

WORKING Volume 2 – Technical Specifications

9/12/2016

Design Standards for use by Design Professionals for new construction and modernization for Sweetwater Union High School District Schools.

Office of the District Architect 619.796.7729

District Standards

VOLUME 2 - TECHNICAL SPECIFICATIONS

PREFACE

This Technical Specifications portion of the Design Standards are a work in process. One goal of updating the standards is to convert the specifications from the 5-digit 2004 Masterformat® numbering system produced by the Construction Specifications Institute to the new 6-digit numbering system in use since 2004. The numbering is based on the current 2016 Masterformat® numbers and titles.

This document is a snapshot of the work in process and sections are being reviewed by the Maintenance Department and the Planning and Construction Department.

Comments and suggestions should be forwarded to Paul Woods, District Architect at paul.woods@sweetwaterschools.org.

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District Standards

VOLUME 2 - TECHNICAL SPECIFICATIONS

PURPOSE

The Sweetwater Union High School District (SUHSD) is committed to creating equitable learning environments. These Design Standards were developed to provide direction to Design Professionals to enable the creation of quality facilities and spaces and to create uniformity with respect to quality and type of materials and systems to be incorporated into the various designs.

COMPLIANCE WITH STANDARDS

All Design Professionals (architects, engineers, etc.) shall follow the requirements and standards in this document for the planning and design of new construction (including additions), modernization or alterations to school buildings and sites. These standards are not intended to dictate the scope of work or to restrict creativity or innovation. It is the Design Professional's responsibility to develop scope within the budget established as the project progresses through the design phases.

The District welcomes suggestions to improve these standards; however, deviations from these standards need to be specifically approved, in writing, by the District's designated representative. Any deviation requests should be submitted as early in the design phase as possible. It is the objective that continued input from the Design Professionals, District staff, and other stakeholders will result in continuous improvement of these Design Standards.

These Design Standards do not address all items required for all projects. The intent is to address the District concerns and those items that require standardization. Specialty products unique to an individual project that are not addressed in these Standards still need to be reviewed and approved by the Designated District Representative prior to completion of Construction Documents.

TECHNICAL SPECIFICATIONS PRINCIPLES

The following specifications represent the District's requirements. There is a combination of both outline specifications and master specifications for the various sections that may apply to your specific project. The master specification sections are provided in Word format for editing by the Design Professionals to make it project specific and are to be incorporated into the project manual. All edits shall be made with "Track Changes" on so that the District may review the edits. Only after District review may the changes be accepted.

The outline specification sections include requirements that are to be integrated into the master specifications of the Design Professional's choice and edited as appropriate to meet the specific project requirements. It is not the intent to address all items required for all projects. Materials, products, and items not listed are to be recommended by the Design Professional and reviewed by the designated District Representative.

CONVERSION TABLES

The following tables show the conversion from the 2004 5-digit Construction Specifications Institute (CSI) numbering system to the current 6-digit CSI Masterformat® 2016 numbering system.

CURRENT SPECIFICATIONS	NEW CSI	NEW TITLE
DIVISION 1 - GENERAL REQUIREMENTS		
01410 - REGULATORY REQUIREMENTS		
01450 - OLIALITY CONTROL		
01465 - CUTTING AND PATCHING	01 73 29	Cutting and Patching
01600 - PRODUCT REQUIREMENTS		
01744 - RENOVATION CLEANING PROCEDORES		
DIVISION 2 - SITE WORK		
02222 - SELECTIVE DEMOLITION	02 41 00	Demolition
02225 - REMOVALS AND RELOCATIONS		
02230 - SITE CLEARING		
02300 - FARTHWORK		
02362 - TERMITE CONTROL		
02530 - SANITARY SEWERAGE SYSTEM		
	32 12 16	Asphalt Paving
	32 12 10	Concrete Paving
	32 13 13	Payement Marking
	32 17 23	
02822 - ORNAMENTAL FENCES AND GATES		
02830 - CHAIN LINK FENCING	40.44.50	Dealing and Teeffer Olivery and
02891 - PARKING AND TRAFFIC CONTROL SIGNAGE	10 14 53	Parking and Traffic Signage
02920 - LAWNS AND GRASSES		
03100 - CONCRETE FORMWORK		
	03 30 00	Cast_in_Place Concrete
	00 00 00	
05050 - CEMENTITIOUS UNDERERTMENT		
DIVISION 4 - MASONRY		
04822 - REINFORCED CONCRETE UNIT MASONRY		
DIVISION 5 - METALS		
05060 – WELDING		
05081 - GALVANIZED FINISHES ON STEEL		
05090 - ANCHORS AND FASTENERS	05 05 23	Metal Fasteners
	03 60 00	Grouting
05120 - STRUCTURAL STEEL		
05310 - STEEL DECKING		
05400 - COLD-FORMED STRUCTURAL METAL FRAMING		
05505 - MISCELLANEOUS METAL FABRICATIONS	05 05 00	Metal Fabrications
05525 - STEEL PIPE AND TUBE RAILINGS	05 52 00	Metal Railings
05532 - TRENCH AND ACCESS COVERS		
05810 - EXPANSION JOINT ASSEMBLIES		
DIVISION 6 - WOOD AND PLASTICS		
06112 - WOOD FRAMING AND SHEATHING	06 11 00	Wood Framing
06114 - WOOD BACKING, BLOCKING AND CURBING	06 11 11	Wood Backing, Blocking and Curbing
06200 - FINISH CARPENTRY		××
06410 - CUSTOM CASEWORK		
06640 - FIBER-REINFORCED PLASTIC (FRP) WALL		
PANELING		
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CURRENT SPECIFICATIONS	<u>NEW CSI</u>	NEW TITLE
DIVISION 7 - THERMAL AND MOISTURE		
PROTECTION		
07110 - DAMPPROOFING		
07210 - BUILDING THERMAL INSULATION		
07260 - VAPOR RETARDERS		
07265 - VAPOR EMISSION REDUCTION SYSTEM		
07311 - ASPHALT SHINGLES		
07410 - STANDING SEAM ROOF PANELS		
07450 - INSULATED METAL ROOFING		
07550 - MODIFIED BITUMINOUS MEMBRANE ROOFING	07 52 20	Modified Bituminous Membrane Roofing
	07 52 30	Modified Bituminous Membrane Roofing
	07 52 40	Modified Bituminous Membrane Roofing
07620 - SHEET METAL FLASHING AND TRIM	07 60 00	Flashing and Sheet Metal
07710 - MANUFACTURED ROOF SPECIALTIES	07 71 00	Roof Specialties
07720 - ROOF ACCESSORIES		
07840 - FIRESTOPPING AND SMOKE SEALS	07 84 00	Firestopping
07900 - JOINT SEALERS	07 90 00	Joint Protection
DIVISION 8 - DOORS AND WINDOWS		
08110 - STEEL DOORS AND FRAMES	08 11 00	Metal Doors and Frames
08211 - FLUSH WOOD VENEER DOORS		
08255 – FRP FLUSH DOORS		
08310 - ACCESS DOORS AND PANELS	08 31 00	Access Doors and Panels
08318 - INSULATING SECURITY DOORS		
08520 - ALUMINUM WINDOWS	08 51 13	Aluminum Windows
08710 - DOOR HARDWARE	08 70 00	Hardware
08810 - GLASS AND GLAZING	08 80 00	Glazing
DIVISION 9 - FINISHES		
09110 - NON-LOAD BEARING METAL FRAMING	09 22 16	Non-Structural Metal Framing
09115 - SUSPENDED METAL FRAMING AND FURRING	09 22 26	Suspension Systems
09210 - GYPSUM PLASTER	09 23 00	Gypsum Plastering
09220 - PORTLAND CEMENT PLASTER	09 24 00	Portland Cement Plastering
09250 - GYPSUM BOARD	09 29 00	Gypsum Board
09255 - TILE BACKING BOARD		
09310 - CERAMIC TILE		
09510 - ACOUSTICAL PANEL CETLINGS		
09645 - CUSHIONED WOOD FLOORING ASSEMBLIES		
09650 - RESILIENT FLOORING		
09656 - RESILIENT ATHLETIC FLOORING		
09676 - SEAMLESS QUARTZ ELOORING		
09680 - SHEET CARPET		
09820 - ACOUSTICAL INSULATION		
09905 - FIFLD PAINTING	09 90 00	Painting and Coating
09964 - ANTI-GRAFFITI COATINGS		
DIVISION 10 - SPECIALTIES		
10100 - VISUAL DISPLAY BOARDS		
10125 - TACKABLE WALL PANELS		
10170 - SOLID-PLASTIC TOILET PARTITIONS		
10190 - CUBICLE TRACK SYSTEMS		
10210 - WALL LOUVERS		
10350 - FLAGPOLES		<u> </u>

