverage, requires control unit. Hubbell No. ATD500CRP.
2. Ceiling mount sensor, white, 2000 sq. ft. coverage, ceiling height dependent, requires control unit. Hubbell No. ATD2000CRP.
3. Ceiling or wall mount sensor, white, 1000 sq. ft. coverage, requires control unit. Hubbell No. ATD1000CRP.
4. Ceiling or wall mount hallway sensor, white, covers area 75 ft. long by 20 ft. wide, requires control unit. Hubbell No. PIR90HW1.
5. Low-voltage control unit, 120VAC, controls one to four sensors. Mount in 4 in. x 4in. enclosure. Hubbell No. CU120A.
6. Relay, 120VAC coil, used when load to be controlled exceeds capacity of a single circuit. Hubbell No. AAR

C. Receptacles, caps, and connectors:

1. 15A-125V, NEMA 5-15, parallel slot type with grounding pin:

| | DUPLEX | SINGLE | GFI |
|---|---|---|---|
| Arrow-Hart | 5252-I | 5261-I | GF5242-I |
| Bryant | 5252-I | 5261-I | GFR52FT |
| General Electric | 5252-2 | 5261-2 | TGTR115F |
| Hubbell | 5252-I | 5251-I | GF5252-I |
| Pass & Seymour/Legrand | 5252-I | 5261-I | 1591-SHG |

2. 15A-250V, NEMA 6-15, straight blade grounding type:

| | RECEPTACLE | CAP |
|---|---|---|
| Arrow-Hart | 5661-I | 6666 |
| Bryant | 5661-I | 5666-N |
| General Electric | GE4069-2 | GED0611 |
| Hubbell | 5661-I | 5666-C |
| Pass & Seymour/Legrand | 5662-I | 5666-X |

3. 15A-125V, NEMA L5-15, locking type with ground:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 4700 | 4721 | 4731 |
| Bryant | 4700 | 4721-NSY | 4732-NSY |
| General Electric | GL4700 | GLD0511 | GLD0513 |
| Hubbell | 4700 | 4720-C | 4729-C |
| Pass & Seymour/Legrand | 4700 | L515-P | L515-C |

4. 20A-125V, NEMA 5-20, straight blade grounding type:

| | RECEPTACLE | CAP |
|---|---|---|
| Arrow-Hart | 5361-I | 5362-I |
| Bryant | 5361-I | 5362-I |
| General Electric | GE4102-2 | GE4108-2 |
| Hubbell | 5361-I | 5362-I |
| Pass & Seymour/Legrand | 5361-I | 5362-I |

5. 20A-125V, NEMA L5-20, two-pole, three-wire locking type, with ground:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 6200 | 6202 | 6204 |
| Bryant | 70520-FR | 70520-NP | 70520-NC |
| General Electric | GL0520 | GLD0521 | GLD0523 |
| Hubbell | 2310-A | 2311 | 2313 |
| Pass & Seymour/Legrand | L520-R | L520-P | L520-C |

6. 20A-125V, NEMA 5-20, two-pole, three-wire, straight blade isolated grounding type receptacle:

| | DUPLEX | SINGLE |
|---|---|---|
| Arrow-Hart | IG5362 | IG5361 |
| Bryant | 5362-IG | 5361-IG |
| General Electric | GE8300-IG | GE8310-IG |
| Hubbell | IG-5362 | IG-5361 |
| Pass & Seymour/Legrand | IG-6300 | IG-5361 |

7. 20A-125 VAC, two-pole, three-wire, NEMA 5-20, straight blade, specification grade, ivory color, ground fault circuit interrupter receptacle (GFCI), rated for feed-through wiring, with LED indicator light:

| | GFCI RECEPTACLE |
|---|---|
| Hubbell | GF-5362I |
| Pass & Seymour | 2091-S-L-I |
| Leviton | 6898-I |

8. 20A-125/250V, NEMA 14-20, three-pole, four-wire straight blade grounding type:

| | RECEPTACLE | CAP |
|---|---|---|
| Arrow-Hart | 5759 | 5757 |
| Bryant | - | - |
| General Electric | GE1420 | GED1421 |
| Hubbell | 8410 | 8411-C |
| Pass & Seymour/Legrand | L1420-R | L1420-P |

9. 20A-250V, NEMA 6-20, two-pole, three-wire straight blade grounding type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 8510 | 6866 | 6869 |
| Bryant | 5461 | 5466N | 5469N |
| General Electric | GE4182 | GED0621 | GED0623 |
| Hubbell | 5461 | HBL5466-C | HBL5469-C |
| Pass & Seymour/Legrand | 5871 | 5466-X | 5469-X |

10. 20A-120/208V, NEMA L21-20, four-pole, five-wire locking and grounding type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 6470 | 6472 | 6474 |
| Bryant | 72120-FR | 72120-NP | 72120-NC |
| General Electric | GL2120 | GLD2121 | GLD2123 |
| Hubbell | 2510A | 2511 | 2513 |
| Pass & Seymour/Legrand | L2120R | L2120P | L2120C |

11. 20A-250V, NEMA L6-20, two-pole, three-wire locking and grounding type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 6210 | 6212 | 6214 |
| Bryant | 70620FR | 70620NP | 70620NC |
| General Electric | GL0620 | GLD0621 | GLD0623 |
| Hubbell | 2320A | 2321 | 2323 |
| Pass & Seymour/Legrand | L620-R | L620-P | L620-C |

12. 20A-480V, NEMA L16-20, three-pole, four-wire locking type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 6430 | 6432 | 6434 |
| Bryant | 71620-FR | 71620-NP | 71620-NC |
| General Electric | GL1620 | GLD1621 | GLD1623 |
| Hubbell | 2430A | 2431 | 2433 |
| Pass & Seymour/Legrand | L1620-R | L1620-P | L1620-C |

13. 30A-125V, NEMA 5-30, two-pole, three-wire straight blade grounding type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 5716N | 5717N | 6716N |
| Bryant | 9530-FR | 9630-RP | - |
| General Electric | GE4138-3 | GED0531 | GED0533 |
| Hubbell | 9308 | 9309 | - |
| Pass & Seymour/Legrand | 3802 | 5921 | - |

14. 30A-125V, NEMA L5-30, two-pole, three-wire grounding and locking type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 6330 | 6332 | 6334 |
| Bryant | 70530-FR | 70530-NP | 70530-NC |
| General Electric | GL0530 | GLD0531 | GLD0533 |
| Hubbell | 2610 | 2611 | 2613 |
| Pass & Seymour/Legrand | L530-R | L530-P | L530-C |

15. 30A-125/250V, NEMA 14-30, three-pole, four-wire straight blade grounding type:

| | RECEPTACLE | CAP |
|---|---|---|
| Arrow-Hart | 5744N | 5746N |
| Bryant | 9430-FR | 5746 |
| General Electric | GE4191-3 | GED1431 |
| Hubbell | 9430 | 9431 |
| Pass & Seymour/Legrand | 5740 | 5741-AN |

16. 30A-125/250V, NEMA L14-30, three-pole, four-wire grounding and locking type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 6510 | 6512 | 6514 |
| Bryant | 71430-FR | 71430-NP | 71430-NC |
| General Electric | GL1430 | GLD1431 | GLD1433 |
| Hubbell | 2710-A | 2711 | 2713 |
| Pass & Seymour/Legrand | L1430-R | L1430-P | L1430-C |

17. 30A-250V, NEMA L6-30, two-pole, three-wire locking blade grounding type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 6340 | 6342 | 6344 |
| Bryant | 70630-FR | 70630-NP | 70630-NC |
| General Electric | GL0630 | GLD0631 | GLD0633 |
| Hubbell | 2620-A | 2621 | 2623 |
| Pass & Seymour/Legrand | L630-R | L630-P | L630-C |

18. 30A-250V, NEMA 6-30, two-pole, three-wire straight blade grounding type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 5700N | 5701N | 6700N |
| Bryant | 9630-FR | 9630-ANP | - |
| General Electric | GE4139-3 | GE4328-9 | GE4373-9 |
| Hubbell | 9330 | 9331 | - |
| Pass & Seymour/Legrand | 3801 | 5931 | - |

19. 50A-208V (50A-600V), three-pole, four-wire locking type with ground:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 3769 | 3765 | 3764 |
| Bryant | 3769 | 3765 | 3764 |
| General Electric | LD3769 | LD3765 | LD3764 |
| Hubbell | 3769 | 3765-C | 3764-C |
| Pass & Seymour/Legrand | 3769 | 3765 | 3764 |

20. 50A-125/250V, NEMA 15-50, three-pole, four-wire grounding straight blade type:

| | RECEPTACLE | CAP |
|---|---|---|
| Arrow-Hart | 5754N | 5745N |
| Bryant | 9450-FR | 5745 |
| General Electric | GE4181-3 | GE4180-3 |
| Hubbell | 9450 | 9451 |
| Pass & Seymour/Legrand | 5750 | 5751-AN |

21. 50A-125/250V, three-pole, four-wire grounding locking blade type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | CS6369 | CS6365 | CS6364 |
| Bryant | CS6369 | CS6365 | CS6364 |
| General Electric | - | - | - |
| Hubbell | CS6369 | CS6365 | CS6364 |
| Pass & Seymour/Legrand | - | - | - |

22. 50A-250V, NEMA 6-50, two-pole, three-wire grounding straight blade type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | 5709N | 5710N | 6709N |
| Bryant | 9650-FR | 9650-RP | - |
| General Electric | GE4141-3 | GED0651 | GED0653 |
| Hubbell | 9367 | 9368 | - |
| Pass & Seymour/Legrand | 3804 | 3869 | - |

23. 60A-120/208V, three-phase, 60 Hz, five-pole, five-wire, watertight, with threaded cap:

| | BOX | ANGLE ADAPTER | RECEPTACLE BODY | COMPLETE ASSEMBLY |
|---|---|---|---|---|
| Hubbell | 26401 | 26404 | 26520 | - |
| Crouse-Hinds | - | - | - | Area-6575 |
| Russell Stoll | - | - | - | DS6516-FRAB- |

24. 60A-480V, NEMA L16-20, three-pole, four-wire locking type:

| | RECEPTACLE | CAP | CONNECTOR |
|---|---|---|---|
| Arrow-Hart | - | - | - |
| Bryant | - | - | - |
| General Electric | - | - | - |
| Hubbell | HBL 26410 | HBL 26402 | HBL 26418 |
| Pass & Seymour/Legrand | - | - | - |

D. Safety receptacle: 15A-125V, NEMA 5-15, straight blade grounding safety receptacle, Hubbell No. SG-62H-1.

E. Door monitoring switches:

1. General: Provide magnetic door switches (one per leaf) and key switches at specific door locations as indicated on Drawings. Refer to Electrical Drawings details for schematic installation details of door switches.

2. Magnetic contact switches: Provide concealed magnetic SPDT switches with minimum 6-ft. wire leads, Sentrol No. 1076W-06 for hollow metal doors and frames. Where necessary, provide other similar Sentrol types to suit concealed installation conditions, as approved by Owner and compatible with Owner's ride control and/or existing security system equipment. Color of switches to closely match finish or paint color of door frame.

3. Key switches: Arrow-Hart No. 1191L.

F. Device cover plates:

1. Interior plates: Specification grade plastic, 0.1 in. thick, ivory in color, UL listed.

a) Plates in kitchens and restrooms to be polished stainless steel, 0.040 in. thick except in kitchens use double lift lid weatherproof gasketed plates for convenience receptacles.

b) MATV plate: RMS No. CA-4028.

2. Exterior plates: Choose type of exterior cover plate in accord with the device location and/or manner in which device will be used. Device cover plates shall be die-cast aluminum with hinged cover, rated for respective type of use specified below, or as indicated on Drawings.

a) Outlet box weatherproof hoods: NEMA 3R rating, gasketed, for unattended use with cover closed, padlockable latching cover to meet OSHA lockout/tagout requirements, large cord opening and UL listed. As manufactured by Hubbell, Intermatic or Leviton.

b) Low profile weatherproof cover: Gasketed, approved for use with cover open, self-closing hinged covers (two independent self-closing lids for duplex receptacles which are horizontally mounted), UL listed. As manufactured by Hubbell, Leviton or Pass & Seymour.

c) Communication outlet weatherproof hoods: NEMA 3R rating for unattended use with cover closed, two-cord openings and UL listed. As manufactured by Red Dot.

## PART 3 - EXECUTION

### 3.1 Installation

A. Mount switches and receptacles in vertical position in building interiors.

B. Mount receptacles with weatherproof plates in horizontal position.

C. Install receptacles mounted vertically so that the ground contact falls on the top position, and horizontally-mounted receptacles with neutral pole in top position.

D. Use plastic blank plates on J-boxes in public areas.

E. Use mechanical type door switches for load control.

F. Install receptacles for plug in lighting fixtures within 36 in. of fixture location.

G. Use safety type receptacles with low profile weatherproof metal covers for all convenience outlets in guest accessible areas (i.e., queue lines, waiting areas, etc.).

H. All GFI type exterior receptacles shall be provided with weatherproof metal hoods.

I. GFI type receptacles shall not be fed-through wire.

END OF SECTION

SECTION 26 0142

NAMEPLATES AND WARNING SIGNS

PART 1 - GENERAL

Not Used.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Nameplate shall be plastic laminate with 3/4" high letters in white on black background screwed onto equipment designations shall clearly state:

1. Equipment Enclosure Nameplates.

a) Manufacturer's nameplate including equipment design rating of current, voltage, KVA, HP, bus bracing rating, or as applicable.

b) Equipment nameplate designating system usage and purpose, system nominal voltage, equipment rating for KVA, amperes, HP and RPM as applicable. Designation data per drawings or to be supplied with shop drawings approval.

2. Device nameplates: Device usage, purpose, or circuit number; manufacturer and electrical characteristic ratings including the following:

a) Circuit Breakers: Voltage, continuous current, maximum interrupting current and trip current.

b) Switches: Voltage, continuous current, horsepower or maximum current switching. If fused, include nameplate stating "Fuses must be replaced with current limiting type of identical characteristics."

c) Contactors: Voltage, continuous current, horsepower or interrupting current, and whether "mechanically-held" or "electrically-held".

d) Motors: Rated voltage, full load amperes, frequency, phases, speed, horsepower, code letter rating, time rating, type of winding, class and temperature.

e) Controllers: Voltage, current, horsepower and trip setting of motor running over current protection.

2.2 WARNING SIGNS

A. Warning signs shall be minimum 18 gauge steel, white porcelain enamel finish with red lettering. Lettering to read "DANGER - HIGH VOLTAGE" in 1" letters. Warning signs to be included on door or immediately above door of all electrical equipment rooms, vaults or closets containing equipment rooms, vaults or closets containing equipment energized above 150 volts to ground, except where such spaces are accessible from public areas.

2.3 WARNING SIGN DESIGNATION

A. Warning designation in 1" red letters shall be painted by stencil or pre-printed adhesive on each pull box, cabinet or 1-foot length of exposed conduit stating "DANGER" and giving voltage of enclosed conductors such as "DANGER - 480 VOLTS", for all systems over 150 volts to ground.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Nameplates shall be mounted by self-tapping or threaded screws and bolts or by rivets.

B. Signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.

END OF SECTION

SECTION 26 0164

BRANCH CIRCUIT PANELBOARDS

PART 1 - GENERAL

CEC 220 PROVISIONS.

1.1 WORK INCLUDED

A. Branch circuit panelboards.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals: Section 260000.

B. Overcurrent Protective Devices: Section 260180.

C. Control Devices: Section 264901.

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION

A. Provide factory assembled, enclosed panelboards in dead front cabinets, with doors, surface mounted or recessed as indicated, not less than 20" wide and 5-3/4" deep. Height will depend on the number of breakers and spaces.

B. Where a control compartment is indicated, provide an integral compartment with a separate hinged lockable door held with captive screws. Identify all internal control wiring with manufacturers wire numbering or control wire numbering when indicated, at all terminal points and connections.

C. Provide feeder terminal lugs for both main lugs only and main breakers rated for use with copper conductors.

D. Provide full length copper bussing including areas indicated as space only.

E. Provide full size neutral bus where neutral bus is indicated. Provide equipment ground bus and bolt-on circuit breakers.

F. Key all door locks alike.

G. 120/208V, 3 Phase, 4 Wire Panelboards: Square-D Co. Type NQOD or Powerlink G3 NF with programmable module where designated, alternate bid for General Electric type AQ.

H. 277/480V, 3 Phase, 4 Wire Panelboards: Square-D Co. Type NF, alternate bid for General Electric type CCB.

I. All equipment shall be listed to meet or exceed the available fault current by 10%.

J. Doors shall be hinged.

K. All placards are welded steel type.

L. Provide hinged deadfront doors to allow internal access to panel without totally rewiring cover panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Secure panelboards to building structure to withstand wire pulling strains.

B. Secure surface mounted panelboards to wood studs or channel material spanning metal studs.

C. Do not use toggle bolts.

D. Contractor shall program lighting control Powerlink panelboard per owner's requirements.

3.2 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates on all branch circuit panelboards shown on the single line diagram.

B. Provide panelboard and source feed designation on nameplates with 3/8" minimum height lettering for the panel name and 1/4" height lettering for the source feed designation.

EXAMPLE: LA

FED FROM: DLA

C. Secure nameplates with at least two spaces or rivets. Cementing and adhesive installation not acceptable.

D. Provide a typewritten directory for each branch circuit panelboard, showing each circuits and its use. Provide metal directory frame with plastic window.

END OF SECTION

SECTION 26 0170

DISCONNECTS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Disconnects: Switches, fused or unfused.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals: Section 260010.

B. Fuses: Section 260180.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Square D Company

B. General Electric

2.2 MATERIAL AND FABRICATION

A. Provide heavy duty type, quick-make, quick-break disconnects with cover interlocks.

B. Provide NEMA Type 1 enclosure for dry locations, provide the proper enclosure for other locations as indicated.

C. Provide motor rated toggle switches where indicated.

D. Provide fused disconnect for elevator drive motors.

E. Provide rejection clips on disconnects where rejection type fuses are to be installed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Securely fasten disconnects to structure to withstand wire pulling strains.

3.2 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates on individually mounted disconnects with minimum 1/4" height letters indicating the load served and the source feed designation.

EXAMPLE: LOAD: A/C-1

FED FROM: DHA-1

B. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

END OF SECTION

SECTION 26 0190

SUPPORT DEVICES

PART 1 - General

1.1 Work Included

A. Support devices for conduit, boxes, lighting fixtures and equipment.

PART 2 - Products

2.1 Acceptable Manufacturers

A. Hangers, Straps and Beam Clamps:
   1. Efcor.
   2. Raco, Inc.
   3. Steel City.
   4. O.Z./Gedney Co.
   5. Caddy Fastening System by ERICO Products Inc.

B. Channels and Fittings:
   1. Kindorf.
   2. Unistrut Corp.

C. Anchors:
   1. Acherman-Johnson Corp.
   2. Phillips Drill Co.
   3. Rawl Products Co.

2.2 Material and Fabrication

A. Hangers: Steel cadmium plated.

B. Straps: One-hole and two-hole malleable iron, hot-dipped galvanized or steel, cadmium or zinc plated.

C. Beam Clamps: Malleable iron, hot-dipped galvanized or cadmium plated.

D. Channels and Fittings:

1. Channels: Hot-dipped galvanized.

2. Fittings: Galvanized.

E. Anchors: Self drilling and expansion bolt types. No wood or fiber plugs or concrete nails are acceptable.

PART 3 - Execution

3.1 Use

A. Use one-hole or two-hole straps for single conduit runs on walls or ceilings.

B. Use hangers with solid steel rods for hanging single conduits.

C. Use formed channel trapezes for groups of two or more conduits.

D. To fasten boxes and supports to:

1. Wood: Use wood screws or screw type nails of equal holding power.

2. Brick and Concrete: Use bolts and expansion shields.

3. Hollow Masonry Units: Use toggle bolts.

E. Support sheet metal boxes from building structure directly or by bar hangers.

F. Do not penetrate reinforced concrete beams with fastenings more than 1-1/2" or reinforced concrete joints with more than 3/4" fastenings to prevent contact with reinforcing steel.

END OF SECTION

SECTION 26 2450

GROUNDING

PART 1 - GENERAL

1.1 REFERENCES

A. N.E.C.: Article 250 "Grounding".

B. Underwriter's Laboratories (U.L.). Standard A67 - "Grounding and Bonding Equipment". STD 869 - Grounding and Bonding.

C. ITEE - Standards 142 and 241.

1.2 DESCRIPTION OF SYSTEM:

A. A permanent grounding system with methods and materials in accordance with applicable Codes and Standards, able to conduct ground fault currents to the grounded neutral of electrical distribution systems, and limit potential differences between grounding conductors, raceways and enclosures.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's data on grounding systems and accessories.

B. Shop Drawings: Submit layout drawings of grounding systems and accessories including, but not limited to, ground wiring, copper braid and bus, ground rods, and plate electrodes.

1.4 QUALITY ASSURANCE:

A. Installer qualifies with at least 3 years of successful installation experience on projects with electrical grounding experience similar to that required for project.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Handle electrical grounding accessories and components carefully to avoid damage. Store in location that will protect from dirt and weather.

PART 2 - PRODUCTS

2.1 GROUND RODS:

A. Copper clad steel, unless indicated otherwise. Minimum dimension of 5/8" diameter by 8' long or larger if indicated and sectional rods with couplings where lengths exceeding 12' are specified or indicated, or where added driving depth is required to achieve a specified minimum resistance.

2.2 GROUNDING ELECTRODE:

A. Bare stranded copper, 3/0 AWG unless indicated otherwise, for installation in soil or embedded in concrete and cable with type TW insulation when installed in raceway. Install without splice from connection to connection.

2.3 GROUNDING CONDUCTORS:

A. Type TW insulation, unless specified or indicated otherwise with a continuous green outer insulating jacket for size #6 AWG and smaller and with green tape banding for #4 AWG and larger, marked at each access point (e.g.: Junction boxes, Enclosures).

2.4 CLAMPS AND PRESSURE CONNECTORS:

A. Cast copper, copper alloy, or bronze alloy suitable for use with aluminum and copper. Double bolt type with formed shoe and "U" cable clamp for connection to pipe or conduit; Single bolt type with cable shoe and "U" clamp for connections to flat bar or metal; and double bolt, parallel conductor split clamp type for cable to cable connections.

2.5 WELDED CONNECTIONS:

A. Exothermic process (Cadweld or Thermoweld).

2.6 EQUIPMENT ROOM GROUND TERMINAL BAR:

A. Copper 1/4" X 2-1/2" X 24", unless otherwise indicated. Two rows of holes on 1-1/2" centers for 1/2" bolt, to receive cables from two directions.

PART 3 - EXECUTION

3.1 GENERAL:

A. Ground conductive raceways, cable trays and enclosures for electrical systems wiring. Make ground circuits complete to form permanent conductive paths. Solidly ground each low voltage electrical system unless indicated or specified as ungrounded, or grounded through an impedance of a specified value. Provide bare conductors when in open air or soil and provide 600 volt, green, insulated conductors when in raceway.

3.2 MAIN GROUNDING JUMPER:

A. Install a main grounding jumper between the system neutral and the enclosure ground bus (or directly to enclosure where ground bus is not present) at each location where system grounding is required. Main grounding jumper:

1. Formed bus in switchboards and panelboards.

2. Formed bus or copper cable in transformers not coupled in unitized assembly with distribution equipment.

3.3 GROUND CONNECTIONS:

A. Make grounding electrode connections electrically ahead of any overcurrent or disconnect device or tap connection such that disconnection of neutral load conductors does not interfere with or remove the system ground connection. Use separate lugs on the transformer neutral terminals for neutral and main grounding jumpers when cable is used for transformer connections.

3.4 SEPARATELY DERIVED SYSTEMS:

A. For each separately derived system, grounded or ungrounded, install a grounding electrode conductor between each system enclosure ground bus (or bolted connection to enclosure where ground bus is not present) and a cold water pipe or building structural steel of one (1) inch size or larger near the separately derived system ground connection. Make connections to water pipes or steel accessible for easy inspection. Provide a separate ground conductor for each audio, video, isolated panels and UPS as noted on the plans.

3.5 SERVICE GROUND:

A. For each low voltage service, install a grounding electrode conductor between the system enclosure ground bus and the water service entrance to the building and install bonding jumpers around insulating unions and removable fittings in the water pipe between the grounding electrode conductor connection to the water pipe and the water service entrance.

3.6 GROUNDING ELECTRODE SYSTEM:

A. Install a complete grounding electrode system with interconnecting cables and terminations at the equipment room ground terminal bar. Make connections to the grounding electrode system accessible. Install the following grounding electrode systems:

1. Metal frame of building.
2. Grounding electrode encased by at least two inches of concrete, within and near the bottom of the building foundation or footing of the type specified in Part 2 - Products, at least 20 feet in length without splice from connection to connection.
3. Connection of other metal piping systems as required by National Electrical Code Article 250.
4. Driven ground rods.
5. Driven steel piles.
6. Connection to water service with bonding jumper around water meter.

3.7 GROUNDING ELECTRODE CONDUCTORS:

A. Install grounding electrode conductor in PVC or other non-conductive, non-metallic enclosure where a raceway system is indicated or necessary for conductor installation. Install grounding electrode conductors without splice from the enclosure ground bus to the connection at the grounding electrode system.

3.8 GROUND RODS:

A. Install a vertical position, full length below grade unless specified otherwise, and with conductor and top of rod 6" minimum below grade. Provide exotheric welds at all connections.

3.9 EQUIPMENT ROOM GROUND TERMINAL BAR:

A. Install in equipment rooms where indicated. Mount bar by anchors and bolts using 1-1/2" long segments of 1/2" rigid conduit as spacer between bar and wall. Use a minimum of two supports, 18" on center. Connect grounding electrode system conductors, system enclosure ground bus, and other indicated electrode systems to the terminal bar. Label permanently all ground conductors as to destination location, e.g. TR1, panel IPS, etcetera.

3.10 EQUIPMENT GROUND:

A. Form the equipment ground circuits with rigid metallic raceways (e.g., EMT, rigid steel conduit) unless indicated otherwise. Make all threaded coupling connections wrench tight. Install bonding jumpers for continuity around fittings and terminations where the conductive raceway is made non-continuous. Where indicated or specified, install ground conductors in raceways to augment the circuits formed by the metallic raceway system. Bond the conductors to boxes or enclosures in which access is possible. Size conductors as specified, indicated, or required by code, whichever is larger. Install grounding bushings and bonding jumpers to enclosures or ground bussing for the following: Service entrance feeder; each location where multiple ring knockouts are damaged during conduit installation; each location where conduits are stubbed up into floor mounted and each conduit termination at a painted enclosure where paint is not removed before installation of raceway.

3.11 FLEXIBLE RACEWAY GROUNDING:

A. Install a ground conductor inside all flexible raceways (e.g., Flexible steel, liquid tight) regardless of length. Bond the conductor to the enclosure or ground bus in the nearest box or access on either side of the flexible section. Size conductor as specified, indicated, or required by code, whichever is larger.

3.12 NON-CONDUCTIVE RACEWAY:

A. Install a ground conductor in raceways of non-conductive materials. Bond conductor to conductive enclosures in which access is possible. Bond non-current carrying conductive equipment contained in a non-conductive enclosure. Install insulated or bare conductors, sized as specified, indicated, or required by code, whichever is larger.

3.13 SECTIONAL RACEWAY:

A. Install a ground conductor in sectional raceways with removable covers for access (e.g., Plug-in strips, surface raceway systems, and wireways) unless specified otherwise. Size conductor in accordance with the N.E.C. for the largest phase conductor size installed in raceway, or as indicated. Bond sections of the raceway to the ground conductor. Connect receptacle ground terminals in the raceway to the ground conductor, and make other ground connections indicated on the drawings.

3.14 CABLE SUPPORT SYSTEMS:

A. Ground elements of the cable support system to panelboards, cabinets and switchboards from which their circuits originate. Install a ground conductor sized as required by code, as indicated, or #12 AWG, whichever is larger.

3.15 MULTI-CONDUCTOR CABLE, METALLIC SHEATH:

A. Use multi-conductor cable with metallic sheath or armor approved for use as ground circuit conductor or install ground conductor(s). Size ground circuit conductor as required by code, as specified, or as indicated on the drawings, whichever is larger. Terminating devices for cable using the sheath or armor as the ground circuit conductor shall be approved for use as the connecting device between the cable and the enclosure. Terminate internal ground circuit conductors by lug to the interior of the enclosure or to the contained ground bus where present. Use bare or clearly identified internal grounding conductors.

3.16 MULTI-CONDUCTOR CABLE, NON-METALLIC SHEATHED:

A. Use only non-metallic sheathed multi-conductor cables having a ground circuit conductor enclosed in the sheath the same size as the ungrounded conductors. Use bare or clearly identified internal grounding conductors. Terminate ground circuit conductor by lug to the enclosure ground bus where present or to the interior of the enclosure.

3.17 GROUND CONDUCTOR BONDING:

A. Bond grounding conductors to boxes or enclosures at each access point. Do not use building steel as equipment grounding path. Use welded ground connections, at least where such are buried in soil, installed below slabs on grade, or embedded in concrete.

END OF SECTION

SECTION 26 2510

LIGHTING FIXTURES

PART 1 - General

1.1 Summary

A. Section includes:

1. Lighting fixtures, including lamps, accessories and support materials.

B. Related work:

1. Submittals: Section 01 3300.
2. Outlet and Junction Boxes: Section 26 0130.
3. Supporting Devices: Section 26 0190.
4. Contactors, Relays, Time Switches, Photocontrols, etc.: Section 26 4901.