CURRENT SPECIFICATIONS	<u>NEW CSI</u>	NEW TITLE
		-
10671 - METAL STORAGE SHELVING		
10805 - TOILET AND SHOWER ACCESSORIES		
11024 - EIDE-DATED SECURITY DOODS		
11610 - LABORATORY FUME HOODS		
DIVISION 12 - FURNISHINGS		
12350 - LABORATORY COUNTERTOPS		
12355 - LABORATORY CASEWORK		•
12359 - MUSICAL INSTRUMENT CABINET SYSTEM		
12490 - WINDOW BLINDS		
12450 - WINDOW DEINDS		
DIVISION 13 - SPECIAL CONSTRUCTION		
13130 - FABRIC STRUCTURES		
DIVISION 14 - CONVEYING SYSTEMS		
14420 - WHEELCHAIR LIFTS		
DIVISION 15 - MECHANICAL		
15010 - GENERAL PROVISIONS	included in	22 00 00
15250 – INSULATION	22 07 00	Plumbing Insulation
15400 – PLUMBING	22 00 00	Plumbing
15800 - HEATING VENTILATING AND AIR	23 00 00	Commissioning of HVAC
CONDITIONING		, , , , , , , , , , , , , , , , , , ,
	23 07 00	HVAC Insulation
	23 31 00	HVAC Ducts and Casings
	23 33 00	Air Duct Accessories
	23 37 00	Air Outlets and Inlets
	23 40 00	HVAC Air Cleaning Devices
	23 80 00	Decentralized HVAC Equipment
15900 - TEMPERATURE CONTROLS	23 09 23	Direct-Digital Control Systems for HVAC
DIVISION 16 - ELECTRICAL	00.05.00	
16010 - GENERAL ELECTRICAL REQUIREMENTS	26 05 00	General Electrical Requirements
16060 - ELECTRICAL DEMOLITION	26 05 05	Selective Demolition for Electrical
	26 51 00	Lighting Fixtures
	26 55 61	Theatrical Lighting and Stage Dimming
		System
16600 - INTEGRATED COMMUNICATION SYSTEM		
16660 - TELEVISION DISTRIBUTION SYSTEM		
16721 – FIRE ALARM SYSTEM	28 46 00	Fire Detection and Alarm

DIVISION 00 - PROCUREMENT AND CONTRACTING

The "front-end" inclusive of bid form, bid instructions, General Conditions, insurance and contractual requirements are provided by the District and edited for specific project requirements. The Design Professional is to coordinate with the designated District Representative to obtain copies.

The Design Professional must assist the District in the preparation of the front end documents by submitting:

- 1. List of Alternates, deductive and additive
- 2. List of Allowances
- 3. Suggested duration of construction
- 4. Brief description of the work, including phasing requirements
- 5. Construction Cost Estimate

DIVISION 01 – GENERAL REQUIREMENTS

The Design Professional must coordinate the technical specifications with the District's Division 1 requirements.

Warranty: A general two-year warranty from the General Contractor on the entire project is required. The warranty shall commence upon issuance of the Notice of Completion as determined by the District. In addition, provide the specific manufacturer warranty requirements that are beyond the one year. The Design Professional shall prepare a spreadsheet with itemized materials, equipment and systems that have specific warranties. Include manufacturer, contact, length of warranty, and start date of the warranty.

Extra Stock: The Design Professional must coordinate with the District which specifications shall include extra stock items. This is to be determined on a project by project basis.

01 73 29 – CUTTING AND PATCHING

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 Section includes:
 - A. Requirements and limitations for cutting and patching of Work.

PART 2 - PRODUCTS

- 2.1 Patching Materials, General: As required for original installation and to match surrounding construction.
- 2.2 Product Substitution: For each proposed change in materials, submit request for substitution under provisions of Section 01600 Product Requirements.

PART 3 - EXECUTION

- 3.1 Paving: At portland cement concrete paving, use concrete mix with maximum 3/8-inch aggregate and minimum 3000 psi 28-day compressive strength. Provide dowels to existing paving and reinforce new paving with minimum No. 3 reinforcing steel bars at 16-inches on center each way. Welded wire fabric reinforcement will not be acceptable.
- 3.2 Lawns and grasses: Restore areas trenched, disturbed or damaged. Provide sod or seeded planting mix, to match existing lawn or grass area.
- 3.3 Irrigation system: Restore by repair and replacement, as necessary, irrigation system affected by Work under the Contract.
- 3.4 Building finish materials: Match existing products and finishes. Confirm colors, patterns and textures with Architect. Custom cut new materials to fit and to match joint patterns with existing materials.
- 3.5 Ceramic tile and acoustical panels: Custom cut new materials to size to match existing construction.

END OF SECTION

DIVISION 02 - EXISTING CONDITIONS

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements.

02 41 00 – **DEMOLITION**

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SECTION INCLUDES:

- A. Demolition and removal of portions of existing building, as indicated on Drawings.
- B. Demolition and removal of site improvements such as pavement (including walkways), landscaping, electrical, etc.
- C. Removal of building utility services, such as power and signal circuits and including capping and identification.
- D. Removal of designated building equipment and fixtures.
- E. Removal of designated walls, partitions and components, including cutting of new openings in existing construction for new doors, plumbing HVAC and electrical components.
- F. Handling and disposal of removed materials.
- G. Temporary partitions to allow continued building occupancy.
- H. Removal and protection of existing fixtures, materials, and equipment items indicated as "salvage."

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with specific requirements of California Building Code (CBC) and requirements of serving utilities.
 - 1. Notify affected utility companies before starting demolition Work and comply with their requirements.
 - 2. Notify Architect and Inspector of Record before starting demolition Work and comply with Owner's directions through Architect for barriers, noise abatement and dust control.
 - 3. Do not close or obstruct walkways, passageways, roadways and fire hydrants without permits.
 - 4. Conform to applicable regulatory procedures should hazardous or contaminated materials be encountered.
- B. Pre-Construction Conference:
 - 1. Convene a conference at the Project site 7 days prior to starting demolition to review the Drawings and Specifications, requirements of authorities having jurisdiction, instructions and requirements of serving utilities, sequencing and interface considerations and project conditions.