PART 2 - Products

2.1 Material and Fabrication

A. Fixtures schedule lists one or more acceptable manufacturers for each fixture type.

B. Provide all lighting fixtures of each type from the same manufacturer.

C. Provide sockets for screw base lamps of plated steel, brass or bronze.

D. Lamps Acceptable Manufacturers:

1. General Electric.
2. Phillips.
3. Sylvania.
4. As indicated for specialty lamps.

E. Flexible metal conduit systems connecting individual tandem wired lighting fixtures.

1. Conductors carrying line voltage and current shall be sized in accordance with the overcurrent device protecting the circuit indicated.
2. Provide a #12 AWG minimum size ground conductor.

F. Provide electronic ballasts for all fluorescent and HID fixtures.

PART 3 - Execution

3.1 Installation

A. Provide a lighting fixture for each lighting outlet indicated.

B. Provide recessed and semi recessed fixtures with mounting frames compatible with the ceiling and wall systems employed and secure fixture mechanically to frame.

C. Align rows of suspended and surface mounted fluorescent fixtures to form straight lines at uniform elevations.

D. Provide swivel ball type hangers which will allow a minimum of 45 degrees angle for fixtures indicated as pendant mounted.

E. Make recessed fixture fit snugly against ceiling to prevent light leakage.

F. Support suspended and surface mounted LED fixtures as follows:

1. Fixtures not over 12 inches wide and not over 50 inches long, a minimum of two fastenings.
2. Fixtures not over 12 inches wide and over 50 inches long, a minimum of three fastenings.
3. Fixtures over 12 inches wide and not over 50 inches long, a minimum of four fastenings.

G. Support pendant mounted LED fixtures as follows:

1. Single fixtures not over 12 inches wide, a minimum of two single pendants.
2. Single fixtures over 12 inches wide, a minimum of two single pendants at each end or one double pendant at each end.
3. Continuous rows of fixtures not over 12 inches wide, a minimum of one single pendant for each fixture plus one for each row.
4. Continuous rows of fixtures over 12 inches wide, a minimum of two single pendants or one double pendant for each fixture plus one for each row.
5. Locate pendants for continuous row fixtures at each joint and each end of row.
6. Rigidly fasten continuous row fixtures together with fixtures manufacturer supplied joiner.

H. Provide each lighting fixture with the lamps indicated on the fixture schedule.

1. Provide self extinguishing lamps in open bottom or unshielded metal halide fixtures.

I. Clean and relamp existing fixtures to be reused.

J. EMT shall not be used to support suspended fixtures of any type. Suspension shall be by means of standard hangers, where available and applicable, by rigid threaded conduit and fittings, or by rods.

K. Where fixtures are to be mounted on, or suspended from concrete ceiling, provide cast in place inserts.

L. Fixtures shall not be supported by outlet box cover screws alone; provide a fixture stud or "hickey" for added support.

M. Provide a junction box at each exit light fixture indicated.

N. Provide weatherproof boxes and connectors and liquid tight flexible conduit to each light fixture.

O. All suspended fixtures will be installed with 1/8-inch safety cable and four Crosby clamps (two top and two bottom) to be used as a fixture support backup.

END OF SECTION

SECTION 26 4721

FIRE ALARM SYSTEM

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This specification document provides the requirements for the Fire Alarm Systems throughout the facility. These systems shall include, but not be limited to, system terminal cabinets, signal power boosters, backboards, terminal strips, devices with termination, wire/cabling, testing and verification and other relevant components. The contractor shall include all costs for devices, wire, cable, panels, installation labor, tests, approvals and as-built documentation. Additionally, the contractor will be required to provide the necessary interfaces (control modules, etc.) to the monitoring system in which audio is incorporated. All conduits for the fire alarm systems and associated wiring shall be included. The fire alarm contractor shall provide "shop" drawing layouts to owner showing device locations mounting heights and conduit size requirements.

### 1.2 WORK INCLUDED

A. General Requirements:

1. The contractor shall furnish and install a complete building automatic addressable fire alarm evacuation system comprising of fire alarm panels, signal booster panels, Manual Pull Stations, Smoke Detectors, Heat Detectors, system alarm connections, connection to building Speakers, Alarm Strobes, Alarm Speaker/Strobes, Alarm Speakers as required by code and as specified herein.

2. Labeling: All system equipment shall be labeled with the manufacturer's name and logotype to assure the integrity of the complete system.

### 1.3 RELATED WORK DOCUMENTS

A. Submittals.

B. Coordination

C. Electrical General Requirements

D. Electrical Raceway

E. Electrical Conduit

F. Electrical Outlet and Junction Boxes

G. Fire Alarm Evacuation System

H. Electrical Interior Pull boxes and wireways

I. Electrical Grounding systems

J. Mechanical Plans (connections to heating and air conditioning units)

K. Plumbing Plans (sprinkler flow, tamper and Post Indicator Valve locations)

L. Systems Plans (monitoring systems)

M. Electrical Plans

1.4 DESCRIPTION:

A. This section of the specification includes the furnishing, installation, and connection of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of CBC/CFC/Title 19 NFPA Standards for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

C. The FACP and peripheral initiation devices shall be manufactured 100% by a single manufacturer (or division thereof).

D. The installing company shall employ only factory-trained technicians on site to install and perform the final checkout and to ensure the systems integrity. No "parts & smarts" installation will be acceptable.

1.5 SCOPE

A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

B. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on a two wire Signaling Line Circuit (SLC).

2. Initiation Device Circuits (IDC) shall be a two-wire circuit.

3. Notification Appliance Circuits (NAC) shall be a two-wire circuit.

4. Digitized electronic signals shall employ check digits or multiple polling.

5. A single ground or open on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

6. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

7. The Alarm System shall perform the following functions:

   a) Provide automatic fire alarm detection in all building spaces as dictated by local code requirements.

   b) Provide evacuation signals for employees and guests as dictated by local code requirements.

   c) Connect all buildings local fire alarm panels into a seamless network incorporating a central control console located in the administration building and remote console in the guard gatehouse.

   d) Perform any added functions as specified or required by local codes or AHJ.

C. Basic System Functional Operation:

1. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

   a) The system alarm LED shall flash.

   b) A local piezo electric signal in the control panel shall sound.

   c) A backlit 80 character LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

   d) Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.

   e) All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed and the associated system outputs (alarm Notification appliances and/or relays) shall be activated.

## 1.6 SUBMITTALS

A. General:

1. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

2. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Software Modifications:

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modification on site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

C. Certifications: Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

D. Owner's designated representative shall approve all equipment submittals.

E. In addition to the General requirements, submit all materials for approval arranged in the same order as Specifications, Individually referenced to Specification paragraph and drawing number Submit number required In Division I plus three (3) copies of A4 material and 2 prints plus one reproducible of drawings in A0, minimum. Submit A4 items bound in volumes and A0 drawings in edgebound sets.

F. Progress Schedule: Include duration and milestones for the following:

1. All submittals specified.

2. Shipment to site.

3. Installation.

4. Field testing.

5. Training.

6. First beneficial use date.

G. Manufacturer's Product Data:

1. List of Materials: For each item, Include:

a) Manufacturer.

b) Model number.

c) Listing: CSFM.

d) Quantity.

2. Manufacturer's Product Data: In sequence of List of Materials, Data sheet for each item, including all accessories, marked for proposed product. Photo copies will not be accepted. Original manufacturer specifications sheets only.

H. Field/Shop Drawings:

1. Resubmit: for coordination reference complete with corrections from previous submittal:

a) List of Materials.

b) Manufacturer's Product Data.

2. Field (installation) Drawings: Collate in sequence:

a) Drawing Index/symbol sheet.

b) Floor plans. At scale of Contract Documents. Show:

(1) Devices with circuit number.

(2) Rough-in.

(3) Mounting height.

(4) Conduit size.

(5) Wire type.

(6) Wire fill.

c) Sections/Elevations. At scale of Contract Documents.

(1) Mounting location reference.

d) Enlarged Plans. At scale of Contract Documents or larger as required for trade coordination. Show:

(1) Refer to "floor plans".

(2) Architectural features.

(3) Clearances.

e) System conduit riser drawing, show:

(1) Terminal cabinets.

(2) Coordination with floor plans.

(3) Wire runs not shown on floor plans.

(4) Wire type.

(5) Wire fill.

f) Mounting details

(1) Stamped and signed by Engineer licensed in jurisdiction for work of this type.

(2) Show loads, strength of connections, etc.

(3) Show calculations - on drawings or in bound volume for review by authorities having jurisdiction.

(4) Provide details for:

(a) Racks/cabinets/panels

g) Installation details as required.

(1) Terminal cabinets: terminations.

h) Wire run sheets (if used) Show:

(1) Wire Number.

(2) Source.

(3) Designation

(4) Signal Type.

(5) Wire type.

(6) Operating level or voltage (if applies).

3. Shop (Fabrication) Drawings: Collate In sequence:

a) Drawing Index/symbol sheet (if separate set from Field Drawings).

b) System functional drawings. Submit separate drawing for each system/subsystem. Show:

(1) Equipment: Function, make, model.

(2) Wire number.

(3) Wire Type.

c) Fabrication details submit for:

(1) Receptacles.

(2) Panels.

(3) Special mounting provisions.

(4) Legends/engraving details. Half or full size:

(a) Receptacles.

(b) Panels.

(c) Equipment.

4. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

5. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

6. Show annunciator layout, configurations, and terminations.

I. Shop and Field Test Reports:

1. Schedule: Submit test reports in timely manner relative to Project schedule such that owner may conduct Verification of submitted Test Data at owner's option, without delay of progress.

a) Shop test report: Submit prior to shipping completed system to project site.

b) Field test report: Submit following system completion and prior to and as condition precedent to owner's acceptance of the Work of this Section.

2. Test Reports: Include:

a) Time and date of test.

b) Personnel conducting test. Provide with 24 hour notice for test. (Provide per CFC 901.2.1)

c) Test Object.

d) Procedure used. (Per Chapter 9 CFC)

e) Test equipment, Including serial and date of calibration.

f) Results of test - numerical or graphical presentation.

3. Verification of Submitted Test Data: owner may elect to verify some or all test data submitted. Provide with written request for 24 hour notice for test per CFC 901.2.1. Retest In presence of designated observer(s) at reasonable convenience of owner. Provide technician familiar with work of this Section. Provide all test equipment.

J. Reference Data for Operation, Maintenance and Repair

1. In addition to the requirements of Division 1, submit one (1) additional set. Submit in three post binders (not ring binder) with Tabs.
2. Index.
3. Systems operating Instructions.
4. Reduced set of system Record Drawings.
5. Key schedule.
6. Maintenance and spare parts schedules.
7. Shop and Field Test Reports.
8. Equipment manuals. Collate alphabetically by manufacturer. Provide manufacturer's original operation, Instruction and service manuals for each equipment item. For each set, provide manufacturer's original printed copies only. Photocopies not acceptable.

K. Record Drawings in AutoCAD R2014 format min.

1. Quantity:
   a) Review sets: as for Shop and Field Drawings.
   b) Record set:
      (1) Three (3) blueline.
      (2) One CD disk with applicable .DWG files
      (3) Retain on premises minimum 5 years. CFC 901.6.2.1
2. Content: All drawings required under "Field and Shop Drawings". Show "as Installed" condition.

L. Other than Specified Equipment

1. Equipment other than specified shall be considered for approval provided the following is submitted in writing by the contractor to the Consultant ten (3) days before the bid date:
2. Complete lists, descriptions and drawings of materials to be used.
3. A complete list of current drain requirements during normal supervisory conditions, trouble conditions, and alarm conditions
4. Battery standby calculations showing total standby power needed to meet the system requirements as specified

M. Substituted Equipment:

1. If equipment other than that specified is supplied, it shall be the contractor's obligation to submit the appropriate documentation and allow the specifying Consultant sufficient time to consider the equality of the substituted items.

N. Satisfying the Entire Intent of these Specifications

1. It is the contractor's responsibility to meet the entire intent of these specifications. Deviations from the specified items shall be at the risk of the contractor until the date of final acceptance by the Consultant and owner's representative.

2. All costs for removal, relocation, or replacement of a substituted item shall be at the risk of the contractor.

## 1.7 GUARANTEE/WARRANTY

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

## 1.8 POST CONTRACT MAINTENANCE:

A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

B. As part of the submittal, include a quote for a maintenance contract to provide all maintenance, test, and repair described below. Include also a quote of unscheduled maintenance/repair, including hourly rates for technicians trained on this equipment, and response travel costs. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor that shall describe the protocol for preventive maintenance. The schedule shall include:

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
2. Each circuit in the fire alarm system shall be tested semiannually.
3. Each smoke detector shall be tested in accordance with the requirements of CSFM & NFPA Standards.

1.9 POST CONTRACT EXPANSIONS:

A. The contractor shall provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable control modules equal (list actual quantity of each type).

C. Quotation shall include installation and test labor and labor to reprogram the system for this 10% expansion. If additional FACP hardware would be required, include the material and labor necessary to install this hardware.

D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include cost of conventional peripherals or the cost of initiating devices or Notification appliances connected to the addressable monitor/control modules.

E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.10 APPLICABLE STANDARDS AND SPECIFICATIONS: (2016 CBC/CFC/NFPA72 & Title 19)

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards.

1. DSA Requirements
2. County of Ventura Fire Code
3. All requirements of the Authority Having Jurisdiction (AHJ).

1.11 APPROVALS

A. The system shall have proper listing and/or approval from internationally recognized agencies.

B. The system shall be listed by the international agencies as suitable for extinguishing release applications.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT AND MATERIAL

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the Fire Alarm Code.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

C. All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

### 2.2 CONDUIT AND WIRE

A. Conduit:

1. Conduit shall be red & installed in accordance with the DSA & fire marshal requirements.
2. All wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of Power, or Class circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors.
4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4 inch (19.1 mm) minimum and red in color.

B. Wire:

1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with DSA codes and approved by CSFM and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation.
5. Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. The system shall support up to 1,000 ft. of untwisted, unshielded wire. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.
6. All field wiring shall be completely supervised.
7. The Fire Alarm Control panel shall be capable of T-Tapping two wire type. Signaling Line Circuits (SLC's) Systems, which do not allow or have restrictions in, for example, the amount of T-Taps, length of T-Taps etc., are not acceptable.
8. All wire/cable used in underground or below grade, applications shall be rated by the manufacturer for the intended use and be gel filled.

C. Terminal Boxes, Junction Boxes and Cabinets:

1. All boxes and cabinets shall be DIN listed for their use and purpose.

D. Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

E. The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 16 amperes. This circuit shall be labeled at the Main Power Distribution Panel as FIRE ALARM. Fire Alarm Control Panel Primary Power wiring shall be 12 AWG. The Control Panel Cabinet shall be grounded securely to either a cold water pipe or grounding rod.

## 2.3 MAIN FIRE ALARM CONTROL PANEL

A. The FACP shall be an EST and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, printer, annunciators, and other system controlled devices.

B. System Capacity and General Operation:

1. The control panel shall provide, or be capable of expansion to 2000 intelligent/addressable devices.
2. The system shall include Form-C alarm and trouble relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include four Class B (Style Y) programmable Notification Appliance Circuits.
3. The system shall support programmable driven relays.
4. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
5. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.
6. The FACP shall provide the following features:
    a) Drift Compensation to extend detector accuracy over life.
    b) Sensitivity Test
    c) Maintenance Alert to warn of excessive smoke detector dirt or dust accumulation.
    d) System Status Reports to display or printer.
    e) Alarm Verification, with verification counters.
    f) PAS presignal.
    g) Rapid manual station reporting (under 2 seconds).
    h) Non-Alarm points for general (non-fire) control.
    i) Periodic Detector Test, conducted automatically by software.
    j) Pre-alarm for advanced fire warning.
    k) Cross Zoning with the capability of: counting two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
    l) March time and temporal coding options.
    m) Walk Test, with check for two detectors set to same address.
    n) Security Monitor Points.
    o) Control-By-Time for non-fire operations, with holiday schedules.
    p) Day/Night automatic adjustment of detector sensitivity.
    q) Device Blink Control for sleeping areas.

C. Central Microprocessor:

1. The Microprocessor shall communicate with, monitor, and control all external interfaces with the control panel. It shall include EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.

2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory and shall not be lost even if system primary and secondary power failure occurs.

3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

D. Display:

1. The display shall provide all the controls and indicators used by the system operator and may be used to program all system operational parameters.

2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.

3. The display shall provide an 80-character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide Light-Emitting-Diodes (LEDs), that will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, SIGNAL SILENCED, SUPERVISORY, and PRE-ALARM.

4. The Display shall provide a key touch key-pad with control capability to command all system functions, entry of alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

5. The Display shall include the following operator functions: SIGNAL SILENCE, RESET, DRILL, and ACKNOWLEDGE.

E. Signaling Line Circuit (SLC):

1. The SLC interface shall provide power to and communicate with intelligent detectors (Ionization, Photoelectric, or Thermal) and intelligent modules (monitor or control). This shall be accomplished over a single SLC loop and shall be capable of Style 4 or Style 6 wiring.

2. The loop interface shall receive analog information from all intelligent detectors that shall be processed to determine whether normal, alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

3. The detector software shall meet all local VDE and VdS requirements and be certified by VdS as a calibrated sensitivity test instrument.

4. The detector software shall allow manual or automatic sensitivity adjustment.

F. Serial Interfaces:

1. An EIA-232 interface between the Fire Alarm Control Panel and Listed Electronic Data Processing (EDP) peripherals shall be provided.

2. The EIA-232 interface shall allow the use of printers, CRT monitors, and PC compatible computers.

3. The EIA-232 interface shall include special protocol methods that allow off-site monitoring of the FACP over standard dial-up phone lines. This ancillary capability shall allow remote readout of all status information, including analog values, and shall not interfere with or degrade FACP operations when used. It shall allow remote FACP Acknowledge, Reset, or Signal Silence in this mode. It shall also allow adjustment of detector sensitivity and readout of the history file.

4. An EIA-485 interface shall be available for the serial connection of remote annunciators and LCD displays.

5. The EIA-485 interface may be used for network connection to a Proprietary Receiving Unit.

G. Enclosures:

1. The control panel shall be housed in a DIN listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

2. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.

H. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients, consistent with DIN standards.

I. An optional module shall be available which provides Form-C relays rated at 5.0. The relays shall track programmable software zones.

J. Power Supply:

1. The Power Supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.

2. It shall provide a battery charger for 30 hours of standby using dual-rate charging techniques for fast battery recharge.

3. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.

4. It shall provide 5.0 amps of usable Notification appliance power, using a switching 24 VDC regulator. A 3.0 amp notification expansion power supply shall be available for the demanding requirements visual devices, for a total system capacity of 8 amps.

5. It shall be power-limited.

6. It shall provide optional meters to indicate battery voltage and charging current.

K. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.

1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 30 hour standby.

2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.

3. The FCPS shall include an attractive surface mount backbox.

4. The Field Charging Power Supply shall include the ability to delay the AC fail delay requirements.

5. The FCPS include power limited circuitry.

L. Field Wiring Terminal Blocks:

1. For ease of service all panel I/O wiring terminal blocks shall be a removable, plug-in type and have sufficient capacity for 18 to 12 AWG wire. Terminal blocks, which are permanently fixed, are not acceptable.

M. Operators Controls:

1. Acknowledge Switch:

   a) Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and Trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.

   b) Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

2. Signal Silence Switch: Activation of the Signal silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

3. System Reset Switch: The system reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.

   a) Holding the system RESET switch shall perform a lamp test function.

1. Drill (Evacuate) Switch:

   a) The drill switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

N. Field Programming:

1. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.

2. All programming may be accomplished through the standard FACP keypad.

3. All field defined programs shall be stored in non-volatile memory.

4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.

5. Program edit shall not interfere with normal operation and fire protection. If a fire condition is detected during programming operation, the system shall exit programming and perform fire protection functions as programmed.

6. A special program check function shall be provided to detect common operator errors.

7. An Auto-Program (self-learn) function shall be provided to quickly install initial functions and make the system operational.

8. For flexibility, an off-line programming function, with batch upload/download, shall also be available.

O. Specific System Operations:

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the control panel. Sensitivity range shall be within the allowed window.

2. Alarm Verification: Each intelligent addressable smoke detector in the system shall be independently selected and enabled to be alarm verified. The alarm verification delay shall be programmable from 5 to 30 seconds. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

3. Point Disable: Any device in the system may be enabled or disabled through the system keypad.

4. Point Read: The system shall be able to display or print the following point status diagnostic functions:

   a) Device status.

   b) Device types.

   c) Custom device labels.

   d) View analog detector values.

   e) Device zone assignments.

   f) ll program Parameters.

5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing system status.

6. System History Recording and Reporting: The Fire Alarm Control Panel shall contain a History Buffer that will be capable of storing up to 800 system alarms/troubles/operator actions. Each of these activation's will be stored and time and date stamped with the actual time of the activation. The contents of the History Buffer may be manually reviewed, one event at a time, or printed in its entirety.

   a) Although the foreground history buffer may be cleared for user convenience, a background, non-erasable buffer shall be maintained which provides the last 800 system events.

b) The History Buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable.

7. Automatic Detector Maintenance Alert: The Fire Alarm Control Panel shall automatically interrogate each intelligent smoke detector and shall analyze the detector responses over a period of time.

a) If any intelligent smoke detector in the system responds with a reading that is below or above normal limits, then the system will enter the Trouble Mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

8. Pre-alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

9. Software Zones: The FACP shall provide 99 software zones. All addressable devices may be field programmed to be grouped into software zones for control activation and annunciation purposes.

## 2.4 SYSTEM COMPONENTS

A. Signaling Devices:

1. STROBES (as required by Code):

a) Strobes shall be provided as required and indicated on the contract drawings and shall have a flash rate not to exceed 60 times per minute.

b) The word "Fire" shall appear on the lens or lens plate.

c) Strobes shall be a 15cd, 1Hz minimum for restrooms and 75cd, 1Hz for large rooms (i.e., library, multi-use, meeting, etc.).

d) Strobes shall mount to 2 gang box, flush or surface as shown on drawings.

2. SPEAKERS (as required by Code): (Speakers are recommended for means of notification)

a) Alarm Speakers shall be provided as required and as indicated on the contract drawings.

b) Speakers shall mount to a 4 sq. box. for interior use and a cast weatherproof, gasketed box for exterior use.

c) Speakers shall be red in color.

d) Sound pressure level shall be 85dBA at 10 feet

e) Screw terminals shall be provided for field connections.

f) Unit may be configured with optional Strobe for interior Speaker/Strobe applications.

3. SPEAKER/STROBES (as required by Code):

a) Speaker/Strobe combination units shall be supplied as required and as indicated on the contract drawings.

b) Strobes shall not to exceed 60 flashes per minute.

c) The word "Fire" shall appear on the lens or lens plate.

d) Strobes shall be a 15cd, 1Hz minimum restrooms and 75cd, 1Hz for large rooms (i.e., library, multi-use)

e) Wiring for Strobes shall be separate from Speaker Circuits. Strobes shall mount to face of Speaker unit.

f) Wiring for Speakers shall be separate from Strobe Circuits. Speakers shall mount to a 4 sq. box. for interior use.

g) Speakers shall be red in color.

h) Sound pressure level shall be 85dBA at 10 feet

i) Screw terminals shall be provided for field connections.

4. SPEAKERS (as required by Code):

a) Speaker units shall be supplied as required and as indicated on the contract drawings.

b) Speakers shall mount to a single gang or double gang box for interior use.

c) Speakers shall be red in color.

d) Sound pressure level shall be 90dBA at 10 feet

e) Screw terminals shall be provided for field connections.

B. Addressable Devices – General:

1. Addressable Devices shall provide an address-setting means using rotary decimal switches.

2. Addressable Devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches. Devices, which use a binary address setting method, such as a dip switch, are not an allowable substitute.

3. Detectors shall be intelligent and addressable, and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuits.

4. Addressable smoke and thermal detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.

5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall be automatically adjusted by the panel on a time-of-day basis.

6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by DIN, VDE and/or VdS as meeting the calibrated sensitivity test requirements.

7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. An optional base shall be available with a built-in (local) sounder rated at 85 DBA minimum.

8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

C. Addressable Pull Box (manual station as required by Code):

1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

3. Manual stations shall be constructed with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.

D. Intelligent Photoelectric Smoke Detector:

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

E. Intelligent Thermal Detectors:

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

F. Intelligent Duct Smoke Detector:

1. The in-duct smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.

2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

G. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLC loops.

2. The monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.

3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch x 1-1/4 inch x 1/2 inch. This version need not include Style D or an LED.

H. Two Wire Detector Monitor Module:

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).

2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.

3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

I. Addressable Control Module:

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.

2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.

3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised listed remote power supply.

5. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

2.5 BATTERIES:

A. Shall be 24 volt, Gell-Cell type (two required).

B. Battery shall have sufficient capacity to power the fire alarm system for not less than thirty hours (30) plus thirty minutes (30) of alarm upon a normal AC power failure.

C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the VDE, DIN, EN, VdS Standards, along with local codes, as shown on the drawings, and as recommended by the equipment manufacturer.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

## PART 4 - GUARANTEE AND TEST

### 4.1 GENERAL

A. The contractor shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for one year from the date of final acceptance by consultant.

B. Acceptance shall consist of the following:

1. Burn-in period.

a) The system shall be accepted for start of warranty upon successful completion and testing of AHJ and Consultant.

b) Burn-In period shall be a 30 day time frame to allow the system to operate free of defects, grounds, programming faults, etc.

c) The 30 day Burn-In shall begin the day of acceptance by AHJ.

d) The Burn-In period shall be 30 days of continuous use without system trouble, false alarm, open, short or ground condition present.

e) Should the system fail for any reason during the burn-in period, the contractor shall respond immediately upon notification by owner's personnel and correct said deficiencies.

f) Upon correction and restoration, the "Burn-In" period shall be re-set to "0" and the 30 day count shall begin again.

g) Start of Warranty shall commence upon day 31 of successful "Burn-In" period.

### 4.2 FINAL TEST (as applicable for project devices)

A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with VDE, VdS and DIN Standards.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all flow switches.
4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open and short signaling line circuits and verify that the trouble signal actuates.
6. Open and short Notification Appliance Circuits and verify that trouble signal actuates.
7. Ground all circuits and verify response of trouble signals.
8. Check presence and audibility of tone at all alarm notification devices.
9. Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.
10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
11. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

B. Before the installation shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows:

   1. The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, the inspector of record (IOR) and the fire department shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel.
   2. Audibility tests shall be performed utilizing a calibrated Decibel Meter. The system shall be capable of supplying 15dB over ambient noise levels. Tests shall be conducted in the presence of the Consultant and AHJ at selected locations by Consultant/AHJ. Prior to acceptance, testing the contractor shall have verified signal levels in each area as to meeting the above criteria.

3. Where application of heat would destroy any detector, it may be manually activated.

4. The initiation circuits and the indicating appliance circuits shall be opened in at least two (2) locations per zone to check for the presence of correct supervisory circuitry.

5. When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the fire department.

6. The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance and successful burn in period.

7. Prior to final test, the fire department must be notified in accordance with local requirements.

8. Submit completed Certification form. The form shall be submitted in type written format. Hand written forms will not be accepted.

4.3 As-Built Drawings, Testing, and Maintenance Instructions

A. A complete set of reproducible "as-built" drawings in AutoCAD R2015 format (CDs and sheets) showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system acceptance.

B. Operating and Instruction Manuals:

1. Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to the owner upon completion.

2. The owner shall be furnished with all programming disks for each installation as well as hard copy printouts. Provide necessary training and/or schooling to designated owner personnel at no additional cost to owner. Training shall be at the owner's designated location, by factory trained personnel. Provide all necessary interconnection cables for remote programming via "laptop" computer.

C. Testing Frequency Instructions:

1. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble-shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to the owner upon completion of the system.

D. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

1. Instruction on replacing any components of the system, including internal parts.

2. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions

3. A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and local supplier of each item.

4. User operating instructions, shall be provided prominently displayed on a separate sheet located next to the control unit.

5. Administrative staff of the school shall be thoroughly instructed in the use of system by authorized distributor. Such service shall be provided in conjunction with the Fire Alarm equipment.

6. Staff of the Park as well as owner maintenance staff shall be thoroughly instructed in the use of the System. Training shall include a minimum of three (1) hour sessions, to be scheduled at the Owner's designated time.

7. Maintenance instruction shall be performed in the same manner as described above. Training shall include a minimum of three (1) hour sessions, to be scheduled at the owner's designated time.

END OF SECTION

SECTION 26 4745

NETWORKING & DATA COMMUNICATIONS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. SCOPE

1. This section outlines the requirements for the Local Area Networks system switches, system hubs, networking modules (transceivers) and connectivity at the MC/MDF and at the various IC/IDF's throughout the owner's facility.

2. Administrative Network

a) The Administrative Network distribution components will be located in telecom room MDF and in various communications rooms throughout the facility. The system is connected via CAT 5e or 6e cabling to various server and workstation locations throughout the building.

b) Administrative Network nodes are located throughout the building.

c) These are fed by fiber optic cabling to the MDF and distributed locally via UTP CAT 6 (as noted on the plans) cabling infrastructure. The Administrative Network will be a Fast-EtherNet design providing switched 100Mbit speed to various workgroups in the facility.

d) The contractor will be responsible to install, program, test and document the system as installed, verifying throughput rates.

e) The contractor will be required to work in close coordination with the owner's information systems director and staff.

### 1.2 WORK INCLUDED

A. Furnish and install all required system switches, system hubs, system 100/1000BASE-T modules, transceivers, patch cables and accessories for a complete system.

B. The installation shall include interconnect/patching equipment (fiber and copper), jumpers (optical fiber and twisted-pair copper), hub & switch equipment, optical fiber transceivers, routers, asynchronous controllers, optical fiber transceivers, and any other equipment enumerated within. In addition to material and equipment, contractor shall provide labor and any incidental material required for installation. All active equipment shall be installed and connected to the cable system.