- 2. Conference shall be attended by supervisory and quality control personnel of Contractor and all subcontractors performing this and directly-related Work.
- 3. Submit minutes of meeting to Owner and Architect for Project record purposes.

PART 2 - PRODUCTS (na)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Preparation for Demolition:
 - 1. Erect and maintain weatherproof closures for exterior openings.
 - 2. Erect and maintain temporary partitions or barriers to prevent spread of dust, fumes, noise, and smoke to provide for continued occupancy of facility by Owner.
 - 3. Protect existing construction which is not indicated to be altered.
- B. Protection: Protect existing construction and adjacent areas with temporary barriers and security devices in accordance with requirements specified in Section 01500 Temporary Facilities and Controls.
 - 1. Review location and type of construction of temporary barriers with Owner's Representative and public safety authorities having jurisdiction.
 - 2. Barriers shall control dust, debris and provide protection for building occupants in adjacent spaces from construction activities.
 - 3. Maintain protected egress and access at all times, in compliance with requirements of authorities having jurisdiction.

3.2 CONTINUED OPERATION

- A. Contractor shall maintain access to parking lots and buildings that are not closed and not part of the project.
- B. Contractor shall provide protective barriers and tunnels as necessary to protect occupants of buildings and paths of travel.

3.3 DEMOLITION

- A. Selective Demolition of Building Elements:
 - 1. Use techniques acceptable to Owner's Representative and authorities having jurisdiction, and which will achieve intended results and provide protection of surrounding features to remain.
 - 2. Some items may have been demolished prior to Work of this Contract. Verify existing conditions prior to start of demolition. If items are in the process of demolition or have been demolished by others, notify Owner's Representative for directions.
 - 3. Some items may require postponement of demolition until late in Contract Time period.

- 4. Phase demolition as necessary to provide adequate interfacing of related Work.
- 5. Demolish in an orderly and careful manner. Protect existing foundation supporting structural members, utility structures and finish materials to remain.
- 6. Remove, store, and protect equipment and materials to be re-installed in manner to prevent damage from soiling, moisture, marring, denting, scratching, distortion and impacts.
- 7. Protect materials and equipment to remain in place.
- B. Building Services and Utilities Demolition:
 - 1. Disconnect, remove, and cap designated building services and utilities within Project area. Minimize effect on portions of services and utilities to remain.
 - 2. Mark location of disconnected building services and utilities. Identify and indicate capping locations on project record drawings.
 - 3. Coordinate cutting and capping sequences and procedures to minimize disruption of activities in adjacent spaces.
- C. Cutting and Patching:
 - 1. Refer to requirements specified in Section 01 73 29 Cutting and Patching.

3.4 SALVAGED MATERIALS

- A. Ownership: Unless otherwise indicated, all materials demolished and removed shall become property of Contractor.
- B. Disposal of Materials: Contractor shall haul and dispose of all demolished and removed materials to offsite disposal sites in a legal manner.
 - 1. Except where noted otherwise, immediately remove demolished materials from site.
 - 2. Promptly remove from the site and properly dispose of all contaminated, vermin infested, or dangerous materials encountered.
- C. Salvage:
 - 1. Contractor shall take care when removing salvageable material to avoid damaging the material itself and building components that are to remain.
 - 2. Items of salvable value to the Contractor shall be removed from the site by the Contractor as the Work progresses and transported from the site as they are removed. Storage or sale of salvaged items on the site by the Contractor will not be permitted.

END OF SECTION

DIVISION 03 - CONCRETE

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements.

03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Cast in place reinforced concrete footings, foundations and foundation walls.
 - B. Slab on grade interior floors.
 - C. Exterior slabs on grade not part of portland cement concrete paving.
 - D. Unreinforced cast in place concrete for underground utilities.

1.3 SUBMITTALS

- A. Submit concrete mix design(s) for review.
- B. Submit proposed skateboard deterrents for review.

PART 2 - PRODUCTS

- 2.1 BASE AND OTHER UNDERSLAB MATERIALS
 - A. Granular Base: Crushed aggregate base, evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade, complying with recommendations of geotechnical (soils) report referenced in Document 00320 Geotechnical Data.
 - B. Sand Base: Clean, manufactured or natural sand complying with ANSI/ASTM C 136.

2.2 CONCRETE MATERIALS

- A. Concrete Materials, General: Acquire cement and aggregates from single source for all cast in place concrete.
- B. Portland Cement: ASTM C150, Type I or Type II, gray color. Provide sulfate-resistant type if determined unnecessary by sulfate content tests of soil. Refer to geotechnical report referenced in Document 00320 Geotechnical Data.
- C. Aggregates for Regular Weight Concrete: Fine and coarse aggregates, conforming to ASTM C33, California Building Code (CBC) Section 1903.3, and as follows.
 - 1. Structural Concrete: Maximum size not larger than 1/4 of narrowest dimension between forms, 1/3 depth of slab nor 3/4 of minimum clear spacing between individual reinforcing bars. Maximum aggregate size shall be 1-1/2 inch.

- 2. Other than Structural Concrete: Conform to requirements for structural concrete except maximum aggregate for mass concrete shall be 1-inch.
- D. Water: Clean, fresh and drinkable, free of amounts of acids, alkalis and organic materials detrimental to concrete production.

2.3 ADMIXTURES

- A. Chemical Admixtures, General: Admixtures which result in more than 0.1 percent of soluble chloride ions by weight of cement are prohibited. Use no admixtures not included in mix design. The following admixtures may be used only with the written acceptance of the Architect (Structural Engineer) and only if they comply with referenced standards all other requirements of the Contract Documents. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600
 - 1. Water-Reducing Admixture: ASTM C 494, Type A. Design is based on use of Kel-Crete Admixture, manufactured by Kel-Crete Industries (ICBO ER 5005). Equivalent products will be considered in accordance with the "or equal" provision specified in Section 01600 Product Requirements. Provide water-reducing admixture which enhances the characteristics of concrete to extent no less beneficial than the following:
 - a. Water reduction: Not less than 5 percent.
 - b. Increase in compressive strength: Not less than 10 percent at age 28 days.
 - c. Dry shrinkage: At age 21 days, less than concrete without water-reducing admixture.
 - 2. Accelerating or Retarding Admixtures: Conform to ASTM C 494 for Type C or Type B.
 - 3. Air-Entraining Admixture: Conform to ASTM C 260. Admixture shall be certified by manufacturer for compatibility with other mix components. Design is based on use of one of the following:
 - a. Kel-Crete Admixture, manufactured by Kel-Crete Industries.
 - b. Nox-Aire, manufactured by Nox-Crete.
 - 4. Waterproofing: Design is based on use of one of the following:
 - a. Kel-Crete Admixture, manufactured by Kel-Crete Industries.
 - b. Red Label, manufactured by Sika Chemical Corporation.
 - c. Super-Mix, manufactured by Concrete Surface Materials Company.
 - 5. Plasticizer: Conform to ASTM C 494, Type F. Design is based on use of Kel-Crete Admixture, manufactured by Kel-Crete Industries.
 - 6. Superplasticizers:
 - a. Dynatron, as manufactured by Chem-Masters Corporation. Or equal
 - b. Sikament 10 ESL, as manufactured by Chem-Masters Corporation. Or equal
 - c. Plastiflow N, as manufactured by Chem-Masters Corporation. Or equal
 - 7. Pozzolanic (Fly Ash) Materials: Not permitted.