C. Configuration, programming and testing of the local area networks.

D. New local area network locations are listed on the drawings.

1.3 RELATED DOCUMENTS

A. SECTION 260000 - GENERAL ELECTRICAL CONDITIONS;

B. SECTION 264750 - CABLING & DISTRIBUTION SYSTEMS

1.4 FUNCTIONAL REQUIREMENTS

A. Transmission Media. The example LAN will use both twisted-pair and fiber optic cable plant to provide connectivity between user workstations located in offices and network resources located in the facility computer room(s).

B. Host/Server Access. The network will allow users to access all host/server resources, including future application servers, such as additional database servers. There should be full compatibility with existing initiatives (e.g., a new financial system, security system, and telephone and employee services database repository).

C. Outside Communications. The network will need to support future access to external networks through routers. These communications will use the Transport Control Protocol/Internet Protocol (TCP/IP) protocol.

D. Environment/Facility Considerations. The network architecture design must take into account existing space, power, and heat constraints.

E. Flexible Architecture. The design must have sufficient flexibility to permit grouping users into distinct "workgroups" for office automation services. Physical features, such as a layered distribution scheme, redundant patching, and real-time configuration and topology modifications, will be included in the design. The overall transition strategy should minimize downtime and denial of service.

F. Office Automation Services. The network will support a broad range of office automation services for DOS, Windows, and Macintosh workstations. The following services will be provided:

1. File storage and retrieval;

2. Network printing;

3. Support of commercial off-the-shelf (COTS) desktop applications (in the DOS, Windows and Macintosh environments), including electronic mail and calendaring; and fax services.

1.5 OPERATIONAL REQUIREMENTS

A. Network Management. The design will contain methods and tools for the efficient management and control of the network. The capability to monitor and manageboth network traffic and physical components of the network will be provided.

B. Fault Recovery. The design will include contingency or back-up plans should any element of the network fail.

1.6 PERFORMANCE REQUIREMENTS

A. Network Response. The servers and other components of the network must be sized to avoid unacceptable start-up delays when workstations are first activated, long login times, and slow response during normal network utilization (e.g., application startup and exit, file retrieval and save operations). Response times for network desktop applications should not be significantly greater than stand-alone usage.

B. Network Availability. The users must be able to access the network 24 hours a day, seven days a week unless specifically made unavailable at organization discretion(e.g., for administrative or maintenance activities).

1.7 NETWORK CAPACITY: Individual components of the network will be sized as indicated below:

A. The cable plant -- The cable plant will provide for approximately 150 cable drops distributed throughout the offices and facility.

B. User workstations -- Initially, service will be provided for approximately 50 local users. However, when fully operational, the network will be capable of supporting approximately 150+ local users (150+ Windows-based PCs and servers).

C. Intelligent hub equipment -- All hub equipment will be sized to support all ports plus 25% spare ports for growth.

## 1.8 REFERENCES AND STANDARDS INCORPORATED

A. Published specifications, standards, tests or recommended methods of trade, industry or government organizations apply to work of this section where cited by abbreviation noted below:

1. EIA Electrical Industries Association
2. IEEE Institution of Electrical and Electronics Engineers
3. ISO International Standards Organization
4. ITU International Telecommunications Union
5. CCITT Consultative Committee of International Telegraph and Telephone
6. ANSI American National Standards Institute
7. TIA Telecommunications Industry Association
8. ASTM American Society for Testing and Materials
9. NEC National Electric Code
10. FCC Federal Communications Commission
11. CEA Insulated Cable Engineers Association, Inc.
12. IEC International Electrotechnical Commission
13. NEMA National Electrical Manufacturers Association
14. UL Underwriters' Laboratories, Inc.
15. IPC The Institute for Interconnecting and Packaging Electronic Circuits
16. NFPA National Fire Protection Association
17. BICSI Building Industry Consulting Service International

B. Nothing in the drawings, details, or specifications shall be construed to permit work not conforming to applicable laws, ordinances, rules, or regulations and standard industry IEEE 802 Ethernet standards.

C. It is not the intent of the drawings, details, or specifications to repeat requirements of codes except where necessary for completeness or clarity.

## 1.9 SUBMITTALS

A. Submit manufacturer's data literature for each item used describing each product, including specification, installation instructions and general recommendations.

B. Submit manufacture's data literature on system hubs, switches, 100/1000BASE-T modules, 100/1000BASE-FB modules, 100/1000Base2 modules, power supplies and accessories.

C. As per section 260000 - General drawings, submittals and shop drawings.

D. In addition to the requirements of Division 1, submit all materials for approval, arranged in same order as specifications, individually referenced to specification paragraph and drawing number. Submit number required in Division 1 plus three (3) copies of 8 1/2" x 11" material and 2 prints and one reproducible of drawings in 24" X 26" size, minimum. Submit 8 1/2" x 11" items bound in volumes and 24" X 36" drawings in edgebound sets.

E. Progress Schedule: Include duration and milestones for the following:

1. All submittals specified.
2. Completion of equipment buyout.
3. Completion of equipment receipt at fabrication shop.
4. Shop fabrication.
5. Shop testing.
6. Shipment to site.
7. Installation.
8. Field testing.
9. Training.
10. First use date.

F. Manufacturer's Product Data:

1. List of Materials: For each item include:
   a) Manufacturer.
   b) Model number.
   c) Listing: UL, City Lab or none.
   d) Quantity.
2. Manufacturer's Product Data: In sequence of list of materials, data sheet for each item, including all accessories, marked for proposed product.

G. Field and Shop Drawings:

1. Resubmit: for coordination reference complete with corrections from previous submittal:
   a) List of Materials.
   b) Manufacturer's Product Data.
2. Field (installation) Drawings: collate in sequence:
   a) Drawing index/symbol sheet.
   b) Floor plans. At scale of contract documents. Show:
      (1) Devices with circuit number.

(2) Rough-in.

(3) Mounting height.

(4) Conduit size.

(5) Wire type.

(6) Wire fill.

c) Sections/Elevations. At scale of contract documents.

(1) Mounting Location Reference

d) Enlarged Plans. At scale of contract documents or larger as required for trade coordination. Show:

(1) Refer to floor plans.

(2) Architectural features.

(3) Rack cabinets.

(4) System furniture.

(5) Clearances.

e) System conduit riser drawing, show:

(1) Terminal cabinets.

(2) Coordination with floor plans.

(3) Wire runs not shown on floor plans.

(4) Wire type.

(5) Wire fill.

f) Mounting details

(1) Stamped and signed by engineer licensed in jurisdiction for work of this type.

(2) Show loads, strength of connections, etc.

(3) Show calculations - on drawings or in bound volume forreview by authorities having jurisdiction.

(4) Provide details for:

(a) Racks.

(5) Installation details as required.

(6) Terminal cabinets: terminations.

g) Wire run sheets (if used) show:

(1) Wire number.

(2) Source.

(3) Designation.

(4) Signal type.

(5) Wire type.

(6) Operating level or voltage (if applies).

h) Shop and Field Test Reports

3. Schedule: Submit test reports in timely manner relative to project schedule such that owner may conduct verification of submitted test data at owner's option, without delay of progress.

a) Shop test report: Submit prior to shipping completed system to project site.

b) Field test report: Submit following system completion and prior to and as condition precedent to owner's acceptance of the work of this section.

4. Test Reports: Include:

a) Time and date of test.

b) Personnel conducting test.

c) Test object.

d) Procedure used.

e) Test equipment, including serial and date of calibration.

f) Results of test - numerical or graphical presentation.

5. Verification of submitted test data: Owner may elect to verify some or all test data submitted. Retest in presence of designated observer(s) at reasonable convenience of owner. Provide technician familiar with work of this section. Provide all test equipment.

H. Reference Data for Operation, Maintenance and Repair

1. In addition to the requirements of Division 1, submit 3 sets. Submit in three post binders (not ring binder) with tabs.

a) Index.

b) Systems operating instructions.

c) Reduced set of system record drawings.

d) Key schedule.

e) Maintenance and spare pans schedules.

f) Shop and Field Test Reports.

g) Equipment manuals. Collate alphabetically by manufacturer. Provide manufacturer's original operation, instruction and service manuals for each equipment item. For each set, provide manufacturer's original printed copies only. Photocopies not acceptable.

I. Record Drawings in AutoCAD R2010 format

1. Quantity:

a) Review sets: as for shop and field drawings.

b) Record set:

(1) Three (3) bluelines.

(2) One CD with applicable .DWG files as full scale

c) Content: All drawings required under "Field and Shop Drawings". Show as installed condition.

PART 2 - PRODUCTS

2.1 GENERAL

A. Quality of Products: Material and equipment specified herein have been selected as the basis of acceptable and desired quality of performance and have been coordinated to function as components of the specified system. Where a particular material, device, piece of equipment of system is specified directly, the current manufacturer's specification for the same shall be considered to be part of these specifications, as if completely contained herein in every detail. Each material, device, or piece of equipment provided hereunder shall comply with all of the manufacturer's published specifications for that item.

B. Quantity: Provide quantity as shown on contract drawings, the schedule or as otherwise defined herein.

C. Preference: Owner desires system to be furnished and installed as specified herein.

D. Substitutions: Comply with SECTION 16010 -GENERAL CONDITIONS.

E. Provide complete: Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the work of this section at, if specified in full herein.

F. Provide new: All materials provided under the work of this section shall be new, shall be the manufacturer's latest design/model, and shall be permanently labeled with the manufacturer's name, model number and serial number.

G. Similar: Similar devices shall be of the same manufacturer, unless specifically noted otherwise in these specifications.

H. Continuous Use: All active circuitry shall be solid state and shall be rated for continuous use. All circuit components shall be operated in full compliance with the manufacturer's recommendations and shall contain sufficient permanent identification to facilitate replacement.

2.2 MANUFACTURERS

A. NETWORKING HARDWARE

1. System design is based on products as manufactured by Cisco, 3Com or BayNetworks Substitutions must be pre-approved according to Sectin 16010 and general conditions.

B. SYSTEM SPECIFICATIONS

1. LOCAL AREA NETWORK

a) The Local Area Network shall be based on and support IEEE802.3 functional standards for EtherNet Local Area Networking. This shall include IEEE 802.3 100/1000BASE-T and 100/1000BASE-T for station microcomputers, and IEEE 802.3 100/1000BASE-F or 100/1000BASE-F (FIORL) synchronous technology for fiber optic repeater interconnection.

b) The main distribution frame (MDF) and all intermediate distribution frames (IDF's) shall support one EtherNet segment per network.

c) System shall be sufficient to support use at full capacity without user-perceptible delays in network response time.

d) System shall be sufficient to support any combination of system features at full capacity. System shall allow reconfiguration of backbone to allow Customer maximum flexibility and implementation of options in case of need when future services are identified and added.

C. LAN CONFIGURATION

1. System hubs are required in DESIGNATED zones so that every data drop on site can be serviced by a hub.

2. Each system hub shall allow for growth, without the need to add an additional hubs to 125% of the current data drop count for the area of the campus that it serves even though all those drops will not be connected at initial installation.

3. Each designated location shall utilize a system hub as per the specification.

4. Each hub location shall utilize fiber optic transceiver module for connection to the fiber optic backbone or horizontal distribution (where fiber is utilized as the backbone or horizontal media).

5. Each hub location shall utilize 100/1000BASE-T(RJ45), 100/1000BASE-T (RJ45), unshielded twisted pair ports for connection to the UTP CAT 6 LAN cable plant or 100/1000BASE-2 ports for connection to the ThinLAN cable plant. The quantity of initially installed 100/1000BASE-T/100/1000BASE-2 ports shall be per the needs indicated and requirements of this specification and contract drawings.

6. The initially active 100/1000BASE-T, 100/1000BASE-T locations shall be connected to the system Hubs via CAT 6 UTP patch cords and patch panels. If Telco style 100/1000BASE-T modules are utilized in the system Hub then CAT 6, Telco-to RJ45 patch panels shall be installed with the appropriate cable to the hub for full connectivity.

## 2.3 MATERIALS AND EQUIPMENT

### A. SYSTEM HUBS

1. The Local Area Network shall be created from a family of intelligent, or "smart," switches, hubs and related products. The product family shall consist of various hubs; numerous plug-in EtherNet, FDDI, and internetworking modules for these hubs, and network management software. These products shall enable the customer to create a large-scale facility network that is flexible, reliable, and manageable.

2. The System shall have port switching technology that shall offer remote network configuration and management capabilities.

3. The System's network management shall support network analysis, identify specific network problems, and correct or self-heal problems dynamically. The system's network management shall not be a passive traffic monitoring tool.

4. System hubs shall have the following parameters and features:

   a) Modular Multi-Media Chassis.

   b) Supports SNMP Based Network Management System.

c) Supports Inband and Out of Band Network Management.

5. Specific EtherNet features required:

   a) Supports Shielded/Unshielded Twisted Pair, Coax, AUI & Synchronous Fiber.

   b) Supports Internal EtherNet Terminal Servers for TCP/IP.

   c) Supports Fiber Links Up to 2.0 Kilometers.

6. System hub shall be provided in 12, 24, or 48 port versions. The system hub shall be able to be mounted in a rack and installed from the front.

7. Transceiver slots for connection of twisted pair 100/1000Base-T, Thin LAN or fiber optic FIORL.

8. The unit shall include and Intel I960 RISC-based processor, 1 Mbytes of RAM and 256Kbytes of flash EEPROM.

9. Complete workgroup security including: intruder prevention, auto port disabling, network management alarm, leaves drop prevention, authorized managers list and password protection.

10. Provisions for added SNMP management module.

11. Intelligent error monitoring, intelligent segmentation recovery, auto-segmentation, fault isolation and integrity.

12. Support for SNMP/IP and IPX multi-vendor management with SNMP browsers.

13. The unit shall be UL rated and meet FCC Part 15 Class A emissionsstandards.

14. The unit shall be provided with a lifetime limited, 5 year on site warranty.

15. The system hub must be capable of implementation to include all of the following features:

   a) A single-port FOIRL module shall be available to provide FOIRL-based EtherNet connections through the system hub. The module shall comply with the IEEE FOIRL and 100/1000BASE-FL and 100/1000BASE-FL standards which ensures interoperability with other vendors' FOIRL-compliant devices. In addition, users in a FOIRL environment shall be able to take advantage of the system hub benefits such as multi-channel architecture, port redundancy, and fault tolerance.

b) The FOIRL module shall achieve point-to-point connections longer than the 1 kilometer specified by the IEEE FOIRL specification by use of high power optics.

c) A FOIRL transceiver shall be available to link a network station to EtherNet 100/1000BASE-FL LANs using fiber-optic cable. The FOIRL transceiver shall attach directly to the AUI port on the network station eliminating the need for an AUI cable.

(1) The FOIRL transceiver shall comply with the IEEE 802.3 100/1000BASE-FL draft standard and offers low-light level detection for error-free transmission.

16. An EtherNet transceiver module shall be available to provide AUI connectivity to the system hubs.

17. An EtherNet BNC module shall be available to provide a single connection to thin-wire EtherNet segments up to 185 meters in length.

a) The BNC module shall be fully compliant with the IEEE 100/1000BASE-2 standard. All thin wire segments shall be able to be terminated either internally or externally.

B. Approved Suppliers

1. The following vendors have been pre-approved to supply product under this contract:

a) Cisco

b) 3Com

c) Bay Networks

d) Others submit in accordance with substitution requirements.

## PART 3 - EXECUTION

### 3.1 GENERAL

A. Provide installation logs supporting building infrastructure.

B. Configure and cross connect all ports as required for complete end to end system.

### 3.2 DRAWING DETAILS (Shop Drawings)

A. Show wall elevation and wire details on shop drawings. Show equipment function, make and model and wire routing and terminations within rack or cabinet.

B. Show as-built location of all devices on shop drawings.

C. Provide 3 sets of bound operation and maintenance manuals, including submittal materials, and record of field changes. Provide complete as-built wiring diagrams in AutoCAD2000 format. Provide CD files and original tracings (E size) in format of construction drawings. Input all cabling information into ACS system and provide a detailed printed report with as-builts.

## 3.3 QUALITY CONTROL

A. Evidence of Experience and Qualifications

1. Show that the contractor who will perform the work has a minimum of 5 years experience successfully installing system of the same type and design as specified herein. Include the names, locations, and points of contact of at least two similar installations of the same type and design as specified herein where the installer has installed such systems. Indicate the type of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 12 months.

2. Show that the instructor, who will train staff, operating and maintenance personnel, has received a minimum of a CNE/MCE training from a factory training center, and 2 years experience in the installation of systems of the type specified. Submit training certification in equipment submittals, title section training and certifications.

## 3.4 TESTING

A. GENERAL

1. Testing shall be performed in the presence of the owner.
   a) Testing shall include verification of:
      (1) Server operation and configuration
      (2) NOS installation, configuration and operation
      (3) HUB insulation and operation
      (4) Cable Plant
2. All test equipment shall bear current calibration stickers or dated certificates.
3. Printed test results along with as-built drawings shall be assembled into a 3 ring project binder and delivered to the consultant for verification and final acceptance prior to start of warranty.

## 3.5 COMMISSIONING

A. General

1. The contractor shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for one year from the date of final acceptance by owner.

2. Acceptance shall consist of the following:

a) Burn-in period.

(1) The system shall be accepted for start of warranty upon successful completion and testing of the system.

(2) Burn-in period shall be a 30 day time frame to allow the system to operate free of defects, grounds, programming faults, etcetera.

(3) The 30-day burn-in shall begin the day of acceptance by owner.

(4) The burn-in period shall be 30 days of continuous use without system trouble, false alarm, open, short or ground condition present.

(5) Should the system fail for any reason during the burn-in period, the contractor shall respond immediately upon notification by owner's personnel and correct said deficiencies.

(6) Upon correction and restoration, the burn-in period shall be re-set to "0" and the 30 day count shall begin again.

(7) Warranty shall commence upon day 31 of successful burn-in period.

b) Final Test

(1) Before the installation shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows:

(a) The contractor's job foreman, in the presence of a representative of the manufacturer, and a representative of the owner shall operate every network device to ensure proper operation and correct configuration at the file server location.

(b) When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner.

(c) The contractor shall leave the data network system in proper working order, and, without additional expense to the owner, shall replace any defective

materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance by the consultant.

B. As Built Drawings, Testing, and Maintenance Instructions

1. A complete set of reproducible as-built drawings in AutoCAD R2000 format (CDs and sheets) showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system acceptance.

2. Operating and Instruction Manuals

a) Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to the owner upon completion.

b) Provide necessary training and/or schooling to designated owner personnel at no additional cost to owner. Training shall be on site.

C. Testing Frequency Instructions

1. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble-shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to the owner upon completion of the system.

2. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

a) Instructions on replacing any components of the system, including internal parts.

b) Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions

c) A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and local supplier of each item.

d) User operating instructions shall be provided, prominently displayed on a separate sheet located next to the control.

END OF SECTION

SECTION 26 4750

CABLING AND DISTRIBUTION SYSTEM

## PART 1 - GENERAL

### 1.1 SCOPE OF WORK

A. Provide a complete, tested, Cable Distribution system for Data Processing and Networking systems (local area network), Telecommunications (voice), Audio (paging), Entry Access Control and Monitoring (security) and Closed Circuit Video Surveillance systems (CCTV) as follows:

1. The data distribution system shall include fully terminated fiber optic backbone and CAT-6 STP station cables and specialty data distribution cables and terminations as shown in the contract drawings. All fiber optic trunk cabling will be installed into utility conduit loops around the park in fiber inner-duct. Station cabling will be installed in conduits and office furniture provided by others. This work includes all backbone, horizontal distribution, station cabling and specialty stations/horizontal distribution cabling for the Administration, Point of Sale, Audio, Security, Irrigation and CCTV systems. The contractor shall be responsible to provide and install all cabling, wiring, cabinets, racks, data frames, cable tray, wire management, power distribution, blank panels, structural bracing, inner ducting, termination panels (fiber and UTP), complete testing and certification, along with all as built documentation as set for in these specifications.

2. The voice distribution shall include fully terminated multi pair trunk cablingand CAT-6 STP station cabling along with specialty outdoor cabling and terminations for food carts and retail carts as indicated on the contract drawings. Contractor shall be responsible to provide and install all cabling, wire management, backboards, equipment cabinets, ladder racking, station cabling, specialty cabling, boxes, outlet terminations, splicing (as needed). All voice cabling underground shall use a rated OSP cable. All above ground cabling in conduit may use a CMP rated cable. Conduits and pathways will be installed by others and will be in place prior to the start of wire/cable installation. Complete testing and certification, along with all as built documentation as set for in these specifications.

3. The entry access control and monitoring will utilize a segment of the fiber optic backbone, feeding terminal controllers and I/O boards (FBO) monitoring various security and equipment functions throughout the project. Distribution cabling from controllers and I/O boards are copper cables (coordinate requirements with security contractor) which will provide monitoring to point sensors, motion sensors, equipment, fire protection systems and alarm monitoring. Cabling will be installed into existing underground and above ground conduits. The contractor will be required to provide and install all cabling, terminations, connections, wire management and incidentals for a complete cabled system. Cabling underground shall utilize an OSP rated cable. Cabling above ground shall use a CMP or CL2 or plenum/tray rated cable depending on the application. Complete testing and certification, along with all as built documentation as set for in these specifications.

4. Fiber Optic Riser Cables: Individual 6-fiber, 8-fiber, 12-fiber, 18-fiber, 24-fiber or 48-fiber optical cables shall be installed from the termination enclosure in the new IT Room to fiber optic termination enclosures in each new DATA IC Communications Closets at each cluster attraction area as shown on the plans.

B. Provide system design services (development of specific details consistent with the contract documents) as required to complete shop drawings for data cable systems including detailed documentation for owner's review and detailed documentation of as-built conditions.

C. Data concentrators, local area network controllers, and data terminal equipment will be furnished by others under separate contract. The contractor shall coordinate with other system vendors where appropriate to facilitate equipment backboard installation, scheduling, protection of equipment, and access to the project site in order to provide owner a complete project in a timely manner.

D. The successful cabling contractor shall attend a mandatory pre-construction meeting with individuals deemed necessary by owner prior to the start of work.

E. Raceway Systems Specifications required for voice, data, audio, video systems cables may be found in Electrical Specifications.

F. The successful bidder will not be determined by price alone, but by a rating system to include a combination of price, qualifications, training procedures and proposed documentation package.

G. All unused conduits or interducts shall have metered pull strings.

## 1.2 DESIGN

A. Floor Plans: Furnish floor plans for review showing outlet locations with an indication of outlet type and proposed label. Floor plans shall be coordinated with architectural and electrical power plans and shall be produced at the same scale as the contract documents (see part 1.4, Submittals).

B. Terminal Elevations: Furnish details showing terminal block and backboard elevations including all cable terminals, spaces for equipment, equipment racks, and station cable routing. Communications equipment closets (intermediate distribution frames - MC) shall be arranged to maximize the utility and growth potential available in spaces shown on the floor plans. Terminal elevations shall be based on detail elevations included in the contract documents and shall show additional detail as indicated herein.

C. Outlet Locations: Provide as shown.

D. Terminal Schedules: Furnish terminal outlet schedules showing terminal block position for all station cabling. Terminal outlet schedules shall show proposed labels for all 4-pair STP horizontal cables at station outlets along with patch or 110 frame locations.

1.3 LOCAL AREA NETWORK (overview, electronics FBO – REFERENCE ONLY)

A. The Local Area Network shall be based on and support IEEE 802.3 functional standards for Ethernet Local Area Networking. This shall include IEEE 802.3 10/100BASE-T for station microcomputers, and IEEE 802.3 10/100BASE-FX(FIORL) synchronous technology for fiber optic repeater interconnection.

B. The main distribution frame (MDF) and all intermediate distribution frames (IDF's) shall support up to 12 Ethernet segments (Administrative Network, POS, Security, Audio, Irrigation and Lighting).

C. System Switches (FBO) shall be sufficient to support use at full capacity without the need to add Switch chassis. System shall be sufficient to support use at full capacity without user-perceptible delays in network response time.

D. System shall be sufficient to support any combination of system features at full capacity. System shall allow reconfiguration of backbone to allow Customer maximum flexibility and implementation of options in case of need when future services are identified and added.

E. LAN CONFIGURATION

1. Each building or group of buildings supports an IDF that is a switch location. System Switches are required in DESIGNATED locations so that a switch can service every data drop.

2. Each system switch shall allow for growth, without the need to add an additional switch, to 150% of the current data drop count for the area that it serves even though all those drops will not be connected at initial installation.

3. Each designated location shall utilize a system switch as per the specification.

4. Each switch location shall utilize Fiber Optic-Transceiver module for connection to the Fiber Optic backbone (where fiber is utilized as the backbone media).

5. Each switch location shall utilize, 10/100BASE-T (RJ45) shielded twisted pair ports for connection to the UTP Category 5 LAN cable plant. The quantity of initially installed 100BASE-T ports shall be per the needs indicated and requirements of this specification.

6. The initially active 10/100BASE-T locations shall be connected to the system switches via Category 5 STP patch cords and patch panels.

## 1.4 SUBMITTALS

A. Project Initiation: Within fourteen (14) days of Notice to proceed, the Low Voltage Contractor shall furnish the following in a single consolidated submittal:

1. The name of the person who will act as the low voltage Contractor's official contact with the Contractor/Consultant.

2. Electrical Permits. The Contractor shall obtain all required permits and provide copies to Consultant.

3. Complete manufacturer's product literature for all cable, cross-connect blocks, cable supports, cable labels, outlet devices and other products to be used in the installation. In addition, whenever substitutions for recommended products are made (pre-approved prior to bid by Consultant), samples and the manufacturer's supporting documentation demonstrating compatibility with other related products should be included.

4. A time sealed Construction Schedule using PERT/CPM indicating general project deadlines and specific dates relating to the installation of the cable distribution system. At a minimum, this Construction Schedule shall include the following milestones:

   a) Start of Communications space construction.

   b) Start of Fiber Optic cable terminations.

   c) Start of 4- pair STP and related termination hardware station cable installation.

   d) Start of Level 5e or 6e STP and Fiber Optic backbone cable testing.

   e) Start of Audio Cabling and related termination hardware and testing.

   f) Start of Security and CCTV Cabling and related hardware and testing.

   g) Final inspection.

B. Shop Drawings (within twenty-eight (28) days of notice to proceed).

1.5 SUBMITTALS

A. In addition to the requirements of Division 1, submit all materials for approval arranged in same order as Specifications, individually referenced to Specification paragraph and drawing number. Submit number required in Division 1 plus three (3) copies of 8 1/2" x 11" material and 2 prints plus one reproducible of drawings in 30" x 42" size, minimum. Submit 8 1/2" x 11" items bound in volumes and 30" x 42" drawings in edge-bound sets.

B. Progress Schedule: Include duration and milestones for the following:

1. All submittals specified.
2. Completion of equipment buyout.
3. Completion of equipment receipt at fabrication shop.
4. Shop fabrication.
5. Shop testing.
6. Shipment to site.
7. Installation.
8. Field testing.
9. Training.
10. First event date.

C. Manufacturer's Product Data:

1. List of Materials: For each item, include:
   a) Manufacturer.
   b) Model number.
   c) Listing: UL, City Lab or none.
   d) Quantity.
2. Manufacturer's Product Data: in sequence of List of Materials, Data sheet for each item, including all accessories, marked for proposed product.

D. Field and Shop Drawings:

1. Resubmit: for coordination reference complete with corrections from previous submittal.
   a) List of Materials.
   b) Manufacturer's Product Data.
2. Field (installation) Drawings: Collate in sequence:
   a) Drawing index/symbol sheet.

b) Floor plans. At scale of Contract Documents. Show:

(1) Devices with circuit number.

(2) Rough-in.

(3) Mounting height.

(4) Conduit size.

(5) Wire type.

(6) Wire fill.

c) Sections/Elevations. At scale of Contract Documents.

(1) Mounting Location Reference

d) Enlarged Plans. At scale of Contract Documents or larger as required for trade coordination. Show:

(1) Refer to 'floor plans".

(2) Architectural features.

(3) Rack cabinets.

(4) System furniture.

(5) Clearances.

e) System conduit riser drawing, show:

(1) Terminal cabinets.

(2) Coordination with floor plans.

(3) Wire runs not shown on floor plans.

(4) Wire type.

(5) Wire fill.

f) Mounting details

(1) Stamped and signed by consultant licensed in jurisdiction for work of this type.

(2) Show loads, strength of connections, etc.

(3) Show calculations - on drawings or in bound volume for review by authorities having jurisdiction.

(4) Provide details for:

(a) Racks.

(b) Ladder racking

(c) Mounting/attachment

g) Installation details as required.

(1) Terminal cabinets: terminations.

h) Wire run sheets (if used) Show:

(1) Wire Number.

(2) Source.

(3) Designation.

(4) Signal Type.

(5) Wire type.

(6) Operating level or voltage (if applies).

3. Shop (Fabrication) Drawings: Collate in sequence:

a) Drawing Index/symbol sheet (if separate set from Field Drawings).

b) System functional drawings. Submit separate drawing for each system/subsystem. Show:

(1) Equipment: Function, make, model.

(2) Wire number.

(3) Wire Type.

(4) Shield condition at both ends (float, ground, location of ground).

(5) Connector wiring details, each type.

(6) Audio: Polarity, operating level.

(7) Provide drawings for the following systems:

(a) Control.

(b) Audio.

(c) Coordinated grounding scheme.

c) Equipment rack elevations. All racks scaled at one-inch equals one foot (1" = 1' 0"), or larger. Show:

(1) Power strip: receptacles, circuiting.

d) Rack wiring drawings for, each rack:

(1) Power strip: receptacles, circuiting.

(2) Equipment.

(3) Grounding.

(4) Wiring, all systems.

(5) Wiring harness scheme.

e) Fabrication details submit for:

(1) Receptacles.

(2) Panels.

(3) Special mounting provisions.

(4) Custom enclosures, indicate:

(d) Construction and bracing

(5) Legends/engraving details. Half or full size:

(a) Receptacles.

(b) Panels.

(c) Equipment.

(6) Jackfield, terminations and cross connect details, Front elevation, full size.

(a) Layout.

(b) Text of designations.

E. Samples: Samples for approval by owner

1. Of all finishes/materials which will be visible to the public, including:

a) Receptacles and controls with associated trim plate

b) Each type of information outlet, faceplate, etc.

2. For other items, provide at least two of each as a sample.

F. Shop and Field Test Reports

1. Schedule: Submit test reports in timely manner relative to project schedule such that owner may conduct verification of submitted test data at owner's option, without delay of progress.

a) Shop test report: Submit prior to shipping completed system to project site.

b) Field test report: Submit following system completion and prior to and as condition precedent to owner's acceptance of the work of this section.

2. Test Reports: include:

a) Time and date of test.

b) Personnel conducting test.

c) Test Object.

d) Procedure used.

e) Test equipment, including serial and date of calibration.

f) Results of test - numerical or graphical presentation.

3. Verification of Submitted Test Data: owner may elect to verify some or all test data submitted. Retest in presence of designated observer(s) at reasonable convenience of owner. Provide technician familiar with work of this section. Provide all test equipment.

G. Reference Data for Operation, Maintenance and Repair

1. In addition to the requirements of Division 1, submit one (1) additional set.
2. Submit in three post binders (not ring binder) with tabs.
3. Index.
4. Systems operating instructions.
5. Reduced set of system Record Drawings.
6. Key schedule.
7. Maintenance and spare pans schedules.
8. Shop and Field Test Reports.
9. Equipment manuals. Collate alphabetically by manufacturer. Provide manufacturer's original operation, instruction and service manuals for each equipment item. For each set, provide manufacturer's original printed copies only. Photocopies not acceptable.

H. Record Drawings in AutoCAD R2000 format

1. Quantity:
   a) Review sets: as for Shop and Field Drawings.
   b) Record set:
      (1) Three (3) bluelines.
      (2) One (1) mylar.
      (3) CD with applicable .dwg files
2. Format: Record Set.
   a) Pencil, permanent ink or permanent photographic process.
   b) Front face only of Mylar at least 3.0 mils thick.
   c) Appliqué film or lettering prohibited.
   d) Suitable for microfilming.
3. Content: All drawings required under "Field and Shop Drawings". Show "as installed" condition.

I. Shop Drawings. The contractor shall submit scaled drawings of all IC/MC backboard layouts showing hardware 110 frame placements prior to new installations. The name of the building, room #, title of room IC/MC, shall be included. The contractor must show dimensions for LAN network equipment backboard space. Coordinate with owner/consultant on any backboard discrepancies.

J. Proposed Contractor Category 5e or 6e STP, and fiber optic cable test result forms.

K. As a condition for project acceptance, the contractor shall submit the following for review and approval:

1. Complete manufacturer's product literature and samples (if requested) for all pre-approved substitutions to the recommended products made during the course of the Project.

2. An exceptions list of deviations (in materials, construction and workmanship) from those specified in this section and shown on the Project Drawings. Owner will review this list and declare each item as either an approved exception, or as one the contractor must correct.

3. Inspection and Test Reports: During the course of the project the contractor shall maintain an adequate inspection system and shall perform such inspections to insure that the materials supplied and the work performed conform to contract requirements. The contractor shall provide written documentation, which indicates materials acceptance testing was conducted as outlined in Part 3 below. The contractor shall also provide documentation, which indicates that all cable termination testing was completed and that all irregularities were corrected prior to job completion for owner/consultant analysis.

## 1.6 SYSTEM INSTALLATION REQUIREMENTS

A. System installer must have a BICSI RCDD on staff. Copy of certification must be submitted at time of bid.

B. The data cable system installer shall be a firm normally employed in the low voltage cabling industry with a reference list of five (5) projects and contact names to confirm successful Category 5e or 6e STP and Fiber Optic cable plant projects.

C. Owner reserves the right to exercise its discretion to require the Contractor to remove from the project any such employee of owner's to be deemed incompetent, careless or insubordinate.

D. A fifteen (15) year manufacturer warranty shall be provided by the selected low voltage installer. This warranty shall include defects in material and workmanship. The warranty period shall begin at the date of owner's acceptance of the work. Quality and workmanship evaluation shall be made solely by owner/consultant and designated representatives.

E. The selected low voltage installer must be licensed and bonded.

F. All clean up activity related to work performed will be the responsibility of the Low Voltage Communication Contractor and must be completed daily before leaving the facility.

## 1.7 REGULATORY REQUIREMENTS

A. All work shall be performed in accordance with the latest revisions of the following standards and codes:

1. Uniform International Conference of Building Officials
2. Building Code (ICBO); Regional Office
3. BICSI

B. Other References:

1. TIA/EIA- 569 Commercial Building Standard for Telecommunication
2. Pathways and Spaces.
3. TIA/EIA-568-A Commercial Building Wiring Standard
4. EIA-455-171-D Standard Test Procedures for Fiber Optic Cables
5. TIA/EIA-4750000-B Generic Specification for Fiber Optic Connectors
6. TIA/EIA-475E000 Sectional Specification for Fiber Optic Connectors Type
7. BFOC/2.5
8. TIA/EIA-604-X Fiber Optic Connector Intermateability Standards (FOCIS)
9. Leviton Telcom Category Compliant Design Criteria dated 1995 or Later
10. Leviton Telcom CCS Installation Training dated 1995 or later

C. Governing Codes and Conflicts: If the requirements of this section or the Project Drawings exceed those of the governing codes and regulations, then the requirements of this section and the Drawings shall be construed to permit work not conforming with all governing codes and regulations.

## 1.8 ABBREVIATIONS and DEFINITIONS

A. MC - Main Cross-connect often co-located in the building Entrance Facility (E) and/or Equipment Room (ER) and consisting of riser cable terminals, utility service cable terminals, PBX terminals, and various other equipment.

B. IC - Intermediate Cross-connect usually residing in a Telecommunications

Closet (TC) and consisting of station wire terminals, riser cable terminals, and various equipment. Used to connect the first and second level backbone cables in a two-tier star wiring topology.

C. HC - Horizontal Cross-connect usually residing in a telecommunications closet and consisting of station wire terminals, riser cable terminals, and various equipment. Used to connect the first or second level backbone cables to the horizontal or work area cables.

D. PBX - Private Branch Exchange, a telephone switch.

E. PDS - Premises Distribution System, a common term used for the cable, terminals, and miscellaneous equipment comprising telephone and data transmission systems.

F. STP - Shielded Twisted Pair (telecommunications/data station cables)

## PART 2 - PRODUCTS

### 2.1 GENERAL WIRING

A. The inside/outside wiring plant shall be installed per requirements of these specifications utilizing materials meeting all applicable TIA/EIA standards.

B. Materials shall be as listed or shall be equivalent products of other manufacturers meeting the intent and quality level of the TIA/EIA568 specification. In some cases specific materials are called out to maintain a uniformity of application across all installations. The Contractor shall maintain the same material uniformity for all buildings.

C. All installed wire shall be tested and labeled 100% good after installation by the installer.

D. All products shall be new, and brought to the job site in original manufacturer's packaging. Electrical components (including innerduct) shall bear the Underwriter's Laboratories label. All communications cable shall bear flammability testing ratings as follows:

1. Communications Cable.
2. Plenum rated Communications Cable.
3. Riser rated Communications Cable.

E. Initial Cable Inspection: The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of proper gauge, containing the correct number of pairs, etc. Note any buckling of the jacket, which would indicate possible problems. Damaged cable, or any other components failing to meet specifications shall not be used in the installation.

F. Quantity: Provide quantity as shown on Contract Drawings, the Schedule or as otherwise defined herein.

G. Preference: Owner desires system to be furnished and installed as specified herein.

H. Substitutions: Comply with GENERAL CONDITIONS.

I. Provide Complete: Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the Work of this Section at, if specified in full herein.

J. Provide New: All materials provided under the Work of this Section shall be new, shall be the manufacturer's latest design / model, and shall be permanently labeled with the manufacturer's name, model number and serial number.

K. Similar: Similar devices shall be of the same manufacturer, unless specifically noted otherwise in these specifications.

L. Continuous Use: All active circuitry shall be solid state and shall be rated for continuous use. All circuit components shall be operated in full compliance with the manufacturer's recommendations and shall contain sufficient permanent identification to facilitate replacement.

M. CABLE PLANT REQUIREMENTS

1. The cable plant shall be a star configured, unshielded twisted pair system capable of supporting data rates of 1Ghz.

2. The drop cable shall run from intermediate wiring closets (IDF's) to each office, work station, attraction, food service and retail location as well as other miscellaneous locations as shown on the prints.

3. The trunk fiber optic cable shall run between the main distribution frame (MDF) and each switch (IDF) location as indicated on the project drawings.

4. The cable plant shall meet EIA/TIA-568 "Commercial Building Telecommunications Wiring Standard" and the maximum length of any STP data drop shall NOT exceed 100 meters including patch cables and future jumper cables at each information outlet location.

5. Every switch location shall have one 24 strand multi-mode/single (12mm, 12sm) mode hybrid fiber optic cable (dedicated) from the MDF for LAN service, UON.

N. CABLE PLANT SUPPLIERS

1. The wire provided for all voice trunk runs shall be UTP Category 5e cable UON (OSP rated for below grade use)

   a) Recommended suppliers: Berk-Tek, Essex, Belden, Lucent, Avaya.

2. The wire provided for all data and voice outlets shall be one four pair STP Category 5e or 6e cable per jack, UON (OSP rated for below grade use).

   a) Recommended suppliers: Berk-Tek, Essex, Belden, Lucent

3. The wire provided for all security monitoring sensors shall be 2 pair #22 for point sensors and 4 pair #22 plus 1 pair #20 for powered motion sensors.

   a) Recommended suppliers: West Penn, Belden, Atlas, Mohawk

4. The wire provided for all security camera locations shall be RG58/U coaxial cable with 100% shield or fiber optic cabling. power cabling for cameras shall be #18 Ga. min. cabled constriction. All cabling below grade shall be rated for the application.

   a) Recommended suppliers: West Penn, Belden, Atlas, Mohawk

2.2 CABLING SPECIFICATION

A. STATION WIRING-DATA

1. The wire provided for all data outlets shall be one 4-pair STP Category 5e cable per jack, UON.

   a) The Category 5e or 6e, 4-pair UTP cable, must be Performance Level Tested. Each 1000' spool must be individually tested with test results affixed.

B. DROP CABLE SPECIFICATION

1. All data drop cabling shall be EIA/TIA 568, 569 and TSB-36 Category 6 certified.

2. All data drop cabling shall be 4-pair shielded twisted pair, PVC rated (OSP rated for underground use), Category 6e certified cable. Untwisted cable shall not be used. This includes even short pieces of flat cable for jumpers, etc.

3. All data drop cabling shall also be guaranteed by the cable manufacturer to support data rates to 1Ghz. The bidder must include in writing in the form of press release, newsletter, or cut sheet verification of cable capabilities.

C. STATION WIRING- VOICE

1. The wire provided for all voice outlets shall be one 4-pair STP Category 6e cable per jack, UON.

   a) The Category 6e, 4-pair UTP cable, must be Performance Level Tested. Each 1000' spool must be individually tested with test results affixed.

2. DROP CABLE SPECIFICATION

   a) All voice drop cabling shall be EIA/TIA 568, 569 and TSB-36 Category 6e certified.

   b) All voice drop cabling shall be 4-pair shielded twisted pair, PVC rated (OSP rated for underground use), Category 6e certified cable. Untwisted cable shall not be used. This includes even short pieces of flat cable for jumpers, etc.

c) All voice drop cabling shall be 24 AWG shielded twisted pair cable. All cabling for a single copper conductor shall have a maximum DC resistance of 28.6 ohms per 1000 feet at 20 degrees Celsius. All cabling shall have a maximum DC resistance unbalanced of 5 percent. All cabling will have a maximum mutual capacitance of a pair of 17 picofarads per foot. All cabling shall have a maximum pair-to-ground capacitance unbalanced of 1000 picofarads per 1000 feet.

d) All voice drop cabling shall have an impedance (ohms) of the following values:

| | |
|---|---|
| 0.064 | 125±15% |
| 0.128 | 115±15% |
| 0.256 | 110±15% |
| 722 kHz | 102 + 15% |
| 1.0-100.0 MHz | 100 + 15% |

e) All voice drop cabling shall have a maximum attenuation (dB per 1000 feet at 20 degrees Celsius) of the following values:

| | |
|---|---|
| 1.0 MHz | 2.0 |
| 4.0 MHz | 4.1 |
| 8.0 MHz | 5.8 |
| 10.0 MHz | 6.5 |
| 16.0 MHz | 8.2 |
| 20.0 MHz | 9.3 |
| 25.0 MHz | 10.4 |
| 31.25 MHz | 11.7 |
| 62.5 MHz | 17.0 |
| 100.0 MHz | 22.0 |
| 155.0 MHz | 28.1 |
| 200.0 MHz | 32.4 |
| 310.0 MHz | 41.8 |
| 350.0 MHz | 44.9 |

f) All voice drop cabling shall have a minimum Near-End Crosstalk coupling loss for any pair combination at 20 degrees Celsius shall be greater than the value determined by using the following formula for all frequencies in the range of:

0.772 MHz to 100MHz for a length of 1000 feet:
NEXT (F) > NEXT (0.772) - 15 log (F/O.772)

g) All voice drop cabling shall also be guaranteed by the cable manufacturer to support data rates to 350Mhz. The bidder must include in writing in the form of press release, newsletter, or cut sheet verification of cable capabilities.

h) Provide components consistent with the quality of KRONE part number TN5ETR-BLRB (blue) or approved equal, UL Subject 444, (UL)-C(UL) Type MPR/CMR/CMG, ICEA S-90-661, NEC 800 Type CMR TIA/EIA-568-A Cat 5 Horizontal Cable Requirements, ISO/IEC 11801 Category 5, TIA/EIA-568-A-5 Cat 5e Enhanced Horizontal Cable Requirements certified.

## 2.3 STATION HARDWARE-DATA

A. Flush mount jacks shall be high quality Category 6e, 8-position modular jack with twisted lead-frame construction and 110 style terminations terminated with a high impact 110 termination tool. Jacks shall provide dual color code to allow both T568A and T568B wiring on the same jack, and shall provide a cutting ledge to automatically trim wires during termination. Jacks shall meet TIA/EIA-568-A requirements for Category 6e connecting hardware as manufactured by KRONE or Avaya.

B. Faceplates shall match manufacturer for 8-position modular jack outlets at all locations.

C. All data connecting hardware shall be EIA/TIA TSB-40 Category 6e certified.

D. All data connecting hardware shall be modular jack panels with RJ45 jacks on the front and 110 style insulation displacement connectors (IDC) for termination of drop cable on the back.

E. All modular jacks shall be eight position jacks with pin/pair assignments utilizing EIA/TIA T568B.

F. All modular jacks shall be made continuous to the B-pin modular jack via a printed wiring board interconnection.

G. The connecting blocks shall be KRONE IDC style or approved equal.

H. The outlets faceplates shall be KRONE or approved equal in 4-6-8 port configurations. Supply 1 - 8 conductor modular data jacks and cables as a minimum per location.

## 2.4 STATION HARDWARE-VOICE

A. Flush mount jacks shall be high quality Category 6e, 8-position modular jack with twisted leadframe construction and 110 style terminations terminated with a high impact 110 termination tool. Jacks shall provide dual color code to allow both T568A and T568B wiring on the same jack, and shall provide a cutting ledge to automatically trim wires during termination. Jacks shall meet TIA/EIA-568-A requirements for Category 6e connecting hardware as manufactured by KRONE.

B. Faceplates shall match manufacturer for 8-position modular jack outlets at all locations.

C. All voice connecting hardware shall be EIA/TIA TSB-40 Category 6e certified.

D. All wiring voice connecting hardware shall be modular jack panels with RJ45 jacks on the front and 110 style insulation displacement connectors (IDC) for termination of drop cable on the back.

E. All modular jacks shall be eight position jacks with pin/pair assignments utilizing EIA/TIA T568B.

| | |
|---|---|
| 1.0Mhz | 0.1 |
| 4.0 | 0.1 |
| 8.0 | 0.1 |
| 10.0 | 0.1 |
| 16 | 0.2 |
| 20 | 0.2 |
| 25 | 0.2 |
| 31.25 | 0.2 |
| 62.5 | 0.3 |
| 100 | 0.4 |

F. All modular jacks shall have a maximum attenuation corresponding with the table below. They shall approximate value of an equivalent of a 2 meter cable of the same category or any pair within a connector of the following values:

G. All modular jacks shall have a maximum NEXT corresponding with the table below:

| | |
|---|---|
| 1.0Mhz | >65 |
| 4.0 | >65 |
| 8.0 | 62 |
| 10.0 | 60 |
| 16 | 56 |
| 20 | 54 |
| 25 | 52 |
| 31.25 | 50 |
| 62.5 | 44 |
| 100 | 40 |

H. The connecting blocks shall be KRONE IDC style or approved equal.

I. The outlets faceplates shall be KRONE or approved equal in 4-6-8 port configurations. Supply 1 - 8 conductor modular data jacks and cables as a minimum per location.

2.5 MC(MDF) /IC (IDF) /HC STATIoN TERMINATION HARDWARE-data & VOICE

A. Patch Panels

1. Category 6e STP Termination Hardware. The Category 5e data station cable shall be terminated on Category 5e STP, 8-position modular jack patchpanels with circuit board construction in all IC/MC locations. The panels will have rolled upper and lower edges for rigidity and will provide front and rear side labeling visible after the cables and cords are installed. The 8-position modular jack patch panels shall be either wall mounted or rack mounted with cable management panels per communication detail sheets. The contractor is responsible for all wall brackets, patch panels, and cable management panels for all IC/MC/HC layouts and equipment rack configurations.
2. Products: Category 5e STP patch panels (T568B wired, TIA/EIA-568).
3. Cable management brackets must be provided at each rear section of the patch panel to facilitate cable routing and maintain proper bend radius of cables leading to the termination point.
    a) Recommended Product: Krone
4. Cord or Patch Cable Manager: The cord manager shall have five (5) rings and provide the capability to organize and contain up to forty-eight (48) patch cords on the front of the panel. The front of the panel shall provide five (5) high capacity 1.5" x 4" horizontal distribution rings to reduce stress on stored cables to retain optimal cable geometry. All distribution rings shall have radiused edges to protect cables from nicks and tears. The cable manager shall be a minimum of two (2) RU high, and shall fit a standard 19" EIA rack rails.
5. Provide patch panels as required to terminate all indicated station outlets as shown on the project drawings.
6. Patch panels shall be provided at all EER locations indicated.
7. Supply patch panels in rack mount versions with a minimum of 24-32\ports.
8. The patch panels shall exhibit the following minimum characteristics:
    a) EIA 19" rack mountable
    b) 110 rear termination
    c) Modular jacks are circuit board mounted
    d) supports 568A and 568 wiring
    e) removable front labels
    f) requires 3.0" rack space. min.
9. The patch panel shall meet TSB-40 standards.
10. Supply patch panel with full compliment of CAT-6e data patch cables. CAT-6e patch cables shall be configured as follows:
    a) Color: Yellow

b) 24,36,48,60 & 72" in length

c) RJ45 each end with strain relief boots

d) stranded copper wire

11. Acceptable vendors for patch panels which are pre-approved for this project are:

a) KRONE

## 2.6 MC(MDF) /IC (IDF) /HC TERMINATION HARDWARE-VOICE TRUNK CABLING

A. Main Cross Connect Base

1. The cross-connect shall provide Category 5e compliant 110 termination capable of supporting voice, security, and Category 5e data applications, including high megabit and shared-sheath applications when used with Power Sum rated cabling. The 110 panels shall mount to walls or backboards in a mounting-frame style unit, which provides additional cable access and horizontal cord management. The units shall be UL listed, CSA certified, TIA/EIA-568-A and Category 5e compliant, and made in the USA. The mounting frames shall support up to three 100-pair wiring bases, with the capability to accept extension units to create higher densities of up to 900 pairs per tower. The mounting frames shall be made of 16 gauge steel; wiring bases and blocks shall be made of fire-retardant plastic rated UL 94V-0, with provision for TIA/EIA-606 compliant labeling. A one-year limited product warranty and a 15-year performance guarantee shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

B. Main Cross Connect Extension

1. The cross-connect shall provide Category 5e compliant 110 termination capable of supporting voice, security, and Category 5e data applications, including high megabit and shared-sheath applications when used with Power Sum rated cabling. The 110 panels shall mount to walls or backboards in a mounting-frame style unit, which provides additional cable access and horizontal cord management. The units shall be UL listed, CSA certified, TIA/EIA-568-A and Category 5e compliant, and made in the USA. The mounting frames shall support up to three 100-pair wiring bases, with the capability to accept extension units to create higher densities of up to 900 pairs per tower. The mounting frames shall be made of 16 gauge steel; wiring bases and blocks shall be made of fire-retardant plastic rated UL 94V-0, with provision for TIA/EIA-606 compliant labeling. A one-year limited product warranty and a 15-year performance guarantee shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

C. 100 Pair IDC 110 Terminations

1. The cross-connect shall provide Category 5e compliant 110 termination capable of supporting voice, security, and Category 5e data applications, including high megabit and shared-sheath applications when used with Power Sum rated cabling. The 110 panels shall mount to 19" distribution frame or hinged wall mount bracket. They shall be UL listed, CSA certified, TIA/EIA-568-A and Category 5e compliant, and made in the USA. Panels shall support 100, 200 or 300 pair densities with provision for TIA/EIA-606 compliant labeling, and be made of 16 gauge steel, with bases and blocks made of fire-retardant plastic rated UL 94V-0. A one-year limited product warranty and a 15-year performance guarantee shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

D. Horizontal Cord Manager

1. The horizontal 110 cord managers shall mount to a wall or backboard, or onto 300 pair mounting-frame basic or extension units, providing the capability to organize and contain patch cords between rack mount 110 wiring bases. The cord managers shall comply with TIA/EIA-568-A and -606 requirements, and be made of fire-retardant plastic rated UL 94V-0. A one-year limited product warranty and a 15-year performance guarantee shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

E. 110 Connector Blocks

1. The 110 connector blocks shall support termination for voice, security, and Category 5 data applications, including high megabit and shared-sheath applications when used with Power Sum rated cabling. The blocks shall be Category 5 compliant, UL listed, CSA certified, and TIA/EIA-568-A compliant. They shall be made of fire-retardant UL 94V 0 plastic with solder-plated insulation displacement connectors, and must securely seat wires on 110 wiring bases, providing a gas-tight IDC connection that can withstand 200 reterminations. A one-year limited product warranty and a 15-year performance guarantee shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

F. 110 Patch Cords and Plug Assemblies

1. Provide 110 Patch Cord and Plug Assemblies and patching cables as needed to cross connect all cabled stations/ports in system. Supply compliment of various length cables to cross connect as required.

2. Provide spares as follows:

a) 10 - 36"

b) 10 - 48"

c) 10 - 60"

d) 10 - 72"

e) 10 - 84"

## 2.7 DATA DISTRIBUTION EQUIPMENT RACK

A. Provide equipment racks and/or frames in locations indicated on the drawings. Racks shall be equipped as detailed on the drawings and as hereafter specified.

B. MC/IC/HC locations provide IMRAK 7' tall equipment racks (or as indicated), or equivalent.

C. FREE STANDING CABINETS:

1. Provide 19" or 24" EIA floor mount cabinets with bracing brackets and floor mounting accessories as required to support cabling infrastructure with 19" EIA patch panels, data switches and light interface guides along with ancillary equipment.

2. Provide IMRAK 1400 or ZERO XA series as manufactured by VERO ELECTRONICS or pre-approved equal.

3. The cabinet shall incorporate a Plexiglas, locking front door assembly and solid rear door with lock.

4. Provide with required horizontal and vertical cable management for all racks/cabinets, panels and hardware as required to facilitate complete installation.

D. Jumper Management Panels

1. The rack mount hardware shall incorporate in-rack and interbay jumper management techniques. One or both methods may be used as required. In-rack management panels shall be available to provide jumper storage and routing to the connector housings and electronic switches. Additionally, in-rack panels are required for installations where interbay storage methods are not feasible (i.e. already installed lineup where footprints are already specified). Interbay storage is recommended for large slack storage requirements and multiple out of bay patching.

2. In-Rack jumper management panels shall be available in 1-RMS, 2-RMS and 3-RMS sizes and shall have removable front covers to conceal and protect the jumpers when installation is complete. The front of the jumper management panel cover shall be flush with the front door of the connector housing.

3. Jumper management panels shall be designed to maintain a 1.5 inch minimum bend radius when transitioning between routing panels and frame verticals or connector housings and shall be finished with a wrinkled black powder coat for durability. All fasteners shall be black chromated to match the housing.

4. The vertical jumper routing area shall have vertically adjustable cable retaining rings. The adjustable routing rings shall include a swing out door for ease in jumper routing. The sides of the adjustable routing rings shall have radius guides to provide minimum bend radius control. The rear side of the vertical routing area shall also provide cable retaining rings that hold data and power cables close to the rack to eliminate accidental snags from maintenance personnel.

5. Slack storage spools shall be provided when jumper slack storage is required in-rack.

6. Slack storage shall be available using both in frame and interbay storage panels. The storage panels shall be functional both individually and combined.

7. The Interbay Storage panel shall provide both front and rear jumper routing distribution and storage. The interbay storage panel shall be designed to integrate with an EIA standard 7 foot tall equipment rack. The interbay panel shall have a footprint of 6 inches in width and shall have a removable cover that is flush with the front doors of the connector housings when installed. The panel shall be finished with a wrinkled black powder coat for durability. All fasteners shall be black chromated to match the housings.

8. Wall-mountable hardware shall have a means to transition between the connector housing and cable trough or tray.

E. Distribution Rack Grounding: Provide grounding kit similar to IBM Part # 4716804 for each IC and MC. Rack shall be grounded using stranded # 6 AWG insulated copper conductor. Provide all required bonding material and hardware and bond to building grounding electrode subsystem at building electrical service entrance.

## 2.8 UNDERGROUND VOICE TRUNK CABLING

### A. GENERAL

1. Underground voice trunk cabling shall be installed as indicated on the contract drawings and as called for in these specifications.

2. All UTP voice trunk cabling shall be installed in underground conduit and manhole infrastructure without splicing.

3. The trunk cabling shall be installed free of defects and in accordance with AT&T outside plant installation manuals.

4. The cabling shall exhibit the following properties:

   a) 6,12,25,50,100,200 pair configurations

   b) PIC ALPETH Filled FOAM SKIN "DEPIC"

   c) RE-89 Listed

   d) FlexGel filling compound

   e) Electrical properties:

      (1) Mutual Capacitance - nF per mile = 83 +/-4

      (2) Unbalanced Capacitance - pF per 1000' = 100

      (3) Pair to Ground Capacitance - pF per 1000' = 800

      (4) DC Conductor Resistance - ohms per 1000' = 27.5

      (5) Resistance Unbalance - 1.5 ohms

      (6) Min. Dielectric Strength (kV) = 3.0

      (7) Insulation Resistance - megohm per mile = 10,000

      (8) Nominal Attenuation - dB per mile = 13.4

(9) Far End Crosstalk - dB per 1000' = 73

(10) Near End Crosstalk - dB per 1000' – 66

## 2.9 FIBER OPTIC CABLE SPECIFICATIONS

### A. BACKBONE CABLING FIBER OPTIC CABLE PLANT

1. Outdoor Tight Buffered Hybrid Fiber Optic Cable

   a) Outdoor Cable is designed for backbone interbuilding (outside plant) applications. The cable shall be designed for use outdoors and provide excellent protection from the elements.

   b) The cable shall meet the requirements of the National Electrical Code, Article 770, TIA/EIA 568A "Commercial Building Telecommunications Wiring Standard", ICEA-83-596-1988 Insulated Cable Engineers Association Standard for Fiber Optic Premises Distribution Cable Publication S-83-596, December 1988, ANSI X3.166-1990 Fiber Data Distributed Interface (FDDI), Token Ring Physical Layer Medium Dependent (PMD), and a combination of Bellcore Generic Requirements for Optical Fiber and Fiber Optic Cable (GR-20-CORE)

   c) A tight buffered construction shall be used. The cable shall be constructed Core Locked indoor/outdoor PVC out jacket. The fillers, if used, shall be combined and covered with a medium density jacket to provide excellent environmental protection.

2. Multimode Fibers (24 per cable)

   a) Multimode fibers in the cable shall contain 50 micron graded index multimode fibers. These fibers are located inside the buffer tubes. Multimode fibers shall meet the specifications defined by the Multimode Optical Fiber Specifications.

   b) Fiber Identification

      (1) The fibers within each buffer tube shall be distinguishable from each other by means of color coding. The color coding sequence shall be blue, orange, green, brown, slate, white, red, black, yellow, violet, rose and aqua.

   c) Stranding member using a reverse oscillating lay (SZ) stranding method with counter helically applied non-hydroscopic binder tapes.

3. Single Mode Fibers (12 per cable)

   a) Single Mode Fibers in the cable shall contain 9 micron graded index multimode fibers. These fibers are located inside the buffer tubes. Single mode fibers shall meet the specifications defined by the Single Mode Optical Fiber Specifications.

b) Fiber Identification

(1) The fibers within each buffer tube shall be distinguishable from each other by means of color coding. The color coding sequence shall be blue, orange, green, brown, slate, white, red, black, yellow, violet, rose and aqua.

c) Stranding member using a reverse oscillating lay (SZ) stranding method with counter helically applied non-hydroscopic binder tapes.

4. Strength Member

a) The primary strength member shall consist of aramid yarns applied around the fibers.