2.4 BONDING COMPOUNDS

- A. Bonding Compounds, General: Products of the following manufacturers are specified and will be acceptable provided they comply with requirements of the Contract Documents. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600:
 - 1. The Burke Co., Buffalo, NY (716/832-5959; local representative, Fountain Valley, CA, 714/556-4510).
 - 2. Dayton Superior Corporation, Chemical Operations, Oregon, IL (815/732-3136 or 800/745-3707; local office, Santa Fe Springs, CA, 310/946-5504 or 800/745-3701).
 - 3. Euclid Chemical Co., Cleveland, OH (216/531-9222 or 800/321-7628).
 - 4. Tamms Industries Co. (A.C. Horn), Mentor, OH (216/974-2399 or 800/218-2667; local representative, Los Angeles, CA, 213/269-1846).
 - 5. L&M Construction Chemicals, Inc., Omaha, NE (402/453-6600 or 800/362-3331). Or equal
 - 6. Larsen Products Corp., Rockville, MD (301/770-5200 or 800/633-6668).
 - 7. Master Builders Technology, Inc., Cleveland, OH, (216/831-5500; local representative, Rancho Cucamonga, CA, 909/466-6267).
 - 8. W.R. Meadows, Inc., Elgin, IL (700/683-4500; local representative Walnut, CA, 909/469-2606 or 800/342-5976).
 - 9. Sonneborn Building Products, Division of ChemRex, Inc., Minneapolis, MN (612/835-3434 or 800/433-9517).
 - 10. Stonhard, Inc., USA, Maple Shade, NJ (800/736-9300).
 - 11. Thoro System Products, Miami, FL (800/327-1570).
 - 12. Symons Corporation, Des Plaines, IL (708/298-3200; local representative, Industry, CA, 818/330-6855).
- B. Bonding Compound: Polyvinyl acetate, acrylic or styrene butadiene base. Provide polyvinyl acetate compound at interior locations only. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600.
 - 1. Polyvinyl Acetate (Interior Only):
 - a. Superior Concrete Bonder by Dayton Superior Corp.
 - b. Euco Weld by Euclid Chemical Co.
 - c. Weld-Crete by Larsen Products Corp.
 - d. Everweld by L&M Construction Chemicals, Inc.
 - e. Ready Bond by Symons Corp.
 - 2. Acrylic or Styrene Butadiene:
 - a. Acrylic Bondcrete by The Burke Co.
 - b. Day-Chem Ad Bond by Dayton Superior Corp.
 - c. SBR Latex by Euclid Chemical Co.

- d. Hornweld by Tamms Industries Co. (A.C. Horn).
- e. Everbond by L&M Construction Chemicals, Inc.
- f. Acryl-Set by Master Builders Inc.
- g. Intralok by W.R. Meadows, Inc.
- h. Sonocrete by Sonneborn.
- i. Stonlock LB2 by Stonhard, Inc.
- j. Strong Bond by Symons Corp.
- 2.5 CURING, HARDENING AND SEALING MATERIALS
- A. Specified Manufacturer: Sonneborn Building Products, Division of ChemRex, Inc., Minneapolis, MN (612/835-3434 or 800/433-9517).
- B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 Product Requirements.
 - 1. The Burke Co., Buffalo, NY (716/832-5959; local representative, Fountain Valley, CA, 714/556-4510).
 - 2. Dayton Superior Corporation, Chemical Operations, Oregon, IL (815/732-3136 or 800/745-3707; local office, Santa Fe Springs, CA, 310/946-5504 or 800/745-3701).
 - 3. Euclid Chemical Co., Cleveland, OH (216/531-9222 or 800/321-7628).
 - 4. Fortifiber Corp., Los Angeles, CA (213/268-6783 or 800/443-4079).
 - 5. L&M Construction Chemicals, Inc., Omaha, NE (402/453-6600 or 800/362-3331).
 - 6. Larsen Products Corp., Rockville, MD (301/770-5200 or 800/633-6668).
 - 7. Master Builders Technology, Inc., Cleveland, OH, (216/831-5500; local representative, Rancho Cucamonga, CA, 909/466-6267).
 - 8. W.R. Meadows, Inc., Elgin, IL (700/683-4500; local representative Walnut, CA, 909/469-2606 or 800/342-5976).
 - 9. Sonneborn Building Products, Division of ChemRex, Inc., Minneapolis, MN (612/835-3434 or 800/433-9517).
 - 10. Stonhard, Inc., USA, Maple Shade, NJ (800/736-9300).
 - 11. Tamms Industries Co. Div. of LaPorte Construction Chemicals of North America, Inc., Kirkland, IL (815/522-3394 or 800/218-2667).
 - 12. Thoro System Products, Miami, FL (800/327-1570).
 - 13. Symons Corporation, Des Plaines, IL (708/298-3200; local representative, Industry, CA, 818/330-6855).
- C. Curing, Hardening and Sealing Materials, General: Provide materials suitable for concrete finish and not detrimental to materials to be applied to concrete. Materials shall be compatible with concrete admixtures, shall be recommended by manufacturer for intended use and shall comply with applicable air quality requirements of authorities having jurisdiction.

- D. Concrete Curing Compounds: None specified. Concrete curing shall be by moist curing using moisture-retaining cover method only and not by using curing compounds.
- E. Moisture-Retaining Cover: One of the following, complying with ASTM C 171, for moist curing of concrete. Add water-absorbing blanket-type curing material such as carpet, for placement on top of sheeting to ensure moisture retention under severe sun exposure and high heat.
 - 1. Waterproof paper: ASTM C 171, non-staining reinforced type, Sisalkraft Orange Label by Fortifiber Corp., or equal.
 - 2. Polyethylene film: 6 mil clear polyethylene sheet.
 - 3. White burlap-polyethylene sheeting: White burlap-polyethylene sheeting, Burlene brand or equal, complying with ASTM C 171, for contact with concrete surface.
- F. Concrete Hardening and Sealing Compound, Natural Color Concrete: For exposed, natural color floor slabs in service areas, where indicated on the Drawings as "Sealed", Sonneborn Lapidolith concrete hardening compound, chemically-active solution which interacts with free lime in concrete to form dense, impervious wearing surface.
- 2.6 JOINT DEVICES, FILLER MATERIALS AND OTHER ACCESSORY PRODUCTS
 - A. Cold (Construction) Joints: Keyed Kold by The Burke Group, Inc., or approved equivalent, formed 24 gage galvanized steel joint form, with Keyed Kold stakes.
 - B. Control (Contraction) Joints: Preformed joint materials are not required. Sawcut joints after concrete placement and finishing.

2.7 SKATEBOARD DETERRENTS

A. All retaining walls, benches, or any other features of 48" in height or less must have an architectural dentil block or notch every 36 inches maximum to interrupt the continuous edge. Each block or notch must be a minimum of 1.5 inches wide with square corners and protrude or indent a minimum of .75 inches. Add-on deterrents are acceptable if incorporated into the scope and construction, and approved in writing by the district in advance.

PART 3 - EXECUTION

3.1 CONCRETE MIX DESIGN

- A. Concrete Mix Design: Comply with California Building Code (CBC) Sections 1905A.2, 1905A.3 and 1905A.4.
 - 1. Concrete supplier shall determine mix designs and shall provide test results for each proposes mix design to establish the following:
 - a. Gross weight and yield per cubic yard of trial mixes.
 - b. Measured slump.
 - c. Measured air content.
 - d. Compressive strength developed at 7 days and 28 days, from not less than 3 test cylinders cast for each 7-day and 28-day test, and for each design mix.

- 2. Provide concrete for the following characteristics:
 - a. 7-day compressive strength shall be at least 60 percent of required 28-day strength.
 - b. 28-day compressive strength for structural concrete shall be as indicated on the (Structural) Drawings. If not indicated, minimum compressive strength shall be 3000 psi. For slabs on grade concrete, mix shall have minimum of 5-1/2 sacks of portland cement per cubic yard.
 - c. 28-day compressive strength for non-structural concrete shall be as follows:
 - 1) Equipment pads, site appurtenances, exterior concrete slabs on grade and utility structures: Not less than 3000 psi.
 - 2) Pipe and conduit encasement: Not less than 2000 psi.
 - d. Water-cement ratio shall not exceed 0.6 for all concrete, except interior slabs on grade shall not exceed 0.42. Comply with California Building Code (CBC) Section 1904A, Table 19A-A-2 and Table 19A-A-4.
 - e. Chloride content of the entire mix shall not exceed 0.06 percent by volume.
- B. Selection of Proportions:
 - 1. The proportioning of ingredients shall be such that the concrete can be readily worked into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.
 - 2. The acceptability of the mix proportions shall be determined by either laboratory trial batch or field experience methods, as specified in California Building Code (CBC) Section 1905A.3.
 - 3. Proportioning by weight of loose, dry material, 94 pounds of cement shall be considered 1 cubic foot.
 - 4. Fine aggregate volume shall be at least 35 percent, with a maximum of 50 percent, of the sum of the separate fine and coarse aggregate volumes.
 - 5. Weighing equipment shall be accurate within 1 pound and be adjustable for varying aggregate moisture content.
 - 6. A beam auxiliary shall register any part of the last 100 pounds of each aggregate. The aggregate hopper shall have a volume adjustment.

END OF SECTION

03 60 00 – GROUTING

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Shrinkage-resistant grout and grouting of structural framing baseplates, equipment anchors and miscellaneous metal fabrications.

PART 2 - PRODUCTS

2.1 GROUTING COMPOUNDS

- A. Specified Manufacturers: Products of the following manufacturers are specified and will be acceptable provided they comply with referenced standards all other requirements of the Contract Documents. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600:
 - 1. Dayton Superior Corporation, Chemical Operations, Oregon, IL (815/732-3136 or 800/745-3707; local office, Santa Fe Springs, CA, 310/946-5504 or 800/745-3701).
 - 2. Euclid Chemical Co., Cleveland, OH (216/531-9222 or 800/321-7628).
 - 3. L&M Construction Chemicals, Inc., Omaha, NE (402/453-6600 or 800/362-3331).
 - 4. Master Builders Technology, Inc., Cleveland, OH, (216/831-5500; local representative, Rancho Cucamonga, CA, 909/466-6267).
 - 5. W.R. Meadows, Inc., Elgin, IL (700/683-4500; local representative Walnut, CA, 909/469-2606 or 800/342-5976).
 - 6. The Rawl Plug, Inc., New Rochelle, NY (914/235-6300).
 - 7. Sika Corporation, Lyndhurst, NJ (201/933-8800; local representative, Santa Fe Springs, CA, 310/941-0231).
 - 8. Sonneborn Building Products, Division of ChemRex, Inc., Minneapolis, MN (612/835-3434 or 800/433-9517).
- B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. The Burke Co., Buffalo, NY (716/832-5959; local representative, Fountain Valley, CA, 714/556-4510).
 - 2. Larsen Products Corp., Rockville, MD (301/770-5200 or 800/633-6668).

- 3. Tamms Industries Co. (A.C. Horn), Mentor, OH (216/974-2399 or 800/218-2667; local representative, Los Angeles, CA, 213/269-1846).
- 4. Thoro System Products, Miami, FL (800/327-1570).
- 5. Stonhard, Inc., USA, Maple Shade, NJ (800/736-9300).
- 6. Symons Corporation, Des Plaines, IL (708/298-3200; local representative, Industry, CA, 818/330-6855).
- 2.2 METALLIC SHRINKAGE-RESISTANT GROUT:
- A. For filling under equipment and interior miscellaneous metal fabrications; pre-mixed factory-packaged compound, metallic aggregate, minimum 5000 psi 28-day compressive strength. Confirm product selection with manufacturer's recommendations for intended use. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600.
 - 1. Firmix by Euclid Chemical Co.
 - 2. Ferrogrout by L&M Construction Chemicals, Inc.
 - 3. Embeco 636 or Embeco 885 by Master Builders Technology, Inc.
 - 4. Kemox G by Sika Corporation.
 - 5. Ferrolith G by Sonneborn.
- 2.3 NON-METALLIC SHRINKAGE-RESISTANT GROUT:
- A. For filling around anchors for exterior miscellaneous metal fabrications; pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621, minimum 5000 psi 28-day compressive strength. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600.
 - 1. Sure Grip Grout by Dayton Superior.
 - 2. Euco N.S. by Euclid Chemical Co.
 - 3. Crystex by L&M Construction Chemicals, Inc.
 - 4. Masterflow 713 or Masterflow 928 by Master Builders Technology, Inc.
 - 5. Sealtight 588 Grout by W.R. Meadows.
- 2.4 SHRINKAGE-RESISTANT SETTING GROUT:
- A. For setting railing posts and similar components in sleeves or blockouts in concrete; premixed, natural aggregate, minimum 5000 psi 28-day compressive strength, Master Builders Technology, Inc., Set Grout.
- 2.5 NON-SHRINK POLYMER (EPOXY) GROUT (For setting anchor bolts in concrete):
 - A. For anchor bolts for structural members: Foil Fast Injection Gel Anchor System by The Rawl Plug, Inc., New Rochelle, NY (914/235-6300), or approved equal.

B. For anchor bolts for non-structural components: Polymer (epoxy) grout, Brutem MP or AB by Master Builders Technology, Inc., as recommended by manufacturer for intended use.

PART 3 - EXECUTION na

END OF SECTION

DIVISION 05 - METALS

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements

05 05 23 – METAL FASTENINGS

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Anchors and fasteners for connection to concrete and steel construction.
 - B. General requirements for welding of steel products.