5. Cable Jacket

a) A black jacket made of medium density polyethylene (MDPE) shall be extruded around the cable core and aramid yarn. The jacket shall have two co-extruded tracer stripes located 180° apart for identification. The tracers shall be MDPE jacket material.

b) The cable jacket shall be designed for easy removal, with readily available tools. The design shall permit jacket removal without damage to the optical fibers.

c) The cable jacket shall be printed with manufacturer name, sequential length marking, the number and type of fiber and the appropriate cable type marking according to NEC Section 770.

6. Minimum Bend Radius

a) The minimum static bend radius shall be 10 times the cable outside diameter. The minimum dynamic bend radius shall be 20 times the cable outside diameter.

b) The average increase in attenuation shall not be greater than specified by GR 20-CORE depending on the type of fiber used, single-mode or multimode. No mechanical damage shall occur to the cable jacket.

7. Impact Resistance

a) The average increase in attenuation shall not be greater than specified by GR-20-CORE depending on the type of fiber used, single-mode or multimode. No mechanical damage shall occur to the cable jacket.

b) Testing shall be done in accordance with EIA-455-25A (Impact Testing of Fiber Optic Cables and Cable Assemblies). Optical Attenuation chances shall be measured following the procedures of EIA-455-20 (Measurement of Change in Optical Transmittance). The cable specimen shall be subjected to 25 impacts of 4.3 N.M.

8. Compressive Strength

   a) A representative sample of the cable shall withstand a minimum compressive load of 440 N/mm (250 lbf/in) for armored cable, and 220 N/cm (125 lbf/in) for nonarmored cable applied uniformly over the length to the compression plate.

   b) The average increase in attenuation shall not be greater than specified by GR- 20-CORE depending on the type of fiber used, single-mode or multimode.

   c) Testing shall be done in accordance with EIA-455-41 (Compressive Loading Resistance of Fiber Optic Cable).

9. Tensile Strength

   a) The average increase in attenuation at the rated tensile load of the cable shall not exceed than specified by GR-20-CORE depending on the type of fiber used, single-mode or multimode.

   b) The maximum dynamic (short term) tensile load rating will be 600 lbs. (2700 Newton's). The maximum static (long term) tensile load rating shall be 135 lbs. (600 Newton's).

   c) Testing shall be done in accordance with EIA-455-33A (Fiber Optic Cable Tensile Loading and Bending Test).

10. Cable Twist

   a) The average increase in attenuation shall not be greater than specified by GR 20-CORE depending on the type of fiber used, single-mode or multimode. No mechanical damage shall occur to the cable jacket.

   b) Testing shall be done in accordance with EIA-455-85 (Fiber Optic Cable Twist Test). The test length (L) shall be a maximum of 4 meters.

11. Cable Cycling Flexing

   a) The average increase in attenuation shall not be greater than specified by GR 20-CORE depending on the type of fiber used, single-mode or multimode. No mechanical damage shall occur to the cable jacket.

   b) Testing shall be performed in accordance with EIA-455-104 (Fiber Optic Cable Cyclic Test). The cable shall be flexed for 25 cycles at 30 cycles/minute.

12. Outer Jacket Yield Strength

   a) The yield strength and ultimate elongation of the outer cable jacket shall be tested in accordance with EIA-455-89A (Fiber Optic Cable Jacket Elongation and Tensile Strength).

13. Jacket Shrinkage

    a) The maximum cable jacket shrink back shall be less than 5%.

    b) Testing shall be done in accordance with EIA-455-86 (Fiber Optic Cable Jacket Shrinkage).

14. Temperature

    a) The cable shall maintain optical and mechanical integrity over the following temperature ranges:

        (1) Operation:-40° C to +85° C

        (2) Installation-40° C to +70° C

        (3) Storage:-40° C to +75° C

15. Cable Reels

    a) The cable shall be shipped on non-returnable wooden reels designed to prevent damage to the cable during shipment and installation. Wooden lagging boards will be fastened across the reel flanges.

    b) Each reel should be clearly marked to indicate the direction in which it should be unrolled to prevent loosening of the cable on the reel.

16. Reel Covering

    a) A covering shall be placed between the flanges over the exposed cable. The covering shall be weather resistance and shall limit solar heating of the cable.

    b) The cable ends shall be securely fastened. The end attachments shall prevent the escape of any filling compound and shall prevent the entry of moisture.

17. Reel Identification

    a) Each reel of cable shall be stenciled or have a data sheet attached (Packaged in a waterproof wrapping) containing the following information:

        (1) Reel identification number

        (2) Measured attenuation of cable

        (3) Length of Cable

18. Quality Control

a) Each master reel shall be tested to ensure fiber integrity, attenuation, and cable length. Multimode fibers shall be tested at both 850 and 1300 NM. Single mode fibers shall be tested at both 1300 and 550 NM. Each master reel will be given a unique identification and the test results documented. The manufacturer shall maintain documentation such that the cable history may be traced to the individual fibers used in construction of the cable.

19. Test Report

a) A test report shall be included with each reel of cable. This test report will include the cable description, unique reel identification, measured length of the cable in meters and feet, attenuation measurements at wavelengths tested and the manufacturer name and address.

20. Provide components consistent with the quality of Optical Cable Corporation DX Series certified.

## 2.10 FIBER OPTIC CABLE TERMINATIONS

A. Fiber Optic Cable shall be installed in innerduct. Outside gel filled fiber cable shall be installed in conduit or UL approved plenum innerduct. Non-riser rated gel filled cable must be terminated within 50' of building entrance per BICSI Standards.

B. Terminations shall be performed by a manufacturer trained and certified technician for optical fiber connections.

C. Fiber Optic connectors shall be:

1. SC connectors for all single mode terminations.

2. ST connectors for all multimode terminations.

D. Fiber Optic couplings shall be as provided by on in fiber patch panels and shall be either multi-mode or single mode ST as required for the application.

E. Terminations shall be made in a controlled environment. The contractor may choose to have the cables assembled off-site, although testing must be completed with the cable in its final installed condition.

## 2.11 DATA-MC/DATA-IC/DATA-HC FIBER OPTIC CABLE TERMINATIONS

A. Optical Fiber Connectors.

1. Products: 3M Corporation, AMP or Lucent ST connectors.

2. Optical Fiber Termination Enclosures used in the DATA-MC/DATA-IC/DATA-HC rooms shall provide termination panels for ST or SC type connectors and be of sufficient size and capacity to terminate 100% of the fiber count of the inside or outside fiber optic cables. Patch panels must be wall or 19" rack mountable depending on IC/MC/HC applications. Provide all termination accessories, enclosures, and testing for a complete fiber optic distribution system.

   a) Products: KRONE 36 port panels

B. Optical Fiber Patch Panels

1. The patch panel shall provide 36 fiber couplings in 3.0" of vertical rack space. These couplings shall be pre-installed in a single bulkhead. The patch panel shall have removable front and rear doors as well as a removable lid. There shall be vertical and horizontal ingress/egress features in the form of slots in the top, bottom and sides of the panel, both front and rear. All ingress/egress slots shall be covered with a self-adhesive UL 94V-0 rated grommet material. All ingress/egress slots shall have a strain relief post with a slot capable of holding a tie wrap. The panel shall provide strain relief in the form of a grounding lug and multiple tie-wrap points. The panel must have mounting ears that allow mounting on 19" or 23" hole centers in either a mid- or flush-mount configuration. The panel shall have dual, adjustable plastic cable management rings made of high impact UL 94V-0 rated self-extinguishing plastic. The patch panel shall be capable of having a slide feature attached to it to allow the entire box to be moved in and out of the rack. A port identification label/card shall be provided. The panel shall be made of 16 gauge steel, painted black. A one-year limited warranty shall be provided by the manufacturer. A lifetime warranty against defects in material and workmanship shall be provided by the manufacturer for this unit when it is installed in a certified system.

2. Approved Supplier: KRONE

## PART 3 – EXECUTION

### 3.1 GENERAL

A. The contractor shall avoid penetration of fire-rated walls. Sleeving shall be installed for access where necessary.

B. Any penetration through fire rated walls (including those in sleeves) will be resealed with an Underwriter Laboratories (UL) approved sealant. Use 3M Firestop material. Contractor shall also seal all floor, ceiling, and wall penetrations in fire or smoke barriers and in the MC, IC's and wiring closets.

C. Cable Lubricants: Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue.

1. Recommended Products:

a) Twisted-pair cable: Dyna-Blue, American Polywater.

b) Optical fiber cable: Optic-Lube, Ideal

D. Pull Strings: Provide pull strings in all new conduits, including all conduits with cable installed as part of this contract. Pull test is not to exceed 200 lbs.

E. The Contractor shall replace any damaged ceiling tiles that are broken during cable installation.

F. The Contractor shall replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, over-tightened bindings, loosely twisted and over twisted pairs at terminals, and sheath removed too far (over 2").

G. All cable shall be continuous and splice-free for the entire length of run between designated MDF, IDF, pull boxes or terminations.

H. Terminate all cable in designated MDF,IDF,Jacks and/or designated equipment backboards. No terminations or splices shall be permitted in pull boxes, underground or any non-designated termination point.

I. Provide service loop of cables at all junction and termination cabinets or boxes and backboards.

J. Maintain consistent absolute signal polarity at all connectors, patch points and connection points accessible in the system.

K. Provide identification labels on each cable ends, backboard, wall jack and installation log in accordance with EIA/TIA 606. Cable labels shall be imprinted or type written style and shall be attached in a manner as to allow easy viewing along the length of the wire/cable. Acceptable systems are PANDUIT, BURNDY or approved equal. Submit to Consultant for approval of method.

L. Provide installation logs supporting building infrastructure.

M. Dress or harness all wire and cable to prevent mechanical stress of electrical connectors. No wire or cable shall be supported by a connection point. Provide service loops where harnesses of different classes cross, or where hinged panels are to be interconnected.

N. Configure and cross connect all ports as required for complete end to end system.

O. Strap or secure cables every 5 feet. Do not strap to lighting, ceiling grid, etc.

P. Cables shall be routed in corridors whenever possible to avoid unencumbered access to cables.

Q. Cables shall be placed as a minimum of 12" from 208-240VAC power and 18" from 480 power.

R. Maintain 18" clearance between light fixtures incorporating ballast operation.

S. Cables shall be installed to preclude damage and not come in contact with sharp edges of building, wireways or casework/furniture.

T. Maintain minimum bend radius per drawing details.

U. Cables shall be a minimum of 30" from heating, steam valves etc.

V. All conduits shall have bushings in place prior to cable installation.

W. All installation shall be coordinated with Consultant for Milestone verification.

## 3.2 LABELS

A. The labeling plan shall be developed by the Contractor and approved by owner.The Contractor will label all outlets following the detailed shop drawing design, using permanent/legible typed or machine engraved labels approved by owner. Terminals in the HC's/IC's/MC's shall be labeled by the contractor using designation strips designed for 110 hardware or as applicable to terminal hardware. All copper/fiber terminal for riser cables in the HC and/or IC shall correspond to terminal numbering in the MC.

B. The labels on HC/IC station terminal blocks shall be numerically sequential. Outlets shall be labeled to match the labels on the corresponding terminal block position. Labels shall include a room number component and a sequential extension. The room number component shall reflect the numbering system utilized for existing door labels or room numbers as selected by owner. For example, the third outlet in room 25 (starting on the left side of the door and working clockwise around the room) is labeled: "25.3."

C. A floor plan clearly labeled with all outlet jack numbers shall be included in the as-built plans.

D. All labels shall correspond to as-built and to final test reports.

## 3.3 STATION WIRING INSTALLATION

A. The low voltage Contractor's RCDD shall supervise the installation of communications cable. All Category 5e and Fiber Optic cable shall be installed by individuals trained in low voltage data cable system installation. All Category 5e (4) pair STP cable must be handled with care during installation so as not to change performance specifications. The Contractor shall not over-tighten tie wraps or over-bend the Category 5e STP cable.

B. Exposed station wire will only be run with owner approval. Approval will be granted only when no other option exists. When station wire must be run surface to a single outlet, surface raceway shall be used to cover the cable.

C. All wiring and associated hardware shall be placed so as to make efficient use of available space in coordination with other uses. All wiring and associated hardware shall be placed so as not to impair the use or capacity of other building systems, equipment, or hardware placed by others (or existing). All wiring, and associated support structures and hardware shall be placed so as not to impair owner's efficient use of their full capacity.

D. All wiring placed in ceiling areas must be tied or clamped. When wire is placed in ceiling areas or other non-exposed areas, fasteners shall be placed at intervals no greater than 60" and preferably on 48" centers. Cable sag between supports shall not exceed 12". Attaching wire to pipes or other mechanical items is not permitted. At all runs of twenty or more cables, provide rings at 60" (maximum) centers to hang cable. Communications cable shall be routed to avoid light fixtures (18" minimum spacing), sources of heat (12" minimum spacing) and power feeder conduits (12" minimum spacing). Communications cabling must be spaced a minimum of 120" (10') from bus duct.

## 3.4 STATION HARDWARE

A. Eight (8)-position modular jack pin assignments:

B. Pin connections for data station 8-position modular jacks and patch panels shall match TIA/EIA-568-A modular jack recommendation T568B that is both 10/100BaseT compatible.

C. Pin connections at data jack panels shall match pin connections at outlets with straight through wiring.

D. Terminations at telephone terminal blocks (where required to maintain existing station cable) shall match following pair sequence for T568B:

1. Pair 1, Pins 5 and 4, White-Blue, Blue (/White).
2. Pair 2, Pins 1 and 2, White-Orange, Orange (/White).
3. Pair 3, Pins 3 and 6, White-Green, Green (/White).
4. Pair 4, Pins 7 and 8, White-Brown, Brown (/White).

## 3.5 BACKBOARD CABLING/EQUIPMENT RACK CONFIGURATION

A. Cable installation in the Entrance Room and Communications Closet must conform to the Project Drawings. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation mixing boxes, network equipment mounting access hatches to air filters, switches or electrical panels, and lighting fixtures. Avoid crossing areas horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings. Provide a minimum of 36" for a service loop to the patch panel.

B. Cable shall be routed as close as possible to the ceiling, floor, or corners to insure that adequate wall or backboard space is available for current and future equipment and for cable terminations. Cables shall not be tie-wrapped to existing electrical conduit or other equipment. Minimum bend radius shall be observed.

C. Lay cables via the shortest route directly to the nearest edge of the backboard from the mounted equipment or block. Lace or tie-clamp all similarly routed cables together, and attach by means of clamps screwed to the outside edge(s) of the backboard vertically and/or horizontally, then route via "square" corners over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables.

D. Do not over-tighten cable ties or binding on Category 5e station cable. Observe Category 5e cable bend radius.

## 3.6 PROTECTION OF WORK SPACE AND AREA - SITE SAFETY

### A. SIGNS, BARRICADES, MARKING TAPE

1. Always protect open and confined spaces with standard construction guards and warning devices.

2. Place approved warning lights or reflector signs near areas where work is performed below grade in vaults or manholes. Area shall be barricaded to prevent staff access to work area. Warning lights, barricades and signs shall be placed:

   a) One-half hour before sunset or anytime vision is impaired by fog, haze, etc.

   b) Signs and lights must remain in place until the work is completed.

   c) When below grade work is being performed and work area is left uncovered and unattended, the contractor shall place warning signs with flags, boundary warning tape and cones in the direction of approaching pedestrian or vehicle traffic.

   d) When work is located near a curve in walkway/roadway or near a top of hill, place additional warning devices to give sufficient warning to approaching pedestrian or vehicular traffic.

   e) Work located in public or private intersections, on public or private surface streets or where traffic is heavy additional precautions shall be deemed necessary and the contractor is to provide for public and staff safety at all times.

3. Materials, tools, vehicles and equipment shall be placed and positioned to cause minimal interference with traffic. Materials, tools, vehicles and equipment shall be configured and arranged on the site and in the work area to minimize hazards to traffic, staff or personnel.

4. Provide protection around all pull lines and/or cable.

5. When equipment, vehicles, tools, materials must be left at the site, unattended, it shall not be secured to posts, poles, furniture, buildings, fencing, or fire hydrants.

B. WORK SPACE BELOW GRADE

1. Confined spaces below grade (manholes, handholes, vaults, tunnels, etc.) are required to be tested for hazardous gas prior to entering. Confined spaces shall not be entered until LOCAL SAFETY procedures have been followed to entering below grade work space.

2. If a hazardous substance is detected in the confined work space, the contractor shall immediately notify owner and consultant and the appropriate gas utility company.

3. Report all trapped or unconscious victims to 9-1-1 and owner.

4. Open flame of any type is not allowed into below grade or confined work spaces.

5. Below grade work spaces shall be ventilated in accordance with LOCAL SAFETY guidelines prior to commencement of work.

6. Use only approved lighting in below grade/confined work spaces.

7. Contractor shall take extreme caution and care while working in existing below guard confined spaces to prevent damage to existing lines, wires, cables, circuits, etc.

C. WORK SPACE ABOVE GRADE

1. Contractor shall protect work area as defined in SIGNS, BARRICADES and MARKING TAPE.

3.7 INSPECTION

A. Conformance to the installer practices covered above are to be verified when completed. In some cases, the customer may inspect before acceptance. The following points are to be examined:

1. Is the design documentation complete?

2. Have all terminated cables been tested per the specifications?

3. Is the cable type suitable for its pathway?

4. Have the pathway manufacturer's guidelines been followed?

5. Have the installers avoided excessive cable bending?

6. Have potential EMI sources been considered?

7. Is cable fill correct?

8. Are hanging supports within 60" (5')?

9. Does hanging cable exhibit some sag?

10. Are telecommunications closet terminations compatible with applications equipment?

11. Have station jack instructions been followed?

    a) Jacket removal point.

    b) Termination positions.

    c) Pair terminations tight with minimal pair distortions.

    d) Twists maintained up to termination.

12. Have patch panel instructions been followed?

    a) Cable dressing first.

    b) Jackets remain up to the connecting block.

    c) Pair terminations tight and undistorted.

    d) Twists maintained up to the connecting block.

13. Are the correct outlet connectors used (568B)?

14. Is the jacket stripped back only as much as is needed, not to exceed 2" from the connection?

## 3.8 QUALITY CONTROL

A. Evidence of Experience and Qualifications

1. Show that the installer who will perform the work has a minimum of 5 years experience successfully installing system of the same type and design as specified herein. Include the names, locations, and points of contact of at least two similar installations of the same type and design as specified herein where the installer has installed such systems. Indicate the type of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 12 months.

2. Show that the instructor, who will train staff, operating and maintenance personnel, has received a minimum of a CNE/MCE training from a factory training center, and 2 years experience in the installation of systems of the type specified. Submit training certification in equipment submittals, title section training and certifications.

## 3.9 INSTALLATION TESTING

A. SYSTEM TESTING REQUIREMENTS-STATION

1. Owner/Consultant shall be notified one week prior to any testing so that the testing may be witnessed.

2. Before requesting a final inspection, the Contractor shall perform a series of end-to-end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms, and timetable for fiber optic and all copper plant wiring.

3. Acceptance of the simple test procedures discussed below is predicated on the Contractor's use of the recommended products (including but not limited to twisted pair cable, cross-connect blocks, and outlet devices specified in the Products paragraph) and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation will be evaluated in the context of each of these factors.

4. At a minimum, the Contractor shall test:

   a) All station drop cable pairs from HC/IC/MC termination patch panels to outlet device 8-position modular jacks.

   b) Each wire/pair shall be tested at both ends for the following (utilizing the attached test results forms):

      (1) Termination order.
      (2) Polarity (pair reversals).
      (3) Continuity.
      (4) Shorts.
      (5) Grounds.
      (6) NEXT (near end crosstalk) from both directions.
      (7) Cable length (record all length).
      (8) Wire Map
      (9) Length
      (10) Impedance
      (11) Resistance
      (12) Capacitance
      (13) Attenuation
      (14) Active ACR
      (15) INJ NEXT Loss
      (16) INJ Active ACR

   c) Testing shall be made utilizing a hand cable tester as manufactured by Fluke, Microtest or Wavetek.

   d) All test equipment shall bear current calibration stickers or dated certificates.

   e) Printed test results along with as-built drawings shall be assembled into a 3-ring project binder and delivered to the Consultant for verification and acceptance.

5. When errors are found, the source of each error shall be determined, corrected, and the cable re-tested. All defective components shall be replaced and retested. Defective components not corrected shall be reported to owner/consultant with explanations of the corrective actions attempted.

6. Test records shall be maintained using the test results forms outlined below. The form shall record closet number, riser pair number or outlet ID, outcome of test, indication of errors found (e.g., a, b, c, d, or e) cable length, re-test results after problem resolution and signature of the technician completing the tests. See Appendix to electrical specifications for testing form.

7. Test results for each 4- pair, Category 5e or 6e, STP cable must be submitted with identification to match labels on all patch panel ports and 8-position modular jacks, and identification to match as-builts associated with that cable.

8. Owner will observe and verify the accuracy of test results submitted.

B. SYSTEM TESTING REQUIREMENTS - CABLE PLANT

1. All data drop cables shall be tested for continuity and polarity between station jack, IDF and MDF.

2. All data trunk cables shall be tested for continuity and polarity between

3. IDF and MDF, using a portable handheld Analyzer. Certify tests in writing.

4. All testing shall be performed in accordance with EIA/TIA building standards and shall be done in the presence of the Consultant.

5. Transmission measurements shall be taken at random to ensure overall system compliance. Tests shall be conducted as follows:

   a) Using a network analyzer, coax cables, baluns, UTP test leads and impedance matching terminations perform the following;

      (1) refer to TIA/EIA/TSB-40

   b) Log all tests in acceptance testing manual. Record and document the following for each cable and circuit.

      (1) Continuity

      (2) Polarity

6. All testing equipment shall have current calibration stickers firmly affixed to the testing equipment. All calibrations shall be traceable to the National Standards Bureau.

7. Provide printed test data for CAT-5e certification for LAN service.

8. Testing shall be performed in the presence of owner and consultant.

9. Testing shall include verification of:

a) Cable Plant

3.10 FIBER OPTIC TESTING SPECIFICATIONS

A. All testing shall be performed by trained personnel.

B. For all installed fiber optic cable EIA 455-171 Method D procedures will be adhered to. (Bi-directional).

C. Connector loss shall not exceed .5 dB per termination.

D. The fiber optic cable shall not exceed 1.5 db per kilometer tested at 1300 nm and 1500 nm for single mode cable.

E. The fiber optic cable shall not exceed 4 db per kilometer tested at 850 nm and 2 db per kilometer tested at 1300 nm for multimode 62.5/125 fiber.

F. The Contractor is responsible for obtaining minimum loss in fiber connections and polishing per manufacturer's specifications.

PART 4 - WARRANTY SERVICE & CLOSE OUT

4.1 MINIMUM WARRANTY

A. The cabling system shall meet the performance requirements of the ANSI/TIA/EIA-568-A standard (Annex E) and TIA/EIA Telecommunications Systems Bulletin 67. The warranty on the material, services, and operation of the cabling system to this specification must be for a period of at least 15 years. The connecting hardware shall have a lifetime extended warranty against defects in material and workmanship.

B. The warranty must include the following statements regarding the cabling system:

1. "Will support and conform to TIA/EIA-568-A specifications covering ANY CURRENT OR FUTURE APPLICATION which supports transmission over a properly constructed horizontal cabling system premises network which meets the channel and/or basic link performance as described in TIA/EIA-568-A AnnexE and TIA/EIA-TSB-67."

2. "Will be free from defects in material or faulty workmanship"

3. The contractor shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for one year from the date of final acceptance by Consultant.

4.2 COMMISSIONING

A. General

1. Acceptance shall consist of the following:

a) Burn-in period.

(1) The system shall be accepted for start of warranty upon successful completion and testing of the Consultant.

(2) Burn-in period shall be a 30-day time frame to allow the system to operate free of defects, grounds, programming faults, etc.

(3) The 30-day burn-in shall begin the day of acceptance by Consultant.

(4) The burn-in period shall be 30 days of continuous use without system trouble, false alarm, open, short or ground condition present.

(5) Should the system fail for any reason during the burn-in period, the contractor shall respond immediately upon notification by owner's personnel and correct said deficiencies.

(6) Upon correction and restoration, the burn-in period shall be re-set to "0" and the 30 day count shall begin again.

(7) Warranty shall commence upon day 31 of successful burn-in period.

b) Final Test

(1) Before the installation shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows:

(2) The contractor's job foreman, in the presence of a representative of the manufacturer, and a representative of the owner shall operate every network device to ensure proper operation and correct configuration at the file server location.

(3) When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to owner.

(4) The contractor shall leave the data network system in proper working order, and, without additional expense to owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance by the Consultant.

## 4.3 PROJECT CLOSE OUT

A. Operating and Instruction Manuals

1. Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to owner upon completion.

2. Provide necessary training and/or schooling to designated owner's personnel at no additional cost to owner. Training shall be at owner's designated location, by factory-trained personnel.

B. Testing Frequency Instructions

1. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble-shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to owner upon completion of the system.

2. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

   a) Instruction on replacing any components of the system, including internal parts.

   b) Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions

   c) A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and local supplier of each item.

   d) User operating instructions, shall be provided prominently displayed on a separate sheet located next to the control.

3. Owner shall be furnished with all programming disks for each installation as well as hard copy printouts. Provide necessary training and/or schooling to designated owner's personnel at no additional cost to owner. Training shall be at owner's designated location, by factory-trained personnel.

4. Staff of owner maintenance shall be thoroughly instructed in the use of the System. Training shall include a minimum of three (1) hour sessions, to be scheduled at owner's designated time.

5. Maintenance instruction shall be performed in the same manner as described above. Training shall include a minimum of three (1) hour sessions, to be scheduled at owner's designated time.

## 4.4 DRAWING DETAILS (AS-BUILTS)

A. Show wall elevation and wire details on shop drawings. Show equipment function, make and model and wire routing and terminations within rack or cabinet.

B. Show as-built location of all devices on as-built drawings.

1. Provide 3 sets of bound operation and maintenance manuals, including submittal materials, and record of field changes. Provide complete as-built wiring diagrams in AutoCAD R2000 format. Provide disk files and original tracings (E size) in format of construction drawings.

C. As-Built Drawings, Testing, and Maintenance Instructions

1. A complete set of reproducible as-built drawings in AutoCAD R2000 format (CDs and sheets) showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to owner upon completion of system acceptance.

END OF SECTION

SECTION 26 4901

GENERAL CONTROL DEVICES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Pushbutton and selector switches.
2. Control stations.
3. Relays.
4. Time delay relays.
5. Control power transformers.
6. Control panels.

B. Related work:

1. Control Cabinets: Section 260130.

### 1.2 REFERENCES

A. NEMA ICS 1 General Standards for Industrial Control Systems.

B. NEMA ICS 2 Standards for Industrial Control Devices, Controllers and Assemblies.

C. NEMA ICS 6 Enclosures for Industrial Controls and Systems.

D. NEMA ST 1 Standard for Specialty Transformers (Except General Purpose Type).

E. NFPA 70 - National Electrical Code.

### 1.3 SUBMITTALS

A. Submit under provisions of Section 010000.

B. Shop Drawings: Submit to NEMA ICS 1 indicating control panel layouts, wiring connections and diagrams, dimensions, support points.

C. Product Data: Provide for each component showing electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of project.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION

A. Contactors:

1. Mechanically and Electrically Held Contactors: Open type, 120V coil, number of poles and ampere rating as indicated. Factory wired and installed in lighting panelboard compartment.

2. Square D Co. Class 8903.

B. Time Switch:

1. Intermatic time switch as shown on the drawings.

C. Photo Control With Time Delay:

1. Rated for 1000W load or 1800 VA, sp st, in weatherproof enclosure.

2. General Electric Co. Cat. No. CR174H651, or equal.

D. Control Relays:

1. 120 VAC coil, 10A rated contacts with number of poles indicated. Square D Co. Class 8501 Type X.

2. 48 VDC coil, 10A rated contacts. Square D Co. Class 8501 Type KDP 12.

3. 24 VDC coil, 10A rated contacts, plug in Type 3PDT. Square D Co. Class 8501 Type KDP 13 with NR62 socket.

4. Pneumatic Time Delay Relay: Square D Co. Class 9050 Type B.

E. Control Units, Such as Push Buttons, Pilot Lights, Selector Switches: Heavy duty, oil tight - Square D Co. Class 9001.

1. Push buttons, standard, full guard. Red for stop, green for start.
2. Pilot lights, transformer type, with color caps as indicated.
3. Selector switches, 3 position (Hand Off Automatic) manual return.
4. Legend Plates: Standard, with legends as indicated.

## 2.2 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates with 1/4 inch minimum height letters indicating circuit designation of panel or device controlled on controls which are individually enclosed.

B. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

END OF SECTION

SECTION 26 4920

MOTOR CONTROL

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Motor control; including molded case circuit breakers or fusible disconnects, magnetic starters and other control devices.

B. Related work:

1. Motor Rated Switches: Section 26 0170.
2. Control Units: Section 26 4901.

### 1.2 SUBMITTALS

A. Submit in accordance with Section 01 3300.

## PART 2 - PRODUCTS

### 2.1 MATERIAL AND FABRICATION

A. Motor Control Centers:

1. Provide factory assembled motor control centers consisting of one or more, minimum: 19 inch wide by 16 inch deep, dead front, dead rear, vertical sections bolted together.
2. Full voltage, non reversing starter, unless otherwise indicated.
3. Conform with NEMA Class 1, Type B wiring for starter unit control.
4. Provide two normally open and one normally closed auxiliary contacts on each except where more contacts are indicated.
5. Provide full length copper bussing including areas indicated as space only.
6. Provide a horizontal copper ground bus drilled and tapped every 10 inches for 1/4 20 machine screws.
7. Provide an individual control transformer with the secondary fused and grounded for each starter. Size as required for the control devices indicated plus 25% spare capacity minimum.

8. Provide a 3 position selector switch (hand off auto), manual return, for each starter unless otherwise indicated.

9. Provide a transformer type push to test green pilot light energized by an auxiliary contact.

10. Provide approved pull apart terminal blocks or control circuit disconnect switch for all external wiring connections.

11. Identify all internal control wiring with manufacturers wire numbering or control wire numbering when indicated, at all terminal points and connections.

12. Allen-Bradley, GE or Square D Co.

B. Combination Motor Starters:

1. Full voltage, non reversing starters unless otherwise noted and magnetic trip only circuit breakers, or fusible disconnects in NEMA 1 enclosure for dry areas and NEMA 3R where indicated weatherproof, sized as indicated. Provide current limiters where indicated.

2. Provide two normally open and one normally closed auxiliary contacts on each starter, except where contacts are indicated.

3. Provide an individual control transformer with the secondary fused and grounded for each starter. Size as required for the control devices indicated plus 25% spare capacity minimum.

4. Provide a 3 position selector switch (hand off auto), manual return, for each starter unless otherwise indicated.

5. Provide a transformer type push to test green pilot light energized by an auxiliary contact.

6. Identify all internal control wiring with manufacturers wire numbering or control wire numbering when indicated, at all terminal points and connections.

7. Combination Starter and Circuit Breaker: Square D Co. Class 8539, GE or Allen-Bradley.

8. Combination Starter and Disconnect: Square D Co. Class 8538, GE or Allen-Bradley.

C. Motor Manual Starters:

1. Single Phase:

a) For fractional HP motors, single unit with toggle operator, in NEMA 1 enclosure for dry areas and NEMA 3R where indicated weatherproof.

b) Number of poles as indicated.

c) Provide overload protection.

d) Square D Co. Class 2510, GE or Allen-Bradley.

2. Three Phase:

a) For integral horsepower motors, single unit 3 pole with toggle operator in NEMA 1 enclosure for dry areas and NEMA 3R where indicated weatherproof.

b) Square D Co. Class 2510, GE or Allen-Bradley.

D. Magnetic Motor Starters (Individually Mounted):

1. Non reversing, in NEMA 1 enclosure for dry areas and a NEMA 3R enclosure where indicated weatherproof.

2. Provide start stop push button on door otherwise indicated.

3. Square D Co. Class 8536, GE or Allen-Bradley.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Bolt all sections of the control centers together tightly and secure to floor with anchor bolts after setting assembly plumb and level.

B. Secure units to structures to withstand wire-pulling strains.

C. Use motor nameplates data for selection of heater elements in motor starters, except where power factor correction is used. Size heater elements accordingly.

### 3.2 LABELING AND IDENTIFICATION

A. Provide engraved plastic nameplates on all electrical distribution equipment shown on the single line diagram.

B. Provide motor control center and source feed designation on nameplates with 3/8" minimum lettering for the motor control center name and 1/4" height lettering for the source feed designation.

EXAMPLE: MCC A

FED FROM: DHA 1

C. Provide engraved plastic nameplates with 1/4 inch minimum height letters indicating circuit designation at branch overcurrent devices in motor control centers.

1. Circuit designation and load served at branch overcurrent devices in motor control centers and combination starters.

2. Circuit designation and load served at manual motor starters and individually mounted magnetic motor starters.

D. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation is not acceptable.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section requires the selective removal and subsequent off-site disposal of the following:

1. Removal and disposal of all abandoned pipe and conduit except for pipe or conduit indicated specifically on plans for abandonment in place.

2. Removal and offsite disposal of grass and root mat.

3. Demolition of asphalt concrete and pavements as indicated on the drawings to straight, neatly saw cut surface.

4. Trees as indicated on plans, completed including roots.

5. All other removals which may or may not been shown on plans as required for the project construction.

1.02 SITE CONDITIONS

A. Protections: Contractor shall provide temporary barricades and other forms of protection to protect general public from injury due to demolition work.

B. Traffic: Conduct demolition operations and debris removal to ensure minimum interference with roads, streets, walks, bike paths, and other adjacent occupied or used facilities. Access must be coordinated with District's Representative.

C. Utility Services: Maintain all existing utilities to remain in service and protect them against damage during demolition operations.

D. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations and County Air Pollution Control District pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions such as flooding and pollution.

1.1 1.03 REFERENCES

A. Standard Specifications for Public Works Construction (Green Book), latest edition.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.01 DEMOLITION

A. General: Perform demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with governing regulations.

B. Provide services for effective air and water pollution controls as required by County Air Pollution Control District regulations.

C. Prior to commencing grading operations, soil containing debris, organics, pavement, or other unsuitable materials, shall be stripped from the foundation and pavement areas. Demolition areas shall be cleared of old foundations, slabs, abandoned utilities, tree roots, and soil disturbed during the demolition process. Depressions or disturbed areas left from the removal of such material shall be replaced with compacted fill under observation by the Geotechnical representative.

D. Concrete sidewalks will be removed to the nearest construction or expansion joint to the limits of removal as shown on the plans. Exact locations will be determined in the field by the District's Representative.

3.02 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from Project site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose of off site.

B. If hazardous materials are encountered during demolition operations, contact District's Representative.

C. Burning of removed materials is not permitted on project site.

3.03 HAZARDOUS MATERIALS

A. Except as otherwise specified, in the event Contractor encounters on the Project site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or other hazardous materials which have not been rendered harmless, Contractor shall immediately stop Work in the area affected and report the condition to the District's Representative in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Contractor if in fact the material is asbestos, PCB, or other hazardous materials and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos, PCB, or other hazardous materials, or when such materials have been rendered harmless.

B. Construction involving asbestos cement (transite) pipe shall be performed by qualified personnel in accordance with the standards and specifications set forth by American Water Works Association (AWWA), the Occupational Safety and Health Act (OSHA) and the Environmental Protection Agency (EPA), as well as location jurisdictional codes.

3.04 CLEANUP AND REPAIR

A. General: Upon completion of demolition work, remove tools, equipment and demolished materials from site.

1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to existing condition prior to start of operations. Repair adjacent construction or surfaces soiled or damaged by demolition work.

END OF SECTION

SECTION 31 20 00

EARTHWORK

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes: Excavation, Compaction and Fill.

1.02 REFERENCE

A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

B. Geotechnical Update, Gymnasium Swing Space, Moorpark College, Moorpark, California, dated June 30, 2017, Project No. 1003.035, prepared by Geotechniques and shall be superseded by the most current version.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork in compliance with applicable requirements of governing authorities having jurisdiction.

1. Standard Specifications for Public Works Construction (SSPWC), latest edition.

2. CAL/OSHA Construction Safety Order Requirements.

B. Soil Testing Service

1. The District will engage a soil testing service to include testing soil materials proposed for use in the Work and for quality control testing during grading operations.

2. Samples of materials shall be furnished to the testing service by the Contractor at least one week before their anticipated use.

3. Work for this Section includes smoothing out areas for density tests and otherwise facilitate testing work, as directed.

4. Shoring Systems: Pre-engineered systems, clearly labeled as such, may be used. Refer to the Geotechnical Study for further requirements.

1.04 PROJECT CONDITIONS

A. The Contractor shall visit the site and familiarize himself with existing site conditions.

B. Additional test borings and other exploratory operations may be made by the Contractor at no cost or liability to the District.

C. Existing Utilities:

1. Where uncharted or incorrectly charted piping or other utilities are encountered during excavation, consult District 's Representative immediately for directions. Cooperate with the District's Representative in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the District's Representative at no cost to the District. Disturbed trench sections shall be replaced in kind.

2. Contractor to coordinate with the City of Moorpark to obtain all required permits and schedule inspections.

D. Protection of Subgrade: Do not allow equipment to pump, rut, or disturb subgrade, stripped areas, or other areas prepared for Project.

E. Contractor shall implement measures to prevent soil erosion, and where possible, sediment shall be retained onsite.

F. Contractor shall implement all necessary recommendations contained in the Geotechnical Study.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.01 SITE PREPARATION

A. General:

1. Remove vegetation, improvements, or obstructions interfering with installation of new construction. Transport and legally dispose of off site. Removal includes stumps and roots. Contractor shall utilize the best construction method to minimize the erosive effect from the removal of site vegetation.

2. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction. Paint cuts over one inch in size with tree pruning compound. Care shall be taken so as not to scar any area of the tree's bark.

3. In order to protect from sediment transfer or contamination from urban run-off during construction, the following grading and erosion control practices shall be followed:

a. If grading occurs during the rainy season (November through April), sediment traps, barriers, covers or other methods shall be used to reduce erosion and sedimentation.

b. Excavated materials shall not be deposited or stored where the material can be washed away by high water or storm run-off.

c. Grading operations on site shall be conducted so as to prevent damaging effects of sediment production and dust on the site and on adjoining properties.

d. When vegetation has to be removed on site, the methods shall be one that minimizes the erosive effects from the removal.

e. Exposure of soil to erosion by removing vegetation shall be limited to the area required for construction operations. The construction area shall be fenced to define the project.

f. Temporary mulching, seeding, or other suitable stabilization shall be used to protect areas during construction or other land disturbance activities on site.

g. Topsoil, removed from the surface in preparation for grading and construction activities on Campus is to be stored on or near the site and protected from erosion while grading operations are underway, provided that such storage may not be located where it would cause suffocation of root systems of trees to be preserved. After completion of such grading, topsoil is to be restored to exposed cut and fill embankments of building pads so as to provide a suitable base of seeding and planting.

h. Sediment basins, sediment traps, or similar control measures shall be installed before extensive clearing and grading operations begin for site development.

i. Water or dust palliatives shall be applied to exposed earth services as necessary to control dust emissions.

j. Revegetation or stabilization of exposed earth surfaces shall take place as soon as possible.

B. Removals

1. Clear the site of trees, shrubs, and other vegetation, which is indicated to be removed.

2. Completely remove stumps, roots, and other debris to avoid problems with future utilities.

3. Use only hand methods for grubbing inside the drip line of trees indicated to be left standing.

4. Existing fills, soil containing debris, organics, pavement, or other unsuitable materials shall be excavated and removed prior to commencing grading operations. Demolition areas shall be cleared of old foundations, slabs, abandoned utilities, landscaping, and soils disturbed during the demolition process. Depressions or disturbed areas left from the removal of such material shall be replaced with compacted fill.

5. The limits and depths for removal of existing fill materials shall be evaluated by project soils engineer during grading.

6. Revegetation or stabilization of exposed earth surface shall take place as soon as possible.

C. Removal of Improvements

1. Remove above-grade and below-grade improvements necessary to permit construction and other work as indicated.

2. Remove from site and legally dispose of off-site, existing fill materials, soil debris, or other unsuitable materials prior to commencing grading operations.

3.02 EXCAVATION

A. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown, within a tolerance of plus or minus 0.04 foot.

B. Excavation for Planting Areas: Conform to cross-sections, elevations and dimensions shown, within a tolerance of plus or minus 0.10 foot.

3.03 COMPACTION

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area, under the provisions of the Geotechnical Study.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the percentages of maximum dry density specified in the Geotechnical Study and in accordance with ASTM D1557-91 method of compaction.

C. Moisture Control:

1. When moisture content of exposed scarified soil and/or full material is below that sufficient to achieve recommended compaction, water shall be added to the soil and/or fill. While water is being added, soil shall be bladed and mixed to provide relatively uniform moisture content throughout the material.

2. When moisture content of exposed scarified soil and/or fill material is excessive, material shall be aerated by blading or other methods. Fill placed in pavement areas shall be compacted at near optimum moisture content. Jetting is not permitted for compaction.

3.04 FILL

A. In all excavations, use satisfactory excavated or borrow material sampled and tested by the District 's Testing Laboratory. Fill selection shall be per Geotechnical Study.

B. Fill excavations as promptly as Work permits, but not until completion of the following:

1. Acceptance by District's Representative of construction below finish grade including, where applicable, waterproofing, damp-proofing, and drainage pipe.

2. Examination, testing, approval and recording locations of underground utilities.

3. Removal of concrete formwork.

4. Removal of shoring and bracing and backfilling of voids with satisfactory materials.

5. Removal of trash and debris.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

7. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

C. Continual dust control, as required by the District, and in accordance with County Air Pollution Control District's Standards shall be required for the project construction.

3.05 GRADING

A. General: To provide support for building floor slabs, all existing fill and unsuitable natural soils shall be excavated and replaced as properly compacted fill.

B. Compaction: After grading, compact subgrade surfaces to the depth and percentage of compaction for each area classification.

C. Fill placement and grading operations shall be performed only under the observation of the District 's Testing Laboratory.

D. The exterior grades around building areas shall be sloped to drain away from the buildings to prevent ponding of water adjacent to foundations.

E. Grading operation shall be conducted so as to prevent damaging effects of sediment product and dust on the site and adjoining properties.

3.06 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Transport excess excavated material and legally dispose of off site.

3.07 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: District 's Testing Laboratory will observe, test and approve subgrades and fill layers before further construction Work can be performed. The District's Representative will determine the frequency of tests. Subgrade: Allow at least one field density test of subgrade to be made for every 2000 sq. ft. of paved area, but in no case less than 3 tests.

B. Field examination and testing will be performed by the District 's Testing Laboratory. The Contractor shall cooperate with such testing and shall give the District's Representative advance notice of grading scheduling.

C. Frequency of Tests for Trenching: As specified in Geotechnical Study Section 8 and as determined by the District's Representative.

D. If in the opinion of the District's Representative, based on soil testing reports and observations, subgrades or fills which have been placed are below specified density, provide corrective work as specified at no additional expense to the District, and pay for retesting of the soil.

3.08 PROTECTION

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work as specified, with retesting, prior to further construction.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SUMMARY

A. Excavating trenches for construction of utilities.

B. Trench backfill materials.

C. Backfilling and compacting requirements.

1.02 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

B. Geotechnical Update, Gymnasium Swing Space, Moorpark College, Moorpark, California, dated June 30, 2017, Project No. 1003.035, prepared by Geotechniques and shall be superseded by the most current version.

1.03 SUBMITTALS

A. Materials source.

B. Sand equivalent test reports per ASTM D2419.

C. Certificates.

D. Drawings for shoring, bracing, sloping, or other provisions for worker protection for any excavation shall conform to the requirements of the CAL/OSHA Construction Safety Orders Requirements.

1.04 EXISTING UTILITIES

A. Drawings show existing major underground utilities from reference drawings. Prior to excavation, the Contractor shall notify the District's Representative to obtain any additional information which may be applicable to the Work.

B. Any incident of a utility being inadvertently damaged by the Contractor shall be immediately shutoff and then be immediately repaired by the Contractor at no cost to the District.

C. Contractor to pothole all utility connections and verify exact size, location and material prior to beginning construction and notify engineer of any discrepancies.

PART 2 - MATERIALS

2.01 APPROVALS

A. Imported material shall be approved by the District's Representative prior to being brought to the site. Provide a sample of the material in sufficient quantity for the

District's Representative's use in evaluating the material.

2.02 TRENCH BACKFILL MATERIAL

A. Sand bedding shall have a sand equivalent (SE) of 30 or greater. The SE shall be evaluated during grading. Materials shall conform to the specification of the Geotechnical Study.

B. Slurry Backfill shall be a two-sack slurry mix and shall conform to the requirements of Section 201 of the SSPWC for Backfill Slurry.

C. Aggregate base course shall be per Plan.

D. Topsoil removed from trenches shall be stockpiled at locations approved by the District's Representative.

2.03 SOURCE QUALITY CONTROL

A. Inspection and testing shall be performed by the District's Representative.

PART 3 - EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.02 TRENCH EXCAVATION

A. All saw cutting shall be neat, straight cuts and shall conform to Section 300-1.3.2 of the SSPWC. All cuts shall be square unless otherwise specifically noted on plans.

B. Trench excavation shall conform to Section 306-1.1 of the SSPWC and the following requirements:

1. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe barrel. Suitable excavations shall be made to receive the bell of the pipe and the joint shall not bear upon the bottom of the trench. All adjustments to line and grade shall be made by scraping away or filling in with sand under the body of the pipe and not by wedging or blocking.

2. If the trench is excavated below the required grade, correct any part of the trench excavated below the grade, at no additional cost to the District per the Geotechnical Study. Place the backfill material over the full width of trench in compacted layers not exceeding 6 inches deep to the established grade with allowance for the pipe base. If shoring is required, the trenches shall be shored and braced in accordance with the Trench Construction Safety Orders of the Division of Industrial Safety.

3. When subgrade is encountered that in the opinion of the District's Representative is unsuitable for pipe support, the District's Representative may order the excavation to be carried to an approved depth below the bottom of the pipe and backfilled with sand, to the lines and grades shown on the drawings and specified

by the District's Representative.

4. The minimum width of the trench at the top of the pipe zone shall be as necessary to install the pipe. The utility lines shall be centered in the trench. In the event of (1) actual physical interference between existing crossing subsurface utilities and the proposed utility lines and (2) vertical discrepancy in connecting proposed utility lines to existing utility system, a minimum clearance of 0.5 feet between the utility line and the crossing, interfering utility shall be provided, unless otherwise indicated on the plans.

5. Where existing utilities or tree roots are to be protected, trench excavation shall be by hand. No mechanical excavating equipment shall be used within 6 inches of any utility or root.

6. Trenching machinery may be used for excavations provided the specified trench width can be maintained.

3.03 TRENCH BACKFILL

A. Pipe bedding and trench backfill materials: Suitable imported pipe bedding for utilities shall consist of material having a sand equivalent of at least 30. The sand backfill material shall be placed within the pipe zone that extends from the bottom of the pipe to at least 12 inches above the top of the pipe for the full width of the trench. The horizontal distance between the springline of the pipe and the side walls of the trench shall be such that bedding material can be properly placed and compacted below the haunches of the pipe. Pipe bedding and pipe zone backfill shall be compacted to at least 95 percent relative compaction. Backfill material placement shall conform to provisions of Geotechnical Study.

B. Trench backfill placed above the pipe zone shall consist of suitable onsite or imported soil per Geotechnical Study. The trench backfill materials shall be compacted to at least 90 percent relative compaction. Compaction shall be increased to a minimum of 95 percent of maximum dry density within structural fills within building areas. Mechanical compaction of trench backfill shall be performed and water consolidation (jetting) methods of compaction shall not be permitted. Trench backfill in landscape areas shall be compacted to a minimum of 90 percent relative compaction or per landscape specifications.

C. Trench Backfilling shall conform to the requirements of Sections 306-1.2.1 and 306-1.3 of the SSPWC and Geotechnical Study:

1. During the process of laying pipe in trenches, sufficient material shall be carefully placed and hand tamped about the pipe to hold it firmly to established line and grade. Oversized material, broken rock or shale, if encountered, shall not be used for backfill.

2. No motor driven mechanical compacting equipment shall be used over pipelines until the backfill has been compacted to 12 inches over the crown of the pipe.

3. All backfill material shall be deposited in horizontal layers not exceeding the thickness specified in Section 306-1.3.2 of the SSPWC and not exceeding 8 inches in thickness. The distribution of materials shall be such that all material following compaction and consolidation will form a homogeneous mass free of

voids, pockets, streaks or other imperfections. Backfilling shall be done with earth free from lumps, hardpan, chunks, paving material, organic matter or other deleterious substances.

4. Jetting of bedding or backfill material to obtain specific moisture content or for compaction shall not be permitted. If encountered, existing fill in the utility excavation shall be excavated and recompacted or removed and replaced with new fill materials per requirements of Section 2.02.

5. Compaction of all backfill material for trenches, pavements or structures, shall be per provisions of the Geotechnical Study. Appropriate warning detector tape shall be placed over all utilities.

6. Prior to final cleanup or resurfacing, the District's Representative shall take compaction tests in any backfill area and at any depth, with the Contractor providing equipment and operator to assist in such test. If any such compaction test fails, the Contractor shall correct such failure and pay for any retesting that is required. The District's Representative shall make as many tests as he feels is required to receive a satisfactory and acceptable job.

3.04 STOCKPILING

A. Stockpiling of imported materials or excavated materials shall direct surface water away from approved stockpile site to prevent erosion.

B. After stockpiles are removed, leave area in a clean and neat condition.

3.05 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by District's Representative.

END OF SECTION

SECTION 32 01 30

MAINTENANCE

PART 1 - GENERAL

1. 1 SECTION INCLUDES

A. This section includes requirements for the maintenance of the completed landscape installation. All items noted in these specifications that are required as result of the District's option shall be included in the total bid cost of the work.

1.2 MAINTENANCE PERIOD

A. After all work indicated on the drawings or herein specified including all planting, irrigation and miscellaneous work has been completed, inspected, and approved by the District, the Contractor shall maintain all planted areas by means of continuos watering, weeding, mowing, re-seeding, cultivating, spraying, mulching, trimming, edging, and/or any other operation necessary for the care and upkeep for the period of ninety (90) days after the approval of the Work.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Any required spraying work shall be done in accordance with governing agencies.

PART 2 - PRODUCTS

A. All materials used in conjunction with the maintenance work shall conform to the material requirements originally specified for the work. Apply at manufacturer's recommended rate.

PART 3 - EXECUTION

3.1 REPLACEMENTS

A. Contractor shall immediately replace any and all plant materials which, for any reason, die or are damaged while under his care. Replacement plants shall be of the same quality as the originally specified plants.

3.2 REPAIR

A. Damage to planting areas shall be repaired immediately.

B. Depressions caused by vehicles, equipment and foot traffic will be filled with soil, leveled and replanted.

C. Exterminate gophers and moles, repair damage as above. Comply with all District and State requirements for the use of pesticides and or herbicides. Receive approval for the district before applying any herbicides and or pesticides.

3.3 MOWING

Mowing height – ½ to 1-1/4 inches in cool season. 1 to 2 inches in warm season. First mowing approximately 30 – 40 days, then every other week as authorized by District Representative. Mowing schedule to be adjusted with the growth rate of the lawn. Do not mow more than ½ half of the lawn height at any one time.

3.4 CLEAN-UP

A. All shrub planted areas shall be kept free of debris and weeded at not more than ten-day intervals. If broad leaf weeds become prevalent the District has the option to require that the Contractor apply an approved broad leaf weed herbicide.

B. At completion of the maintenance period, all areas included in the Contract shall be clean and free of debris and weeds. All plant materials shall be live, healthy and free of infestation.

3.5 FERTILIZING

A. Lawn area: - Apply one pound of actual nitrogen per 1,000 square feet after first mowing. Use a balanced fertilizer with a 3:1:2 ratio of NPK with Sulphur. Receive approval from the District before applying. If the District request apply a second application 30 days before the end of the maintenance period.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 - GENERAL

1.01 SUMMARY

A. Aggregate base course for curbs, gutters, sidewalks, and fire access driveway.

1.02 RELATED SECTIONS

A. Section 31 20 00 Earthwork.

B. Section 32 16 00 Curbs, Gutters, Sidewalks, and Driveways.

1.03 REFERENCES

A. Standard Specifications for Public Works (SSPWC), latest edition.

B. ASTM Standards.

C. State Standard Specifications (SSS), Caltrans, latest edition.

D. Geotechnical Update, Gymnasium Swing Space, Moorpark College, Moorpark, California, dated June 30, 2017, Project No. 1003.035, prepared by Geotechniques and shall be superseded by the most current version.

1.04 SUBMITTALS:

A. Submit material samples and reports in accordance with requirements of District.

B. Submit samples in sufficient quantities for material testing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregate Base Material shall be Class 2 Aggregate Base conforming to SSS Section 26-1.02A. Aggregate Base shall have a minimum sand equivalence of 22 and a minimum R-value of 78 and shall be free of organic materials and other deleterious substances.

B. Aggregate Base materials used within building areas shall be free of asphaltic materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify substrate has been inspected; gradients and elevations are correct, and dry.

3.02 AGGREGATE BASE PLACEMENT

A. Aggregate base placement shall conform to the provisions of the SSPWC, Section 301-2

B. Level and contour surfaces to elevations and gradients indicated.

C. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

D. Where the required aggregate base thickness is 6 inches or less, the watered base may be spread and compacted in one layer. Where the required thickness is more than 6 inches, the aggregate base material shall be spread and compacted in 2 or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.

E. Aggregate base course shall be dense and unyielding upon proof-rolling with full water truck.

3.03 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch.

B. Scheduled Compacted Thickness shall conform to the provisions of the SSPWC Section 301-2.2.

3.04 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by the District's Testing Laboratory. Compaction testing will be performed in accordance with ASTM D1557, latest edition.

B. If tests indicate work does not meet specified requirements, remove work, replace and retest at Contractor's expense.

END OF SECTION

SECTION 32 12 16

ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Asphaltic concrete paving for parking lots and driveway pavements.

1.02 RELATED SECTIONS

A. Section 31 20 00 Earthwork.

B. Section 32 11 23 Aggregate Base Course.

1.03 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

B. ASTM Standards.

C. Geotechnical Study prepared by Geotechniques

1.04 SUBMITTALS

A. Submit asphalt concrete mix design(s) for approval of the District Representative.

1.05 TESTING AND INSPECTION

A. Testing and inspection of asphalt pavement mix(es) and testing of placed stabilizing base course and asphalt pavement will be performed by the District's Testing Laboratory. Testing and inspection will be performed so as to minimize disruption of work.

B. Allow the District's Testing Laboratory access to the mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in the preparation of asphaltic concrete mix.

PART 2 – PRODUCTS

2.01 GENERAL

A. Provide the aggregate base, and bituminous surface conforming to the requirements of the Standard Specifications for Public Works Construction (SSPWC).

2.02 PAVING MATERIALS

A. Asphalt Concrete: Asphalt concrete material shall be Type III, C2-PG 64-10 per SSPWC Section 400-4. The grading and proportioning of aggregates shall be such that the combined mineral aggregate conforms to the specified requirements.

B. Asphalt Emulsion: SSPWC Section 203-3, Grade SS-1h.

C. Prime Coat: Grade SC-70 per SSPWC Section 203-2.

D. Aggregates for base course shall conform to requirements of Specification Section 02231, Aggregate Base Course.

2.03 ASPHALT PAVEMENT MIX

A. Combine mineral constituents in proportions to produce a mixture conforming to requirements of the SSPWC Section 400-4.

B. Percentage by weight of asphalt cement in mixture shall be in accordance with SSPWC Section 400-4.

C. Maintain thorough and uniform mixture.

D. Bring asphalt and mineral constituents to required temperatures before mixing. Ensure aggregates are sufficiently dry so as not to cause foaming in mixture.

PART 3 – EXECUTION

3.01 GENERAL

A. Execute Work in accordance with SSPWC Section 302 and the Geotechnical Study.

3.02 PREPARATION

A. Ensure grading of subgrade to required elevation. Subgrade preparation shall be per SSPWC Section 301.

B. Before final rolling, shape entire section, add additional sub-soil if necessary, and compact subgrade to provide grades, elevation and cross-section indicated. Points of finished subgrade surface shall be within 0.04 foot of elevations indicated on the Drawings.

3.03 BASE COURSE

A. Place aggregate base in accordance with requirements of SSPWC Section 301 and to the thickness shown on the Drawings. Grade and compact in 6-inch layers to at least 95 percent of compaction (ASTM D1557).

3.04 MAINTENANCE

A. Maintain the base course until the asphaltic pavement is in place. Maintenance shall include drainage, rolling, shaping and water as necessary to maintain the course in proper condition. Maintain sufficient moisture at the surface to prevent a dusty condition. Areas of completed base course that are damaged shall be conditioned, reshaped and re-compacted in accordance with the requirements of the Specifications without additional cost to the District.

3.05 TACK COAT

A. Prior to the application of the asphalt concrete, a paint binder (tack coat) shall be applied to all surfaces of walkway, curbs, gutters, manholes and drainage structures which will be in contact with asphalt pavement per SSPWC Section 302-5.4.

B. Coat surfaces of catch basins which are to remain free of asphalt with oil, or provide equivalent protection, to prevent asphalt adhesion.

3.06 PRIME COAT

A. Prior to the application of the asphalt concrete, a prime coat shall be applied at a rate of 0.20 to 0.40 gallons per square yard.

3.07 ASPHALT CONCRETE

A. Requirements: The bituminous concrete shall consist of mineral aggregate, uniformly mixed with bituminous material in a central plant in accordance with SSPWC Section 400-4. The percentage of asphalt binder shall be in accordance with SSPWC Section 400-4. The mixing plant and construction equipment shall conform to the requirements of SSPWC Sections 302-5 and 400-4.

B. Placing: Deliver bituminous mixtures to the work site temperatures specified in SSPWC Section 302-5.5. Spread and place in accordance with SSPC Section 302-5.5. Asphalt surface shall be fog-sealed.

C. Compaction: Initial or breakdown rolling and the final rolling of the uppermost layer of the asphalt concrete shall be in accordance with SSPWC Section 302-5.6. Compaction by vehicular traffic shall not be permitted.

3.08 JOINING PAVEMENT

A. Carefully make joints between old and new pavements or between successive days work in such manner as to insure a continuous bond between old and new sections of the course in accordance with SSPWC Section 302.

B. Expose and clean edges of existing pavement. Cut edge to straight, vertical surfaces. Paint all joints with a uniform coat of tack coat before the fresh mixture is placed. Prepare joints in the new pavement in accordance with SSPWC Section 302-5.7.

3.09 JOINING NON-PAVED AREAS

A. Where paving will join landscape or other non-hardscape area a redwood header shall be installed.

3.10 TOLERANCES

A. Flatness: Maximum variation of 1/8 inch when measured with a 10-foot straight edge.

B. Variation from True Elevation: Within 1/4 inch.

3.11 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by the District's Testing Laboratory.

B. Field inspection and testing will be performed by the District's Testing Laboratory. The Contractor shall cooperate with such testing and shall give the District Representative advance notice of paving scheduling. Sufficient "Advance Notice" shall be determined by the District Representative.

C. If tests indicate materials do not meet specified requirement, replace material and retest at no additional cost to the District.