PART 2 - PRODUCTS

- 2.1 ANCHORS, FASTENERS AND ACCESSORY MATERIALS
 - A. Anchors and Fasteners, General: Same material, color and finish as the metal to which applied, unless otherwise indicated.
 - B. Exterior Exposure: Provide stainless steel.
 - C. Type, Size and Spacing: Unless otherwise indicated, provide fasteners of type, grade and class required for intended use and sized and spaced as required for loads and substrate.
 - D. Screw Head, Typical: Unless otherwise noted, exposed screws shall be phillips oval or flat head, countersunk.
 - E. Standard Bolts and Nuts, Steel: ASTM A307, Grade A, hexagonal head.
 - F. Lag Screws and Bolts, Steel: ANSI B18.2.1, type and grade best suited for the purpose, hexagonal or square head.
 - G. Plain Steel Screws: FS FF-S-85, FS FF-S-92 and FS FF-S-111; type and grade best suited for the purpose.
 - H. Stainless Steel Screws: AISI 300 Series.
 - I. Self-Drilling Metal Fasteners: TEKS by Buildex Division, Illinois Tool works, Inc.
 - J. Plain Steel Washers: FS FF-W-92, round, carbon steel.
 - K. Lock Washers: FS FF-W-84, helical spring, carbon steel.
 - L. Toggle Bolts: Not permitted. Depending upon substrate, use expansion anchor or use screw into appropriate backing material.
 - M. Concrete Anchors, Epoxy Adhesive Type: Manufacturer, product, type and size as identified on Structural Drawings. If products are not indicated on Drawings, then provide anchors as directed by the Architect (Structural Engineer) and approved by Division of the State Architect (DSA). Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements, if approved by DSA. Comply with DSA Interpretation of Regulations Document IR 19-1.

- N. Concrete and Masonry Anchors, Wedge-Type: Manufacturer, product, type and size as identified on Structural Drawings. If products are not indicated on Drawings, then provide anchors as directed by the Architect (Structural Engineer) and approved by Division of the State Architect (DSA). Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements, if approved by DSA. Comply with DSA Interpretation of Regulations Document IR 19-1.
- O. Concrete and Masonry Anchors, Self-Threading: Manufacturer, product, type and size as identified on Structural Drawings. If products are not indicated on Drawings, then provide anchors as directed by the Architect (Structural Engineer) and approved by Division of the State Architect (DSA). Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements, if approved by DSA. Comply with DSA Interpretation of Regulations Document IR 19-1.
- P. Fiber Plugs and Screws: Not permitted.
- Q. Lead Expansion Shields: Not Permitted.
- R. Powder-Actuated Driven Fasteners: Comply with notes on Drawings and the following.
 - 1. Use only if acceptable to Architect (Structural Engineer), generally not permitted where not specifically indicated or in load-bearing installations; Fed Spec FF-P-395 or Fed Spec GGG-D-777; as produced by ITW Ramset/Red Head, Wood Dale, IL (708/350-0370; regional representative, City of Commerce, CA, (California) 800/368-9724 or (National) 800/227-1823) in compliance with ICBO Evaluation Service, Inc. Evaluation Report ER-1147.
 - Equivalent products by Hilti Corporation, Tulsa, OK (918/627-9711 or 800/879-8000), will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.
- S. Welding Rods and Bare Electrodes: As indicated on (Structural) Drawings for welding of structural (load-bearing) members. If not indicated, select rods and electrodes in accordance with AWS D1.1 Code for Welding in Building Construction, applicable to metal alloy to be welded.

PART 3 - EXECUTION na

END OF SECTION

05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SECTION INCLUDES

- A. Light structural steel framing members and structural steel support members, with required bracing, welding and fasteners.
- B. Steel and aluminum, materials for miscellaneous metal fabrications specified in this Section and required but not specified in other Sections.
- C. Characteristics, including fabrication and finish requirements for metal fabrications not otherwise specified in other Sections.
- D. Galvanizing of steel products.
- E. Shop priming and painting of steel fabrications.
- F. Miscellaneous metal fabrications, such as:
 - 1. Loose bearing and leveling plates.
 - 2. Steel angle nosings and thresholds.
 - 3. Rough hardware.
 - 4. Sleeves for penetrations through structural members and stud partitions.

PART 2 - PRODUCTS

- 2.1 FERROUS METALS
 - A. Steel Shapes: Steel plates, bars, angles, channels, and H-sections: ASTM A36.
 - B. Steel Tube:
 - 1. Hot-rolled: ASTM A501.
 - 2. Cold-formed: ASTM A500.
 - C. Steel Pipe: ASTM A53 (black steel and hot-dip galvanized).
 - D. Steel Sheet:
 - 1. For structural uses: Hot-rolled, ASTM A570; cold-rolled, ASTM A611.
 - 2. For nonstructural uses: Cold-rolled, ASTM A366; hot-rolled, ASTM A569.
 - E. Steel for Galvanized Products:

- 1. Structural shapes, plates and bars: From fully killed or semi-killed steel, ASTM A36 or A572, except silicon content in the range 0 to 0.4 percent or 0.15 to 0.25 percent, as applicable, only.
- 2. Steel fasteners: ASTM 307, Grade A or B for bolts; ASTM A563, Grade A for nuts.
- 3. Sheet steel: ASTM A526, with ASTM A525, Coating Designation G90, for precoated sheet; ASTM A569 or A570 for sheet used in fabrications.
- 4. Steel for pipe and tubing: ASTM A53, A120 or A595 Grade A or B.
- 5. Galvanizing: See requirements specified below.
- 2.2 CORROSION-RESISTANT (STAINLESS) STEEL
 - A. Bars, Shapes and Forgings: ASTM A276, Type 302 or 304 as best suited for intended purpose.
 - B. Plates, Sheets and Strips: ASTM A167 or ASTM A176, Type 302 or 304 as best suited for intended purpose.
 - C. Finish: Brushed, No. 4 finish, unless otherwise indicated.
- 2.3 ALUMINUM MATERIALS
 - A. Aluminum Bars, Rod and Wire and Non-Structural Tubes: ASTM B211 for rolled or coldfinished; ASTM B221 for extruded. Provide alloy and temper best suited for purpose.
 - B. Aluminum Sheet and Plate: ASTM B209, temper best suited for purpose.
 - C. Cast Aluminum: ASTM B103, alloy and temper best suited for purpose.
 - D. Finishes:
 - 1. Unexposed sheet and plate: Mill finish.
 - 2. Castings: Sandblast finish, medium, equal to NAAMM Metal Finishing Manual, Designation AA-M43.
 - 3. Anodizing: When indicated, AA Class I, except Class II for products in corrosive atmosphere, coating thickness in conformance to AA Designation System for Aluminum Finishes, polished satin finish on aluminum before coating, with clear lacquer overcoating.

2.4 ANCHORS, FASTENERS AND ACCESSORY MATERIALS

- A. Anchors and Fasteners, General: Comply with general requirements specified in Section 05 05 23 Metal Fastenings. Unless otherwise indicated, provide fasteners of type, grade and class required for intended use and sized and spaced as required for loads and substrate. Provide stainless steel fasteners at stainless elements and other elements at exterior locations.
- B. Grouting Compounds: Comply with requirements specified in Section 03 60 00 Grouting.
- C. Shop Primer Paint:
 - 1. Shop primer, general: Coordinate primer with finish paint and coating, as applicable, to provide sound foundation for field-applied topcoats despite prolonged exposure during construction. Refer to Section 09 90 00 Painting and Coating.

- 2. Shop primer for ferrous metal at exposed exterior locations: Tnemec Series 90-97 Tneme-Zinc Two-part Catalyzed Epoxy Coating.
- 3. Shop primer for ferrous metal at concealed exterior locations and for interior locations: Tnemec Series 10, modified alkyd rust-inhibitive primer, or manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer, complying with performance requirements of SSPC - Paint 13.
- 4. Shop primer for galvanized steel, for exposed exterior locations: Tnemec Series 66 Epoxyline Two-Part Catalyzed Epoxy Coating, or approved equivalent compatible with finish coating.
- D. Field Primer and Finish Paints: As specified in Section 09 90 00 Painting and Coating.
- E. Bituminous Coating: High-build mineral-filled coal tar pitch coating, Tnemec 46-450 Heavy Tnemecol, or equal; or a cold-applied asphalt mastic complying with SSPC Paint 12, except containing no asbestos fibers.