D. Frequency of Test: As determined by the District's Testing Laboratory.

3.12 PROTECTION

A. After placement, protect pavement from mechanical injury.

END OF SECTION

# SECTION 32 1313

# SITE CONCRETE WORK

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Portland cement concrete pavement, cement walks, curbs, gutters, trash pick-up area, ramps, mowing strips, fence post footings, sliding gate concrete tracks, catch basins, pipe bedding and encasements, thrust blocks, transition structures, flagpoles and light standard bases and footings, athletic equipment footings and equipment pads.

2. Cast-in-place and surface applied Tactile Warning Pavers.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 32 3113 - Chain Link Fences and Gates.

### 1.02 SUBMITTALS

A. Shop Drawings: Submit plans, elevations and details of concrete site Work.

B. Product Data: Submit mix designs and manufacturer's technical data for materials and products. Submit 3-inch by 3-inch concrete Sample of each specified color.

C. Material Sample: Submit one concrete bumper to the Project Inspector for destructive testing.

### 1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications For Public Works Construction.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Concrete, Mortar and Related Materials: Comply with applicable provisions of Standard Specifications for Public Works Construction, Section 201 - Concrete, Mortar and Related Materials:

1. Concrete: 28-day compressive strength 2,500 psi, unless specified otherwise.

2. Reinforcing Mesh: ASTM A185, 4 by 4/W1.4 by W1.4 welded wire mesh.

3. Expansion Joint Filler: Preformed expansion joint filler, bituminous type, complying with ASTM D994.

B. Form Materials:

1. Side forms: Douglas fir, Construction Grade or Better or metal forms.

2. Stakes: Douglas fir, Construction Grade or Better or metal stakes.

C. Tactile Warning Pavers:

1. Cast-in-place detectable/warning pavers shall be Vitrified Polymer Composite (VPC) pavers by Armor-Tile (www.armor-tile.com), ADA Solutions Inc. (www.adatile.com) or equal with raised dome dimensions and patterns complying with CBC Chapter 11B.

2. Surface applied detectable/warning pavers are not acceptable.

D. Concrete Parking Bumpers:

1. Precast concrete, smooth and free of pits and rock pockets, providing a minimum 28-day compressive strength of 3,500 psi. Size at least 7 ½-inch wide, 5 ½-inch high and 6-foot long. Reinforce with two #5 reinforcing bars. Provide 2 3/4-inch diameter pre-drilled holes for anchor installation.

2. Bumper Anchors: Provide ½ inch diameter by 18-inch long galvanized steel pipe.

3. Bumper Adhesive: Provide adhesive recommended by bumper manufacturer/installer for fastening bumpers to concrete pavement.

## PART 3 - EXECUTION

### 3.01 CONSTRUCTION OF FORMS FOR CAST-IN-PLACE STRUCTURES

A. Concrete Pavement: Install Portland cement concrete pavement in compliance with the Standard Specifications for Public Works Construction, Section 302- Roadway Surfacing.

B. Miscellaneous Exposed Concrete: Install concrete curbs, walks, gutters, cross gutters, access ramps, driveways, catch basins, yard boxes, vaults and similar structures, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.

C. Exposed Concrete Bases: Install bases, such as for post, flagpole, light standards and similar bases, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.

D. Post, flagpole, light standard footings below grade, underground conduit bedding, encasements, thrust blocks and similar structures may be placed \directly in excavations conforming to the required sizes.

E. Reinforcement installation and concrete placement, surface finishes, curing and removal of forms shall be performed in compliance with applicable provisions of Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction. Provide heavy broom finish at slopes exceeding six percent and medium broom finish at slopes up to six percent.

3.02 INSTALLATION OF TACTILE WARNING TILES AND PAVERS

A. Install detectable/warning tile and pavers in strict accordance with manufacturers printed installation instructions and project details.

3.03 INSTALLATION OF PARKING BUMPERS

A. Install bumpers as indicated on the Drawings. On bituminous paving, install anchors through pavement and into the ground a minimum of 12 inches. On concrete pavement, install bumpers in a continuous bed of adhesive.

3.03 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 32 16 00

CURBS, GUTTERS, SIDEWALKS

PART 1 – GENERAL

1.01 SUMMARY

A. Concrete for curbs, gutters, sidewalks.

1.02 RELATED SECTIONS

A. Section 31 20 00 – Earthwork

1.03 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

B. Geotechnical Update, Gymnasium Swing Space, Moorpark College, Moorpark, California, dated June 30, 2017, Project No. 1003.035, prepared by Geotechniques and shall be superseded by the most current version.

C. ASTM Standards.

1.04 SUBMITTALS

A. Submit the following:

1. Product Data: Provide data on admixtures and curing compounds.

2. Concrete mix design(s).

3. Certificates from the batch plant.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with the SSPWC, latest edition; and ASTM Standards, latest edition.

B. Obtain cementitious materials from same source throughout.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F or surface is wet.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

A. Form Materials: Section 303-5 of the SSPWC.

2.02 CONCRETE MATERIALS

A. Concrete Material for Curbs, Walk (Path of Travel), Pavement, and Cast-in-Place Catch Basin:

1. Class 560-C-3250 for cast-in-place catch basins, curbs, and gutters. Portland cement concrete per Standard Specifications for Public Works Construction Section 201-1.1.2.

2. Concrete reinforcements shall be constructed per the Project Plans and Specifications.

2.03 ACCESSORIES

A. Curing Compound shall conform to SSPWC Section 201-4. Pigmented compound shall not demonstrate any residual coloring of the concrete after one week.

2.04 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94.

B. Use accelerating admixtures in cold weather only when approved by the District's Representative. Use of admixtures will not relax cold weather placement requirements.

C. Use calcium chloride only when approved by the District 's Representative.

D. Use set retarding admixtures during hot weather only when approved by the District 's Representative.

2.05 CONCRETE REINFORCEMENT

A. Concrete reinforcement shall conform to SSPWC Section 201-2.

2.06 SOURCE QUALITY CONTROL

A. Provide certificates of compliance from the batch plant.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support imposed loads.

B. Verify gradients and elevations of subgrade are correct.

3.02 PREPARATION

A. Moisten subgrade to minimize absorption of water from fresh concrete. Compact subgrade material to a depth of 12" beneath aggregate base below concrete pavements to 95% relative compaction.

B. Coat surfaces of catch basin frames with oil to prevent bond with concrete pavement.

C. Notify District's Representative a minimum of 24 hours prior to commencement of concrete placement operations.

3.03 FORMING

A. Place and secure forms to correct location, dimension, and profile.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with SSPWC Section 303-5.

B. Install ½" thick fiberboard expansion joint and snap cap. Seal with Sikaflex self-leveling sealant after removal of snap cap (typical).

C. Construct weakened plane joints conforming to SSPWC Section 303-5.4.3, one inch deep, at intervals not exceeding 10 feet.

D. The top edges of curbs shall have 0.5" radius.

3.05 FINISHING

A. Concrete finishes shall be per SSPWC Section 303-5.5.3.

B. Portland cement concrete paving shall have a medium salt (medium broom) finish on all surfaces less than or equal to 5% and slip resistant (heavy broom finish) on all surfaces greater than 5%.

C. Walkway grades in excess of 5% shall conform to requirements of Section 1133B.7.3, California Building Code (2010 edition).

D. Place curing compound in accordance with SSPWC Section 303-5.6 on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.06 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by the District's Testing Laboratory.

B. District 's Testing Laboratory will perform slump and compressive strength tests.

C. Contractor shall maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.07 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, vandalism and mechanical injury.

B. It is the Contractor's responsibility to replace all concrete work subject to vandalism and graffiti at no extra cost to the District.

END OF SECTION

# SECTION 32 1723

# PAVEMENT MARKINGS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Parking stripes, markings and accessibility symbols.
2. Fire lane "No Parking."
3. Curb marking and red curbs.

B. Related Requirements:

1. Division 01 - General Requirements.

### 1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings, indicating location, extent, color and texture of markings.

B. Material Samples: Submit color Samples.

### 1.03 PROJECT CONDITIONS

A. Do not install markings when adverse weather conditions are forecasted.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Paint: Water emulsion-based traffic paint.

1. Dunn Edwards: Vin-L-Stripe.
2. Pervo Paint Company: Acrylic Traffic Paint.
3. Sherwin Williams: Setfast Acrylic Traffic Paint.
4. Vista Paint Corporation: Traffic Paint.
5. Equal.

PART 3 - EXECUTION

3.01 PAVEMENT MARKINGS

A. Application of Paint:

1. Prior to application of paint, allow the pavement to properly cure. Clean and prepare in accordance with paint manufacturer's written recommendations.

2. Provide mechanical equipment to apply paint in a uniform, straight or curved pattern, without gaps, holidays, runs, or other defects.

3. Do not permit traffic until paint has completely cured.

4. Apply two coats in thickness recommended by manufacturer.

5. Playground Markings: Submit Samples to Architect for review. Limited color palettes may be submitted.

B. Marking Width and Color: Unless indicated otherwise, marking width and color are as follows:

| Location | Width | Color |
|---|---|---|
| Parking stall lines | 4 inches | White |
| Traffic markings | | |
| Striping: | 4 inches | Yellow |
| General | 4 inches | Yellow |
| Accessible Parking | 4 inches | Blue |
| International Symbol of Accessibility (ISA) | 2 inches | White on blue background |
| Letters and numbers: | | As indicated |

*Where two sets of lines overlap, one set shall be white and the other set shall be yellow.

3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 80 00

IRRIGATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section includes general requirements for the installation of the irrigation system.

1.2 RELATED SECTIONS

A. Section 32 90 00 Planting

1.3 CATALOG CUTS

A. Ten (10) days after award of Contract submit to the District for approval, five (5) copies of all Manufacturer's catalog cuts, and specifications for all required products.

1.4 RECORD DRAWINGS

A. The Contractor shall maintain a complete and accurate set of record drawings. These drawings shall be kept up to date with the progress of the Work. The Owner shall furnish a set of drawings on which to record drawing conditions. Record drawings shall be up-dated on a weekly basis.

B. The Contractor shall indicate clearly and correctly Work installed differently from that shown on the Contract Drawings by dimensioning from two permanent points of reference. Show connections to existing water lines, ball valves, pressure supply pipe, control valves, quick couplers, and control wiring.

C. On completion of the Work, the Contractor shall submit the completed Record Drawings to the Landscape Architect for transfer to electronic file. Once complete, this final electronic file shall be reviewed by the Contractor and certified as complete and accurate records of work as-built.

1.5 CONTROLLER CHARTS

A. Reduce the approved irrigation record drawing to a size that will fit into the irrigation controller and still remain legible. Color the chart with one color for each valve and its coverage area then have a printing company encapsulated the chart in 5 mil clear plastic. Install finished controller chart in the controller.

1.6 DRAWINGS

A. For purposes of legibility, irrigation lines are essentially diagrammatic, although size and location of irrigation equipment are drawn to scale wherever possible. Make use of all data in all of the Contract Documents and verify this information at construction site.

1.7 MATERIALS TO BE FURNISHED

A. Prior to final inspection, the Contractor shall furnish the following materials to the District: Two keys for each automatic controller, Two operating wrenches to manually open and close operating nut on gate valves.

1. 8 ON-SITE OBSERVATIONS

A.. The Contractor shall notify the Landscape Architect and District Inspector forty-eight hours in advance for all required On-Site Observations. The final On-Site Observation shall require seven days advance notice. The following are required On-Site Observations:

1. Job start meeting.
2. Prior to start of work review existing irrigation system adjacent to the retrofit work. Review all circuits which may be affected by the new work and review with the Landscape Architect any existing defects or deficiencies that can be determined.
3. Review irrigation mainline with the Landscape Architect prior to backfilling. Record drawings must be current at the time of these On-Site Observations.
4. Review with the Landscape Architect the irrigation main line when pressure test is complete. Pressure supply lines shall be tested under hydrostatic pressure of one hundred fifty pounds per square inch for a period of two hours and must be approved by the Landscape Architect prior to backfilling.
5. Irrigation system coverage test. When the irrigation system is completed, determine if the water coverage for the planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the Contract Drawings. Irrigation coverage must be approved by the Landscape Architect and District Inspector before any ground cover or shrubs are planted.

## PART 2 - PRODUCTS

### 2. 1 GENERAL

All irrigation equipment shall be new and unused prior to installation, and shall conform to the irrigation plan and legend as specified.

### 2.2 MATERIALS

A. Pipe Cable & Wire:

1. Sleeving – Sch. 40 PVC and Class 200 PVC - 3 Pipe sizes larger than the pipe to be sleeved - 24" below grade. See pipe sleeving chart on irrigation plan.

2. Mainline - (PW Eagle) Class 315 PVC - Standard white color – 2'-2-1/2" & 3" – Bell and gasket. - 24" below grade.

3. Mainline - (PW Eagle) SCH. 40 PVC - Standard white color - 1-1/2" & Smaller - Solvent weld 24" below grade.

   Mainline – (PW Eagle) C900, blue in color, Pipe 4" and Larger, Bell and Gasket.

4. Lateral - (PW Eagle) Schedule 40 PVC - Standard white color - 3/4" & Larger - Solvent weld - 12" below grade.

5. 14 Gauge direct bury wire.

B. Quick Coupling Valve (Rain Bird) 44 RC - 1" size - In 10" Green colored round valve box.

C. Valve Boxes

1. Valve boxes for quick couplers shall be 10" round, green lid, with locking bolt. Manufactured by NDS Model No. 212BCB or Carson Model No. 910-3B-Green, or approved equal.

2. Valve boxes for gate valves shall be standard rectangular valve boxes 14" W x 19" L x 12" D rectangular, with 6" D valve box extension, green lid, and locking bolt. Manufactured by NDS Model No. 216BCB with 6" valve box extension model 216 or Carson Model No. 1419-12-Green with 6" valve box extension model 1419-6x, or approved equal.

3. Valve boxes for remote control valve assemblies shall be jumbo boxes 13" W x 24" L x 12" D rectangular, green lid, and locking bolt. Manufactured by NDS Model No. 221BCB or Carson Model No. 1324-12-Green or approved equal.

D. Valves:

1. Gate valves installed on mainline 2" and larger - Valves 2" and larger shall be ductile iron body, epoxy coated, flanged, non-rising stem, and line size, Nibco Model F-619 RW-SON with operating nut.

2. PVC Ball Valve (RCV Manifold) – (Colonial / Lasco) – Sch. 80 PVC ball valve with unions - in a standard rectangular valve box - green lid.

3. Remote Control Valve - (Rain Bird) – EFB-CP Series - sizes noted - in a green colored Jumbo rectangular valve box.

4 Brass gate valves used as isolation valve in remote control valve assembly shall be Nibco T-113, line size or approved equal.

E. Solvents-PVC primer and solvents – As recommended by manufacturer. Weld-on, Christy, or equal.

F. Flexible Sch. 40 PVC Hose-PVC Flex Hose – constructed from durable, UVR, S-0214 non-rigid PVC blend materials, furnished with algae resistant compound, solvent weld, black in color, with black PVC UVR fittings I.P.S. 3/8" size, manufactured by GPH Model GPVCSSAR050IRR (0.84") O.D., black in color.

G. PVC Main Line Fittings- for pipe sizes of 1-1/2" or less, shall be schedule 40 PVC, Type 1, Grade 1, Cell Classification 12454-B, side gated, Lasco or equal.

H. PVC Main Line Fittings- for pipe sizes of 2' pipe or greater shall be ductile iron mechanical fittings manufactured by Smith-Blair, Leemco, or approved equal.

I. Nipples and Risers-Nipples and Risers shall be PVC Schedule 80.

J. Pressure Compensating Emitters-Plastic emitters, ½" FIPT, brown in color, pressure compensating, with built in check valve, 4 GPH flow manufactured by GPH Model GPSTCV4M.

K. Direct Bury Splice Kit (for 14 ga. Wire)-Spears model DS 400.

L. Pop Up Turf Rotor - manufactured by Hunter, I-40-06 series rotor.

M. Pop Up Turf Spray Heads - manufactured by Hunter Bird, model PROS-06-PRS40 with Hunter rotator nozzle.

N. Thrust Blocks - Concrete for thrust blocks shall be 2500 psi.

O. Plastic wire pull / splice box – shall be Carson Model 1220-12-4B, green locking valve box lid, (20" wide x 26" L x 12" D) or approved equal.

P. Concrete wire pull / splice box – shall be Old Castle – Box size Model 'B65 Box' with reinforced concrete lid Model '65D' (20"W x 26" L x 12" D) or approved equal.

Q. Irrigation Communication Cable – shall be manufactured by Rain Master, Model EV-CAB-COM. Install 24 inches below grade in a 1 inch schedule 40 PVC electrical conduit. All communication cables splices shall be made using Rain Master Model EV-SPLICE-KIT. No known equal.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Before starting Work on irrigation system, carefully check all grades to determine that Work may safely proceed, keeping within the specified material depths.

B. Do not willfully install the irrigation system as indicated on the Drawings when it is obvious in the field that unknown obstructions, field dimensions, or grade differences exist, that might not have been considered in the engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect.

C. The installation of all irrigation materials, including pipe, shall be coordinated with the landscape Drawings to avoid interfering with the trees, shrubs, or other planting.

D. Lay out irrigation heads and make any minor adjustments required due to differences between site and Drawings. Any such deviations in layout shall be within the intent of the original Drawings, and without additional cost to the District. When directed by the Landscape Architect the layout shall be approved before installation.

3.2 WATER SUPPLY

A. Connections shall be existing main line as indicated on the drawing. Make connections, install new main, and perform all necessary work.

3.3 PIPE FITTINGS (less than two inch

A. All plastic threaded pipe and fittings shall be assembled using non-hardening sealant

B. All plastic slip fittings shall be solvent-welded as per pipe manufacturer's recommendations.

3.4 LINE CLEARANCE

A. All lines shall have a minimum clearance of four inches from each other, and six inches from lines of other trades. Parallel lines shall be installed directly over one another.

3.5 TRACE WIRE

A. 3" blue colored detectable marking tape "Irrigation Water", Christy model TA-DT-3-BIRR, or equal. Install 12" below grade directly over irrigation mainline.

3.6 TRENCHING

A. Dig trench and support pipe continuously on bottom of ditch. Snake pipe in trench to an even grade as noted.

B. Provide minimum cover of 24 inches for all pressure supply lines.

C. Provide minimum cover of 24 inches for all control wires.

D. Provide minimum cover of twelve inches for all other non-pressure lines.

E. All lines under driveway and roadway pavement shall have a twenty-four inch minimum cover below sub-grade.

3.7 BACKFILLING

A. Backfill for trenching shall be compacted to a dry density equal to the adjacent undisturbed soil, and shall conform to the adjacent grades without dips, sunken areas, humps or other irregularities. Initial backfill on all lines shall be of a fine granular material with no foreign matter larger than one inch in size an six to eight inches deep.

B. All irrigation lines under paving shall be backfilled entirely with sand and compacted.

C. Trenches shall be backfilled promptly after the open trench inspection.

D. After initial backfill placement of 6" to 8" over mainline, place caution tape and complete backfill.

3.8 CONTROL WIRES

A. 24-volt conductors shall be U.F. type, solid wire, U.L. approved for direct burial. Minimum size shall be 14 Ga. or as noted on drawings, used to connect remote control valve solenoids to automatic controller, Paige Wire or approved equal.

B. Wiring shall occupy the same trench and shall be installed along the same route as the pressure supply line wherever possible.

C. An expansion loop of 36 inches shall be provided at each wire connection and/or directional turn, with all wire pull boxes.

3.9 BUBBLERS

A. Layout proposed planting design with marking flags to indicate shrub and tree locations. Obtain approval from the District before proceeding.

B. Trench and install laterals. Install Schedule 40 PVC piping as per plan with flexible PVC tubing segments ending adjacent to each proposed plant location root ball. Refer to irrigation details for all installation requirements and specific equipment components.

C. Flush system thoroughly and install pressure compensating emitters as per plan.

3.10 SLEEVING

A. All lines under paving with PVC pipe with minimum 3 pipe sizes larger than the O.D. of the line to be sleeved. Refer to irrigation sleeving schedule on irrigation plan

3.11 THRUST BLOCKS

A. Install thrust blocks at all directional changes in the main line. Thrust blocks shall be concrete and shall be installed on firm, stable, subgrade and shall be a minimum of one foot below the finish grade. Concrete shall be constructed in accordance with the plans. Thrust blocks shall be installed between undisturbed ground and the fittings to be anchored. Place concrete so pipe joints and fittings remain accessible to repairs.

3.12 FLUSHING THE MAIN LINE

A. Make provisions to flush new main line clean and protect existing main line and existing circuits from any debris.

3.13 FLUSHING THE SYSTEM

A. After all new irrigation pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of irrigation heads, the control valves shall be opened and a full head of water used to flush out the system.

3.14 ADJUSTING OF SYSTEM

A. Adjust valves, and alignment and coverage of all irrigation heads.

B. If it is determined that adjustments in the irrigation equipment or nozzle changes will provide proper and more adequate coverage, make all necessary changes, without additional cost to the Owner, prior to any planting.

C. The entire system shall be operating properly before any planting operations commence.

D. Existing system, which may be affected by retrofit, should be tested for leaks, coverage, etc. before and after new installation is completed. Defective valves, etc. that were operable before installation must be repaired and/or replaced by the contractor.

3.15 CLEAN-UP AND REPAIR

A. Upon completion of the Work, make the ground surface level, remove excess materials, rubbish, debris, etc, and remove construction and installation equipment from the premises. Dispose of in a safe and legal manner.

B. Replace and/or repair to the satisfaction of the District all existing paving disturbed during the course of this work. New paving shall be the same type, strength, texture, finish, and be equal in every way to the material removed.

3.16 GUARANTEE

A. The entire irrigation system shall be guaranteed by the Contractor as to material and workmanship, including settling of backfilled areas for a period of one year following the date of final acceptance of the work.

B. This guarantee is in addition to, and not a limitation of, other rights the district may have under the Contract Documents.

END OF SECTION

SECTION 32 90 00

PLANTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section includes general requirements for the installation of the plant material and lawn repair and seeding.

1.2 RELATED SECTIONS

Section 32 10 30 Maintenance
Section 32 80 00 Irrigation

1.3 SUBMITTALS

A. Furnish material invoices indicating the quantities of fertilizers, soil amendments, and all materials delivered to the job site. Material invoices must be approved by the Landscape Architect prior to incorporating soil amendments. Certificates shall be prepared by the supplier or distributor and shall indicate the quantities and qualities of materials used.

B. Plant Material – Submit clear photos of all plant material specified taken and the source. Indicate plant material height and spread measured at the source. Photos must clearly show the plant quality and size. The Landscape Architect will determine if the photos meet the specifications and if further site inspection at the nursery is required or if another source is required to produce the specified plant material.

1.4 PROTECTION

A. Contractor shall check or locate existing structures, electric cables or conduits, utility lines and other existing features or conditions above or below ground level that might be damaged as a result of the operation. Questions or conflicts arising out of such examination prior to or during operation shall be immediately directed to the attention of the District for necessary action or decisions before resuming operation. Contractor shall be responsible for repair or replacement at no cost to the District for features or conditions damaged through failure to comply with the above procedures.

B. Protect existing trees and tree roots from any damage that may be caused as a result of any planting or irrigation operations.

1.5 ALTERNATES

A. Alternates will not be permitted, except where indicated, and as approved by the Landscape Architect.

1.6 LANDSCAPE ON-SITE OBSERVATIONS

A. The Contractor shall notify the district and the Landscape Architect forty-eight (48) hours in advance for all required On-Site Observations. The final On-Site Observation shall require seven (7) days advance notice.

B. The Contractor shall submit for approval a complete work schedule indicating tentative dates for On-Site Observations.

C. Record drawings shall be current and present at the time of On-Site Observations and shall be updated on a weekly basis.

D. Landscape On-Site Observations shall be required for the following phases of Work:

1. Job start meeting.

2. Finish grading - When all fine grading work is complete, notify the Landscape Architect for approval prior to proceeding with the planting.

3. Soil Preparation - furnish certificates for soil amendments at this time. Quantities must be reviewed by the Landscape Architect prior to incorporating into soil. When all soil preparation work is complete notify the Landscape Architect for approval prior to proceeding with the work.

4. Irrigation System Review - See Irrigation Section.

5. Review plant material for quality prior to planting. The Landscape Architect has the right to reject any plant material that it deems unacceptable at time of delivery.

6. Review planting during the planting process.

7. Review planting after installation.

8. Pre-maintenance - When all Work has been completed a pre-maintenance walk thru shall be conducted and the contractor must receive approval from the District prior to starting the maintenance period.

9. Maintenance - Notify the District and the Landscape Architect after the maintenance period has progressed for thirty days for a review of all work and make all corrections that are deemed necessary.

10. Final Review - After the ninety-day (90) maintenance period is complete notify the District and the Landscape Architect for a final review of all work. All work must receive approval from the District and the Landscape Architect prior to being deemed complete and or filing a notice of completion.

1.7 QUALITY

A. All plant material shall have a growth habit normal to the species and shall be sound, healthy, vigorous and free from insect pests, plant diseases, sun scalds, fresh bark abrasions, excessive abrasions, or other objectionable disfigurements. Tree trunks shall be sturdy and well "hardened off." All plants shall have normal well-developed branch systems, and vigorous and fibrous roots systems which are neither root- nor pot-bound and are free of kinked or girdling roots.

1.8 GUARANTEE

A. All plant material shall be guaranteed for one year. This guarantee is in addition to, and not a limitation of, other rights the District may have under the Contract Document.

PART 2 - PRODUCTS

2.1 MATERIALS-: LANDSCAPE

A. Soil Amendments: Organic soil amendment shall be Agromin "Agromend", or equal.

B. Shrubs: varieties, sizes and quantities as noted on the plans. Rhaphiolepis 'Clara' shall be 15 gallon size, fully rooted throughout the entire container without any circling roots. The size of the 15 gallon shall be between 18 inches to 24 inches high and approximately the same width as the container.

C. Backfill material for shrubs shall have a thorough mixture of:

1. 1/2 Agromin "Agromend"
2. 1/2 existing site soil.
3. Commercial Fertilizer (15-15-15), 1 lb. /cu. yd.
4. Iron, Zinc, Manganese, 1 oz. /cu. yd.

I. Soil preparation materials for lawn area per 1,000 square feet:

1. Three cubic yards of Agromin "Agromend"
2. Commercial Fertilizer – Best 'Pro Start' 16-14-10 with Sulphur and iron at the rate of 6 pounds per 1,000 square feet.

2.2 Lawn

A. Stover 'Pro Sportsfield Elite' seed at the rate of 12 pounds per 1,000 square feet.

2.3 Mulch

A. Shall be Agromend ES-2 Mulch.

PART 3 - EXECUTION

3.1 SITE CONDITION

A. No plant materials shall be planted until all operations in conjunction with the installation of the irrigation system have been approved by the District and the Landscape Architect. Final grades shall be established and the planting areas shall be properly prepared and graded.

3.2 GROUND PREPARATION - ALL AREAS

A. After the Site Clearance and Preparation has been approved by the District planted areas shall be thoroughly cultivated to a depth of six inches to reduce any compaction, which occurs as a result of construction. Protect existing tree roots.

B. Stones or rocks over 1" in size, construction refuse, and other deleterious material shall be removed from the site, safely and legally disposed of.

C. Apply soil preparation materials to all planting areas and thoroughly incorporate into the top six inches of soil.

D. Wet soil thoroughly and allow to settle. Repeat this compaction procedure until soil is stable enough to permit aeration and drainage for plant material.

E. Finish grade all planting areas to a smooth, uniform surface ready for planting. Finish grade shall be one inch below finish grade of adjacent paved surfaces unless

otherwise noted on Drawings. Lawn areas shall be fine graded to blend in with the existing adjacent lawn grades with no depressions or high spots.

3.3 PLANTING - SHRUBS

A. Shrub planting shall comply with details on drawings.

B. Make necessary adjustments and excavate pits of square outline and vertical sides for all plants. Scarify sides and bottoms of all plant pits.

C. Protect roots or ball of plants at all times from sun and drying winds.

D. If directed by the Landscape Architect the Contractor shall prune plants in accordance with standard horticultural practice.

E. Wet soil thoroughly and allow to settle. Repeat this compaction procedure until soil is stable enough to permit aeration and drainage for plant material.

3. 4 LAWN

A. After soil prep and fine grading is complete, roll lawn areas with a water ballast roller to create even surface. Soil should be moist to a depth of six (6) inches.

B. Broadcast lawn seed uniformly throughout the lawn area.

C. After seeding top dress lawn area with a uniform coverage of "kellogg topper" then roll with water ballast roller.

END OF SECTION

# SECTION 32 3113

# CHAIN LINK FENCES AND GATES

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Chain link fences and gates as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 32 1313 - Site Concrete Work.

### 1.02 SUBMITTALS

A. Shop Drawings:

1. Submit plans and details indicating extent of fences, locations of gates, and details of attachment and footings. Indicate means and methods for surface preparation and finishing.

### 1.03 QUALITY ASSURANCE

A. Chain Link Fence Manufacturers Institute: CLFMI Product Manual.

B. ASTM A123: Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.

C. ASTM A392: Specification for Zinc-Coated Steel Chain Link Fence Fabric. ASTM F567: Practice for Installation of Chain Link Fence.

E. ASTM F626: Specification for Fence Fittings.

F. ASTM F668: Specification for Poly(Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric.

G. ASTM F900: Specification for Industrial and Commercial Swing Gates.

H. ASTM F1083: Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

I. ASTM F1184: Specification for Industrial and Commercial Horizontal Slide Gates.

J. ASTM F1553: Guide for Specifying Chain Link Fence.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Materials and Properties: Comply with requirements of Section 03 3000 - Cast-in-Place Concrete to provide normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3,000 psi, 4-inch slump, and one inch maximum size aggregate.

1. Concrete may be provided in the following volumetric proportions:

| | |
|---|---|
| Portland Cement | 1 part |
| Fine Aggregate | 2 parts |
| Coarse Aggregate (1/4 inch to 1-1/2 inches) | 4 parts |
| Water | 7 ½ gallons, maximum per sack of cement |

B. Chain Link Fence Fabric: Conforming to ASTM A 392, Class C2 zinc coating, 2.00 ounces minimum per square foot of uncoated wire surface, hot-dipped galvanized after weaving, and top and bottom edges knuckled.

1. Fabric for perimeter fencing and interior fencing shall be 9 gage woven wire with 2 inch mesh, unless otherwise specified.

2. For perimeter fences 16 feet high, the upper 8 feet of fabric may be 11 gage.

3. Fences 12 feet high or less shall be furnished with single width fabric.

4. Fabric for fencing on top of handball court shall be 9 gage wire minimum with 1 inch mesh.

5. Fabric for fencing of tennis courts shall be full height, single width, 9 gage by 1-3/4 inches mesh chain link fabric.

6. Installed fence fabric shall be free from barbs, icicles, or other projections and installed fence fabric with such defects will be deemed defective Work.

C. Posts, Top Rails, Brace Rails and Gate Frames: Standard weight, galvanized, welded or seamless steel pipe conforming to ASTM F 1083, with a minimum yield strength of 35,000 psi. Embed posts into footing 6 inches less than the depth of the footing unless noted otherwise on drawings.

D. Schedule of Posts and Footings:

| Item | Height | Nomina | Outside | Weight | Footings* |
|---|---|---|---|---|---|

| | | l Pipe Size (inches) | Diameter (inches) | (pounds per foot) | Diameter (inches) | Depth (inches) |
|---|---|---|---|---|---|---|
| Top Rail, Brace Rails and Transom Rails | Up to 10'-0" | 1-1/4 | 1.660 | 2.27 | N/A | N/A |
| | 10'-1" to 16'-0" | 1-1/2 | 1.900 | 2.72 | N/A | N/A |
| Line Posts | Up to 6'-0" | 2 | 2.375 | 2.65 | 12 | 24 |
| | 6'-1" to 8'-0" | 2 | 2.375 | 2.65 | 12 | 36 |
| | 8'-1" to 10'-0" | 2-1/2 | 2.875 | 5.79 | 12 | 36 |
| | 10'-1" to 16'-0" | 3 | 3.5 | 7.58 | 14 | 60 |
| Terminal, Corner, Angle & Pull Posts | Up to 8'-0" | 2-1/2 | 2.875 | 5.79 | 12 | 36 |
| | 8'-0" to 10'-0" | 2-1/2 | 2.875 | 5.79 | 14 | 42 |
| | 10'-1" to 16'-0" | 3 | 3.5 | 7.58 | 14 | 60 |
| Pedestrian Gate Posts | Up to 8'-0" | 2-1/2 | 2.875 | 5.79 | 14 | 36 |
| Gate Frames | Up to 8'-0" | 1-1/2 | 1.900 | 2.72 | N/A | N/A |
| Driveway Double-Leaf Swing Gate Posts: Opening | | | | | | |
| Up to17'-3-1/2" | Up to 8'-0" | 3 1/2 | 4 | 9.11 | 16 | 42 |
| 17'-4" to 20'-3-1/2" | Up to 8'-0" | 3-1/2 | 4 | 9.11 | 16 | 42 |

E. Post Caps: Malleable iron, ASTM F 626, , designed to fit snugly over posts with a minimum projection of 1-1/2 inches below top of posts. Post caps shall be manufactured with a curved top.

F. Eye Tops: Malleable iron, ASTM F 626, , designed to fit over line posts, and for through passage of top rail.

G. Expansion Sleeve Couplings for Top Rails: Steel, 6 inches long, designed to fit tightly on inside of rail, fitted with raised center.

H. Rail Ends for Top Rails and Brace Rails: Malleable iron, ASTM F 626, , with holes to receive 3/8 inch bolts for securing to rail end bands.

I. Tension Bands and Bands for Securing Rail Ends: Mild steel flats, at least 11 gage x one inch, tension bands in gates shall be 11 gage by 1 inch. Bolts for use with tension bands and rail end bands shall be 3/8 inch by 1 ½-inch.

J. Tension Bars: Mild steel flats at least 3/16 inch by 3/4 inch.

K. Tension Wire for Installation at Bottom of Fabric: 6 gage steel spring wire, conforming to requirements of AISI Steel Products Manual, Carbon Steel Wire, Section 16, merchant quality, galvanized, soft temper with Type I coating. Wavy type wire is not acceptable.

L. Turnbuckles for installation with Tension Wires: Eye and hook type, drop forged steel, right and left hand threads, at least 3/8 inch screw diameter with at least 4 ½-inches of take-up.

M. Tie Wire: Aluminum ties 6 gage for fastening fabric to posts, top rails and brace rails. At bottom tension wire 9 gage galvanized hog rings shall be installed.

N. Finish of Metal Parts: Post caps, couplings, rail ends, tension bands, tension bars, turnbuckles, rivets, bolts, and other metal parts and fittings shall be hot-dipped galvanized after fabrication, except bolts, which may be galvanized or cadmium-plated. Galvanizing shall conform to ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, and ASTM F 626Specification for Fence Fittings.

O. Paints for Refurbishing Existing Fence Posts, Rails, and Accessories: As required to provide the galvanized color of a new installation.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Install fences to heights indicated on Drawings.

B. Space fence posts at equal intervals between terminal, angle, corner, and gate posts, and not more than 10 feet apart measured from center to center of posts. In curved fence sections having a radius of 50 feet or less, space posts not more than 5 feet - 6 inches apart. Install posts so that top of eye of post caps are level with top of fabric.

C. Install angle or corner posts at each change in direction of 15 degrees or more, at change of 5 percent or more in grade of fencing, and at the beginning and end of curved fence sections.

D. Install terminal posts at ends of runs of fencing. Install gateposts on both sides of driveway and pedestrian gates. For double-leaf gates, net opening between gate posts shall be gate size as indicated on Drawings, plus 3 ½-inches; for single leaf gates, net opening shall be gate size plus 2 ½-inches.

E. Where a fence is to be installed on a curb, construct footings with top of footing level with the lower finish grade. Align posts, set plumb and true before placing footings. Remove splattered concrete from exposed pipe surfaces while concrete is still soft. In bituminous surfaced areas, install seal coat on top of concrete footings.

F. Install fences with top rail. Top rail shall pass through eye tops and be secured at ends with rail-end fittings and bands.

G. Install fences over 10 feet in height, in addition to top rail, with a full length horizontal mid-rail set at mid-height of fence and rigidly secured to posts with rail end fittings and bands.

H. In fences higher than 10 feet, install brace rails at angles, corners, and terminals at 1/4 and 3/4 of fence height. Provide one horizontal brace rail in panels adjacent to terminal,

angle, corner, and gateposts, install at mid-height of fence and rigidly secured to posts with rail end fittings and bands. Provide horizontal brace rails, as specified, in panels of curved sections having a radius of 50 feet or less. Brace rails are not required in fencing 4 feet or less in height.

I. Provide a transom rail and fabric at top of pedestrian gate openings. Install transom rail 6 feet 8 inches above high point of grade at gate opening. Ends of transom rails shall be pinned or riveted to rail end fittings with 1/4 inch mild steel rivets. Pin or rivet must go through rail and peen. Welding on rail ends is not permitted.

J. Install bottom tension wire a minimum of 3 inches from grade for fencing, and provide a turnbuckle for each 150 feet of wire or fractional part thereof. Turnbuckles are not required in runs of 15 feet or less. Install ends of tension wires to posts in a manner to prevent slipping or loss of tension. Wrap should start from fence side of post. Turn end of wire around post tightly twisted at least three times around wire. At turnbuckles, wire through eye and tightly twist end at least three times around wire. Cut tail of bottom wire flush.

K. Install fence fabric on outward facing side of posts, except for tennis courts. Install fence fabric with top edge projecting above top rail of fence.

L. Install bottom of fence fabric to clear finish grades, except on bituminous surface install 3/4 inch above such surface. Locally shape and trench ground surfaces where necessary to provide uniform top and bottom alignment of fence.

M. Tightly stretch fabric and at terminal, pull corner, angle, and gateposts, secure with tension bars extending full height of fence. Secure tension bars to posts with bolted tension bands spaced not more than 14 inches apart.

N. Bands and Ties: Install bands and ties in accordance with following schedule:

| | |
|---|---|
| 15 bands on 16 feet fence | 16 ties on 16 feet fence |
| 11 bands on 12 feet fence | 12 ties on 12 feet fence |
| 7 bands on 8 feet fence | 7 ties on 8 feet fence |
| 6 bands on 6 feet fence | 6 ties on 6 feet fence |
| 4 bands on 4 feet fence | 4 ties on 4 feet fence |

O. Fasten fabric to line posts with wire ties spaced not more than 16 inches apart. Where 6 gage aluminum ties are furnished, hook the tie at both ends. Installation of hooked ties with links is not permitted.

P. Fasten fabric to top rails, mid-rails, brace rails, with wire ties spaced not more than 18 inches apart. Bend back ends of tie wires so as not to be a hazard. At bottom tension wire, install hog rings spaced not more than 18 inches apart. Where 2 fabrics are furnished, lap the fabrics one mesh at mid-rail and tie both fabrics with 9 gage wire or 6 gage aluminum ties to midrails.

Q. Grind all field welds smooth, clean off flux and spatter, damaged galvanizing removed, burrs and projections ground off, properly prepared, then heavily coated with galvanizing repair coating as specified in Section 05 5000; or equal product approved by Owner's Office of Environmental Health and Safety. Install coating in accordance with written recommendations of manufacturer.

R. Fabrication of Gates:

1. Frames: Fabricate gate frames from steel pipe of size specified, with joints at corners miter cut and continuously welded to sides.

2. Fabric: Install fence fabric to side members with tension bars and tension bands as specified, spaced not more than 14 inches apart. Tension bars shall extend full height of gate. Install fence fabric to top and bottom members and to brace rail with wire ties as specified for top rails, spaced not more than 12 inches apart.

3. Latches: Gate latches and strikes will be furnished by the Owner. Weld gate latches and strikes to gate posts and frames. Welding shall be performed before gate frames are galvanized, or welds shall be finished as specified for field welds.

4. Hinges: Install and adjust hinges; burr or center punch threads of gate hinge bolts to prevent removal of nuts. Install 3 hinges on each post for swing gates more than 16 feet wide. Hinges will be provided by the Owner.

5. Grind welds flush and smooth. Hot-dip galvanize fabricated parts after welding, or finish weld as specified for field welds.

## 3.02 REINSTALLED FENCING

A. Where existing fencing is indicated to be reset or relocated, remove existing concrete footings from posts and legally dispose of off the Project site. Construct new concrete footings, as specified, in their designated location. Replace parts of fencing broken or damaged during removal and re-installation with new parts as specified to complete reinstallation. New materials shall closely match design of existing installation. Top rail will be required in reinstalled fencing, which does not have top rail in its existing condition. Install as specified for new installations.

B. Existing fences shall be reset where finish pavement is raised or lowered more than 6 inches from existing grade. Remove and reinstall entire fence assembly as specified.

## 3.03 FENCING ADJUSTMENTS

A. Where the finish grade is raised 6 inches or less, cut and re-knuckle the existing fence fabric. Adjust tension wire and tie to fabric. Bottom of fence fabric shall be installed ¾" above finish grade.

B. Where the finish pavement is lowered 6 inches or less, demolish the fence footing flush with the finish grade and adjust the fabric and its attachments. Bottom of fence fabric shall be installed ¾ inches above finish grade.

C. Post footings and fabrics that require readjustment after installation shall be entirely replaced.

3.04 INSTALLATION OF GATES

A. Provide gates of the sizes indicated on Drawings. Allow clearance on gates of 1-1/2 inches at bottom and one inch at top. Construct gates installed in sloping areas to conform to the grade. Provide an opening in each gate for access to locking device or padlock. Knuckle ends of fabric cut for opening to eliminate hazards.

B. Sliding Gates and Swing Barricade Gates: Fabricate and install as indicated on Drawings. Wheel housing must be designed to fit tightly to roll track and prevent gate from rolling over objects. Unsupported cantilever type roll gates are not acceptable. Install gate stops in accordance with the drawings. Both top and track stops are required.

3.05 RE-FENCING

A. Hardware Removal: Disassemble existing fence and all attachment hardware (bands, pipe, and wire) prior to preparation of posts for painting

B. Fabric Removal: Do not remove more than what can be replaced during one day unless a barricade, providing equal security, will be installed in its place. If freestanding temporary fence is used, it must be clamped and wrap tied.

C. Post and Rails: Bent posts, rails and accessories shall be replaced. Cut bent portion of posts and weld new sections of equal diameter and thickness. Install splice to inside of all welded section prior to welding. Previously repaired or welded posts shall be replaced as necessary.

D. Painting:

1. Preparation: Prepare exposed steel posts, rails and accessories thoroughly cleaned of rust, oil and foreign materials. Painted galvanized metal shall be stripped to bare metal before applying prime coat.

2. Priming: Spot prime areas from which the original surface coating had been removed with a metal primer to match adjoining surfaces. Subsequently, install a prime coat to the entire surface to be painted.

3. First Coat: Install first coat as recommended by the paint manufacturer. Furnish a color that is 10 percent to 15 percent lighter or darker than the finish coat.

4. Second or Finish Coat: Install finish coat after the first coat has cured.

5. Install paint in accordance with manufacturer's written recommendations.

6. Protect adjacent structures, walls, concrete or asphalt from paint.

3.06 COMPLETION

A. Completed fencing shall form continuous units between points indicated with required parts, accessories, and fittings provided and installed. Clean exposed metal surfaces of cement, grout and other foreign substances.

B. Fill in holes left by removal of existing fence footings, except in areas where grading Work is indicated or specified, to existing grade with clean earth thoroughly compacted to at least same density as adjoining soil.

3.07 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.08 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 33 10 00

WATER UTILITIES
Private & Public

PART 1 – GENERAL

1.01 SUMMARY

A. Pipe and fittings for site water lines.

B. Valves.

C. Fire hydrant.

D. Water meter

E. Backflow preventer.

1.02 RELATED SECTIONS

A. Section 31 20 00 Earthwork.

B. Section 31 23 33 Trenching and Backfilling.

1.03 REFERENCES

A. American Water Works Association Standards (AWWA).

B. Ventura County Water Works Districts - Design Standards.

C. Standard Specifications for Public Works Construction (Green Book), latest edition.

1.04 SUBMITTALS

A. Submit the following:

1. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories.

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

3. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Turn over to the project manager one set of drawings with all deviations from the plans shown in neat, clean and readable red ink.

4. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

5. Disinfection Report:
    a. Type and form of disinfectant used.
    b. Date and time of disinfectant injection start and time of completion.
    c. Test locations.
    d. Name of person collecting samples.
    e. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
    f. Date and time of flushing start and completion.
    g. Disinfectant residual after flushing in ppm for each outlet tested.

6. Bacteriological Report:
    a. Date issued, project name, and testing laboratory name, address, and telephone number.
    b. Time and date of water sample collection.
    c. Name of person collecting samples.
    d. Test locations.
    e. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
    f. Coliform bacteria test results for each outlet tested.
    g. Certify water conforms, or fails to conform, to bacterial standards of AWWA C651 Section 7.1 Standard Conditions

7. Water Quality Certificate: Certify water conforms to quality standards of City of Moorpark, suitable for human consumption.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of piping mains, valves, connections, fire hydrant, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with County of Ventura Standards, AWWA, Standard Specifications for Public Works Construction California Fire Code Chapters 5 & 33 and NFPA 24.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.07 QUALIFICATIONS

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section with minimum three years experience.

B. Testing Firm: Company specializing in testing potable water systems, certified by State of California.

C. Submit bacteriologist's signature and authority associated with testing.

1.08 DELIVERY AND STORAGE

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 – PRODUCTS

2.01 GENERAL

A. All water lines shall be designed for a minimum working pressure of 250 psi. All fittings appurtenant piping materials shall be designed for a minimum working pressure of 250 psi unless otherwise indicated.

2.02 PIPE

A. Joints: Mechanical joints shall be used for the waterline construction unless otherwise shown on plans and standard details. Gaskets for mechanical joints shall be rubber conforming to ANSI A21.11 and AWWA C111.

B. Fittings: Fittings shall be ductile iron rated for 250 psi working pressure. Mechanical joint fittings shall conform to ANSI A21.10 or AWWA C110 (short short body style, not approved). Lining for fittings shall be Plastic Engineering P.E.I. 100 epoxy to a minimum thickness of 10 mils. Fittings shall be wrapped with 6 mil. polyethylene sheet. Grease all underground nuts and bolts before wrapped with the polyethylene sheet.

C. Polyvinyl Chloride (PVC) potable water pipe: Pipe material shall be (Polyvinyl chloride (PVC) pressured pipe shall be manufactured in accordance with AWWA Standard Specification C-900).

2.03 GATE VALVES

A. Conform to AWWA C-509-01.

B. Gate valves shall be iron body, NRS valves with O-ring seals, and shall open when the stem is rotated counterclockwise. The valves shall be designed for a minimum working pressure of 250 psig, have a bronze stem, and have a cast iron wedge with styrene butadiene rubber permanently bonded to the wedge. The valves shall have full port openings for unobstructed flow, be designed for underground service, and be in full compliance with the latest revision of AWWA C509. The valve linings and coatings shall be in accordance with AWWA C210-84. Linings and coatings shall be factory applied. Valves shall be furnished with 2-inch square operating nut. Valve shall be wrapped with 6 mil. polyethylene sheet. Grease all underground nuts and bolts before wrapping with the polyethylene sheet.

2.04 FIRE HYDRANT

A. Per County of Ventura Plans & Specifications.

2.05 WATER METER

A. Not Applicable.

2.06 BACKFLOW PREVENTER

A. Per County of Ventura Plans & Specifications.

B. Backflow preventer shall be lead free and USC approved.

2.07 ACCESSORIES

A. Concrete for Thrust Blocks: Contractor shall construct concrete thrust block per County of Ventura Standards.

B. Thrust blocks shall be constructed to bear against undisturbed earth and shall not bear against adjacent pipe, fittings, or valves. Where concrete must be poured around adjacent pipe, a block out or a short pipe length shall be used such that a flexible joint exists within 12 inches of each side of thrust block, unless indicated otherwise on the plans. Concrete shall not be allowed to set in contact with pipe surfaces or to enter or come in contact with any joint.

C. Valve Appurtenances: The Contractor shall furnish and install all valve appurtenances. Provide two galvanized T-handled operating wrenches, 4 feet total length or as required to easily access valve from grade.

D. Valve box body shall be unreinforced concrete 8 ¾" inside diameter traffic box with cast iron ring. The valve box cover shall be cast iron. Both valve body and cover shall be Christy G3 or equal. The cover shall be marked "water." The cover of each valve box shall be provided with a 2" diameter bronze disc and the Contractor shall stamp the valve number on the disc per the Architect's instructions. The disc shall be mounted to the valve box cover or higher using stainless steel screws. The extension piece shall be 8" in diameter, Class 150 P.V.C. water line conforming to the requirements of AWWA C-900.

E. Appropriate warning detector tape shall be placed over all utilities.

1. Underground detectable warning tape shall be placed over all non-metallic underground utilities.

2. 12-gauge copper continuous location wire shall be placed on all water mains.

F. Corrosion-Protection Encasement for Piping

1. Encasement for Underground Metal Piping and Fittings: AWWA C105, Polyethylene film, 10 mil minimum thickness, tube or sheet. Plastic wrap shall be clear or black. Purple wrap shall not be used.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Maintenance records in accordance with NFPA 25.

B. Verify the existing water main sizes, class of pipes, and locations as indicated.

C. Verify piping system has been cleaned, inspected, and pressure tested.

D. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.02 PREPARATION

A. Remove scale and dirt, on inside and outside, before assembly.

B. Prepare pipe connections to equipment with flanges or unions.

3.03 BEDDING

A. Excavate pipe trench in accordance with Specification Section 31 23 33 for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, compact to a minimum of 95 percent relative compaction.

C. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers to protect the pipe. Jetting is not permitted to obtain required compaction.

D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Route pipe in straight line.

B. Install pipe to allow for expansion and contraction without stressing pipe or joints.

C. Install access fittings to permit disinfection of water system.

D. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main in accordance with County of Ventura Standard Plans & Specifications.

E. Protect metal restrained joint components against corrosion by applying a bituminous coating by coating with non-oxide corrosion resistant greased 10 mil plastic wrap.

F. Establish elevations of buried piping to ensure cover conforming to District Standards. The minimum cover from the finish grade to the top of pipe is 36 inches for potable and fire waterline, any shallower cover to clear with the existing utility crossings shall be reviewed and approved by the District's Representative.

G. Install 12 gauge copper continuous location wire over top of pipe.

H. Backfill trench in accordance with Specification Section 31 23 33.

I. Maintain separation of water main from sewer piping in accordance with the State Department of Health Services, Criteria for the Separation of Water Mains and Sanitary Sewers (Section 64630, Title 22 California Administrative Code), and State Regional Water Quality Control Board.

J. All pipe laid in trench which is to be left for further extension (i.e., end of work day) shall have its open end covered to protect from possible rodent intrusion.

3.05 INSTALLATION - VALVES

A. Set valves on solid bearing per County of Ventura Standard Plans & Specifications.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Install brass valve 1 ½" diameter tags and imprint valve number per District.

3.06 SERVICE CONNECTIONS

A. Install service connections in accordance with County of Ventura Standard Plans & Specifications.

3.07 PRESSURE TEST OF WATER PIPING SYSTEM

A. Water piping system shall be pressure tested for 2 hours at 200 psi, with no allowable drop in water pressure.

B. All leakage tests shall be completed and approved prior to placing of permanent resurfacing.

C. Pressure test shall be witnessed by District's inspector.

## 3.08 DISINFECTION AND BACTERIA TESTING OF WATER PIPING SYSTEM

A. Water piping system shall be disinfected and flushed per AAWA Section C651.

B. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.

C. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.

D. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory to sample, test and certify water quality suitable for human consumption.

## 3.09 TEST RECORDS

A. Records shall be in accordance with NFPA 13 & 24. Records shall be made of each piping system installation during the test. These records shall include:

1. Date of test.

2. Description and identification of piping tested.

3. Test fluid.

4. Test pressure.

5. Remarks to include such items as:

   a. Leaks (type, location).
   b. Repairs made on leaks.

6. Certification by Contractor and signed acknowledgment by the District's Representative.

## 3.10 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by District's Representative.

B. Perform pressure test on potable water distribution system in accordance with County of Ventura Standard Plans & Specifications except that there is no allowable leakage for the duration of the test.

1. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.

2. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.

END OF SECTION

SECTION 33 30 00

SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Site sanitary sewerage piping, fittings, accessories and bedding.

B. Cleanouts.

1.02 RELATED SECTIONS

A. Section 31 20 00 Earthwork.

B. Section 31 23 33 Trenching and Backfilling.

1.03 REFERENCES

A. Standard Specifications for Public Works Construction SSPWC (Green Book), latest edition.

B. ASTM Standards.

1.04 SUBMITTALS

A. Submit:

1. Product Data: Provide data indicating pipe, pipe accessories and appurtenances, and manhole covers.

2. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

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

4. Manufacturer's Certificate: Certify that installers are certified for installing plastic pipe.

1.05 PROJECT RECORD DOCUMENTS

A. Submit Record Drawings: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 REGULATORY REQUIREMENTS

A. Conform to California Title 24 (CCR) Part 5, latest edition, for installation of the Work of this section.

B. Minimum separation distance and requirements between water, reclaimed water and sewer pipes per the State of California, Department of Health Services shall be established.

PART 2 – PRODUCTS

2.01 SEWER PIPE MATERIALS AND ACCESSORIES

A. Polyvinyl Chloride (PVC) Pipe for Gravity Sewer: ASTM 3034-SDR35 Ring-Tite Polyvinyl Chloride (PVC) gravity sewer pipe and fittings; inside nominal diameter as indicated on Drawings. PVC pipe shall use "locked-in" rubber sealing ring conforming to ASTM D-3212. Joints using flexible Elastomeric Seals. Minimum pipe stiffness at 5% deflection shall be 46 psi for all sizes when tested in accordance with ASTM Method of Test D2412.

2.02 CLEANOUTS

A. Form and cast-in-place, Class 618-CLE-4000 P concrete base pad, with provisions for sewer pipe end section.

B. Frame and cover shall be Christy G3 or equal, lettered "sewer".

2.03 BEDDING MATERIALS

A. Refer to Specification Section 31 23 33 Trenching and Backfilling for Bedding Material.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that trench cut and/or excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with granular fill.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe trench in accordance with Specification Section 31 23 33. Hand trim excavation for accurate placement of pipe to elevations indicated on drawings.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth, compact to minimum of 95 percent of maximum dry density.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Install pipe, fittings and accessories in accordance with manufacturer's instructions.

B. Sewer pipeline shall be placed from downstream to upstream beginning at the downstream connection to the existing sewers.

C. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Install bedding along sides and over top of pipe to minimum compacted thickness of 12 inches; compacted to a minimum of 95 percent of maximum dry density.

E. Refer to Specification Section 31 23 33 for Trenching Requirements. Do not displace or damage pipe when compacting.

F. Install continuous trace wire over top of pipe.

G. Connect to building sanitary sewer lateral at 5' outside of edge of building.

H. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers to protect the pipe.

3.05 INSTALLATION – CLEANOUTS

A. From bottom of excavation clean and smooth to correct elevation.

B. Establish elevations and pipe inverts for inlets and outlets as indicated on drawings.

C. Mount lid and frame level in grout, secured to cone section to elevation indicated on drawings.

## 3.06 FIELD QUALITY CONTROL

A. Preliminary Tests: The Contractor may perform any tests desired which are not harmful to the lines before backfilling is completed.

B. Cleaning: Before final tests are performed for acceptance of any sewer pipe, clean the pipe by inflatable rubber ball method.

C. Perform air pressure test per SSPWC Section 306-1.4.4.

D. Repairs, if necessary: If the leakage or infiltration is greater than the amount specified, the pipe shall be overhauled and re-laid if necessary by the Contractor, at its own expense, until the joints will hold satisfactorily.

E. Regardless of the results of the above tests, any visible evidence of individual leaks shall be corrected by the Contractor to the satisfaction of the District's Representative.

F. Cleaning Sewer: After all backfilling, compaction testing and paving is completed, sewer lines shall be cleaned by Inflatable Rubber Ball Method, flushed and cleaned, before acceptance by the District's Representative and connection to their sewer system is made.

G. The Contractor shall furnish all sewer line plugs necessary for blocking off all lines as required by the District's Representative until final acceptance.

## 3.07 PROTECTION

A. Protect finished installation.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Storm drainage piping, fittings, accessories, and bedding.

B. Catch basins.

C. Manholes.

D. Inlet and outlet structures.

1.02 RELATED SECTIONS

A. Section 31 20 00 Earthwork.

B. Section 31 23 33 Trenching and Backfilling.

1.03 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

B. ASTM Standards.

1.04 SUBMITTALS

A. Submit the following in accordance with provisions in Division 1:

1. Product Data: Provide data indicating pipe, pipe accessories and catch basin grates.

2. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

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

4. Layout diagram for storm drain components per plan.

1.05 PROJECT RECORD DOCUMENTS

A. Submit record drawings. Accurately record locations of pipe runs, connections, catch basins, structures, manholes and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as indicated on drawings.

B. Complete pothole work per plans and notify the District of any discrepancy prior to commencing construction.

1.07 COORDINATION

A. Coordinate the work with connection to existing storm drain mains, and trenching.

PART 2 – PRODUCTS

2.01 PIPE MATERIALS

A. Polyvinyl Chloride (PVC) SDR35, per SSPWC Section 207-17.

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required. Fittings shall be watertight.

B. Solvent cap cement: pipe with solvent cement joints per SSPWC Section 207-17.3.3.

2.03 CATCH BASINS AND MANHOLES

A. Precast catch basins shall include traffic rated grate, as manufactured by Brooks or approved equal 3.

B. Cast-in-Place catch basins per Utility Improvement Plan.

2.04 METAL

A. All exposed metal parts are to be galvanized in accordance with SSPWC, Section 210-3.

2.05 CONCRETE

A. All concrete shall be Class 560-C-3250, per SSPWC Section 201.

2.06 BEDDING MATERIALS

A. Refer to Specification Section 31 23 33 Trenching and Backfilling for Bedding Material.

2.07 FILTER FABRIC

A. Filter fabric shall be non-woven geosynthetic per SSPWC Section 213-2.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive Work and excavations, dimensions, and elevations are as indicated on Drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with compacted bedding material.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe trench in accordance with Specification Section 31 23 33. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

B. Place bedding material in trench bottom, level materials in continuous layer. Bedding shall be 1/2 of pipe diameter or 4" minimum thickness whichever is greater, compact to a minimum of 95 percent of maximum dry density.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Construct tongue-and-groove mortar type of joint on RCP per SSPWC Section 207-2.5.

B. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

C. Install sand backfill along sides and over top of pipe. Provide sand backfill over top of pipe to minimum compacted thickness of 12 inches, compacted to a minimum of 95 percent of maximum dry density.

D. Refer to Specification Section 31 23 33 for Trenching Requirements. Do not displace or damage pipe when compacting.

E. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers or equal to protect the pipe.

3.05 INSTALLATION - CATCH BASINS, MANHOLES

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base with provisions for storm drainage pipe end sections.

C. Level top surface of concrete base to receive shaft sections.

D. Establish elevations and pipe inverts for inlets and outlets as indicated on drawings.

E. Compact top 12" of native materials below the bottom of catch basins and manholes to minimum 95 percent of maximum dry density.

3.06 FIELD QUALITY CONTROL

A. Inspection and testing shall be performed by the District's representative.

B. Request inspection prior to and immediately after placing backfill cover over pipe.

C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to the District.

3.07 PROTECTION

A. Protect pipe and backfill cover from damage or displacement until backfilling operation is in progress.

END OF SECTION