PART 3 - EXECUTION

- 3.1 METAL FABRICATIONS, GENERAL
 - A. Metal Fabrications, General: Provide metal fabrications of shapes and sizes indicated for profiles shown.
 - 1. Where specific sizes are not indicated, provide materials of sufficient size, thickness and type to provide necessary strength and durability.
 - 2. Thickness of metal, details of metal, details of assembly and support shall give ample strength and stiffness for the intended purpose.
 - 3. Provide brackets, flanges and anchors of cast or formed metal of the same type material and finish fabricated product, unless otherwise indicated.
 - 4. For exterior fabrications, allow for thermal movement in the design, fabrication, and installation of metal fabrications, to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Accommodate temperature range of 100 degrees F.
 - B. Ferrous Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide ferrous metals materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
 - C. Preparation Before Fabrication: Remove loose mill scale and rust and remove twists and bends in manners not injurious to materials and finishes.
 - D. shop drawings.
 - 1. Contractor shall verify measurements before fabrication.
 - 2. Hot-dip galvanize fabricated ferrous items after fabrication. Field connections shall be bolted or screwed where possible. Avoid field cutting and welding which damage galvanized coating.

- 3. Fabricate and shop-assemble in largest practical sections for delivery to site.
- 4. Prepare and reinforce fabrications as required to receive applied items.
- E. Cutting and Fitting: Fabricate with accurate angles and surfaces, true to the required lines and levels and as required to suit installation conditions.
 - 1. Fabricate items with joints tightly fitted and secured.
 - 2. Make exposed joints tight, flush, and hairline.
 - 3. Punch, drill and ream in manner to leave clean, true lines and surfaces.
 - a. Oversize hole 1/16-inch by punching, when material thickness is equal to or less than bolt diameter plus 1/8-inch.
 - b. Sub-punch 1/16-inch smaller than bolt and drill or ream to oversize by 1/16-inch, when material thickness is thicker than bolt diameter plus 1/8-inch.
 - 4. Gas cutting of steel will be acceptable where stress will not be transmitted through flame-cut surfaces.
 - a. Make cuts clean and to contour.
 - b. Deduct 1/8-inch from effective width of members cut by torch.
 - 5. Cut, reinforce, drill and tap metal fabrications as necessary to receive finish hardware, screws, and similar items.
 - 6. Provide cutouts, fittings, and anchorage provisions as required for coordination of assembly and installation with other Work.
- F. Edges: Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work. Remove sharp or rough areas on exposed traffic surfaces.
- G. Welding: Weld corners and seams continuously to comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- H. Coordination: Make provisions to connect metal fabrications with or to receive work specified in other Sections.
- I. Connections, General: Component parts of built-up members shall be well-pinned with closely-fitted contact. Conceal connections where possible. Otherwise, make countersinks for concealment after fabrication, except where noted.
- J. Joints, General: Fit or miter to hairline tolerances. Provide lugs, clips, anchors and miscellaneous fastenings necessary for complete assembly and installation. Component parts of built-up members shall be well-pinned with closely fitted contact.

- 1. Joints on finished surfaces: Provide welds ground smooth and filled.
- 2. Joints exposed to weather or water: Fabricate to keep water out, or provide adequate drainage of water that penetrates.
- K. Steel Tubing and Piping Fabrication: Unless otherwise indicated, close ends with plate stock so no exposed ends of tubing and piping. Grind all edges.
- L. Mechanical Finishes: Complete finishing prior to fabrication wherever possible.
 - 1. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match finish.
 - 2. Protect finish on exposed surfaces by using temporary protective covering.
- M. Sheet Metal Joints: Hem exposed edges.
- N. Embedded Fabrications: For embedment in concrete, provide weld-on lugs or anchors as detailed or necessary.
- O. Bolted and Screwed Connections:
 - 1. Provide holes and connections for Work specified in other Sections.
 - 2. Use bolts for field connections only.
 - 3. Draw all nuts tight and nick threads of permanent connections.
 - 4. Use beveled washers where bearing is on sloped surfaces. Where screws must be used for permanent connections in ferrous metal, use flat head type, countersunk, with screw slots filled and finished smooth and flush.
- P. Brazing: Brazing shall be of adequate strength and durability with joints tight and flush, smooth and clean. All exposed surfaces shall be ground and finished flush, free of brazing discoloration and other marks. Brazing on finished surfaces shall be indistinguishable from parent metal.
- Q. Welding: Conform to AWS D1.1. Do not field weld galvanized components to remain unfinished. Grind welds smooth and flush with base material. Re-weld to fill holes. Putties and fillers will not be accepted.
- R. Light Structural Steel Framing Fabrications: Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges.
 - 1. General: Design of fabrications shall be by licensed Professional Engineer, registered in the State of California. Fabricate structural steel members in accordance with AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings and in compliance with Uniform Building Code (CBC), Chapter 22A.
 - 2. Shop Connections: Make welded connections by shielded-arc method in accordance with AWS D1.1.
 - a. For load-bearing fabrications, comply with requirements specified in Section 05120 Structural Steel.
 - b. Welding shall be done in the shop unless otherwise shown or specified.
 - c. Prior to welding, preheat members in accordance with AISC Section J2.7.
 - d. All welds not otherwise identified shall be continuous fillet welds, with size based on AISC standards for thicker part being joined.

- e. Grind and dress smooth all welds exposed in finished Work to preserve shape and profile of welded item.
- 3. Welding Inspection: For load-bearing fabrications, shop welding shall be continuously inspected by certified inspector, except welding performed by an approved fabricator, as described in California Building Code (CBC) Chapter 17A, Section 1701A.7.
- 4. Field Connections: Provide bolted connections, except where welded connections are indicated.
- 5. Shop Painting: Shop prime all light structural steel fabrications, except fabrications to be encased in concrete. Apply one-coat shop primer paint system in accordance with SSPC Paint System PS 7.01.
- S. Steel Tubing and Piping Fabrications: Close ends with plate stock, no exposed ends; grind edges.
- T. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly.
 - 1. Disassemble units only as necessary for shipping and handling limitations.
 - 2. Use connections that maintain structural value of joined pieces.
 - 3. Clearly mark units for reassembly and coordinated installation.

3.2 GALVANIZING

- A. Galvanizing, General:
 - 1. Ferrous metal fabrications shall be galvanized only as specified or noted on the Drawings.
 - 2. Where galvanized finish is specified or noted, ferrous fabrications shall galvanized in accordance with applicable referenced ASTM standards, after fabrication.
 - 3. Galvanizing shall be by hot dip method only, unless otherwise specified.
- B. Product Fabrication, General: Fabricate products to be galvanized in accordance with Recommended Details for Galvanized Structures by American Hot Dip Galvanizers Association, Inc.
 - 1. Comply with applicable portions of ASTM A143, A384 and A385, except as otherwise specified herein. Avoid techniques which could cause distortion or embrittlement of steel.
 - 2. Notify Architect before and during submittals review and before fabrication proceeds, of potential warpage problems which may require design modification.
- C. Product Preparation for Galvanizing:
 - 1. Remove welding slag and burrs.
 - 2. Provide holes and lifting lugs as necessary for handling during galvanizing process and only at positions approved by Architect.
 - 3. Remove grease, oil, paint and other deleterious materials.
 - 4. Do not use unsuitable marking paints on steel prior to galvanizing.

- 5. Use blast cleaning or other method as necessary if surface contaminants and coatings cannot be removed by normal chemical cleaning process.
- D. Surface Preparation:
 - 1. Pre-clean using caustic bath, acid pickle and flux.
 - 2. Alternatively, pre-clean by blast cleaning and fluxing.
 - 3. Conform to ASTM A123 and A386, as applicable, for steel members, fabrications and assemblies.
 - 4. Conform to ASTM A153 for bolts, nuts and washers, and steel hardware components.
 - 5. Conform to ASTM A143 for protection against embrittlement.
- E. Galvanizing Bath: Use not less than 98.0 percent zinc.
- F. Zinc Coating Weight: Conform to Paragraph 6.1 of ASTM A123, Table 1 of ASTM A153 and Table 1 of ASTM A386, as applicable.
- G. Zinc Coating Surface Finish: Wipe down surfaces after dip to remove pin holes, scale, drips, runs and points. Finish shall be continuous, adherent, smooth and evenly distributed, free from defects detrimental to intended end use and finishing of coated product.
- H. Zinc Coating Adhesion: Adhesion shall be sufficient to withstand normal handling during transport and erection.
- I. Cold Galvanizing Compound: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20; ZRC Zinc Rich Coating, or equal.
- J. Portions Not to Receive Galvanizing: Protect portions of parts to be embedded in concrete from galvanizing, except galvanize anchors and sleeves built into concrete and masonry.
- 3.3 SHOP PAINTING
 - A. Shop Priming and Painting, General: Conform to SSPC Painting Manual.
 - B. Products to be Primed: Shop primer paint after fabrication all metal fabrications, except as follows.
 - 1. Do not prime stainless steel, plated steel and anodized aluminum fabrications, unless specifically noted.
 - 2. Do not prime mill finish aluminum fabrications intended to remain unfinished.
 - 3. Do not shop prime galvanized fabrications, unless specifically noted.
 - 4. Do not shop prime fabrications embedded in concrete or mortar.
 - 5. Do not shop prime fabrications for which an entirely field-applied coating system is indicated.
 - C. Preparation for Priming: Prepare all surfaces to be coated, as follows.
 - 1. Solvent-clean in accordance with SSPC-SP 1.
 - Exterior fabrications: Clean in accordance with SSPC-SP 5, SSPC-SP 6, SSPC-SP 8, or SSPC-SP 10.

- 3. Interior fabrications: Clean in accordance with SSPC-SP 3, SSPC-SP 5, SSPC-SP 6, SSPC-SP 8, or SSPC-SP 10.
- D. Shop Priming: Comply with SSPC-PA 1. Coordinate with requirements specified in Section 09 90 00 Painting and Coating.
 - 1. Apply primer immediately following surface preparation.
 - 2. Do not prime surfaces to be welded.
 - 3. Do not prime surfaces in direct contact bond with concrete or mortar.
 - 4. Spray apply shop prime without holidays, drips, runs.
 - 5. Provide two coats where product will not be finish painted or will be concealed in completed work.
 - 6. Apply an additional coat to corners, welds, edges, and fasteners.
- E. Drying: Allow paint to dry before handling.
- F. Steel Embedded in Concrete: Coat concealed faces with bituminous coating.
- G. Galvanizing Pre-Treatment: Where zinc-coated surfaces are specified to be shop primed, chemically treat surfaces to provide bond for paint before applying primer.
- H. Shop-Applied Finish Painting: Apply thermosetting enamel paint, gloss or semi-gloss, of a type and color as selected and approved by Architect, if not otherwise specified.
 - 1. Shop applied finish paint shall be baked to set and cure.
 - 2. Allow finish paint to thoroughly dry and cure before handling.

3.4 ROUGH HARDWARE

- A. Rough Hardware, General: Provide bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as indicated on Drawings.
- B. Rough Hardware Fabrication: Fabricate items to sizes, shapes, and dimensions required. Provide malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

3.5 SLEEVES

- A. Sleeves: Fabricated from steel pipe as indicated on Drawings and specified for plumbing, mechanical and electrical Work.
- B. Diameter: See Structural Drawings for additional requirements. Diameter shall be such that sleeve provides required clearance for components passing through it, including thermal insulation and firestopping materials.
- C. Sleeves Through Concrete and Masonry: Fabricate sleeve from standard weight steel pipe, galvanized after fabrication where below grade or exposed to weather or wet or damp conditions.
- 3.6 LOOSE BEARING AND LEVELING PLATES
- A. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on concrete and masonry construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize fabrications after fabrication.
- 3.7 STEEL ANGLE NOSINGS AND THRESHOLDS
 - A. Steel Angle Nosings and Thresholds: Steel angle shapes, size and weight as indicated on Drawings, hot-dip galvanized after fabrication, with steel bolts or bent steel strip welded to underside to anchor in place.
- 3.8 PIPE BOLLARDS
 - A. Steel Pipe Bollards: As detailed on Drawings. Provide for padlocks at removable bollards, as detailed on Drawings.
 - B. Material: Standard weight, galvanized steel pipe, size as indicated on Drawings.
 - C. Cap: Formed steel, where indicated on Drawings.
 - D. Sleeves for Removable Bollards: Fabricate from steel pipe, sized as indicated on Drawings.
 - E. Grout: Where fill inside of steel pipe is indicated, portland cement and sand mixture, dome shaped at top as indicated on Drawings.
- 3.9 OTHER FABRICATIONS
 - A. Other Fabrications: Provide fabrications not specifically described but required for a complete and proper installation, as selected by the Contractor, subject to review by Architect.

END OF SECTION

05 52 00 – METAL RAILINGS

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Railings at exterior stairs and ramps.
- 1.3 SUBMITTALS
 - A. Submit shop drawings of all metal railing installations.

PART 2 - PRODUCTS

- 2.1 STEEL MATERIALS
 - A. Steel Bars and Bar Sized Shapes: ASTM A306 Grade 65 or ASTM A36.
 - B. Steel Pipe: ASTM A53 Grade A, Schedule 40 seamless or welded.
 - C. Cast Iron: ASTM A48, Class 30 or higher, soft gray iron.
 - D. Malleable Iron Casting: ASTM A47, Grade 32510.
 - E. Steel Tubing, Hot-formed, Welded or Seamless: ASTM A501.
 - F. Welding Rods: ASTM A233 Series E60 or E70, conforming to AWS D1.1.

2.2 GROUTING COMPOUNDS

- A. Specified Manufacturer: Master Builders Technology, Inc., Cleveland, OH, (216/831-5500; local representative, Rancho Cucamonga, CA, 909/466-6267).
- B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. Euclid Chemical Co., Cleveland, OH (216/531-9222 or 800/321-7628).
 - 2. L&M Construction Chemicals, Inc., Omaha, NE (402/453-6600 or 800/362-3331).
 - 3. Sika Corporation, Lyndhurst, NJ (201/933-8800; local representative, Santa Fe Springs, CA, 310/941-0231).
- C. Shrinkage-Resistant Setting Grout: For setting railing posts and similar components in sleeves or blockouts in concrete; pre-mixed, natural aggregate, minimum 5000 psi 28-day compressive strength, Master Builders Technology, Inc., Set Grout.

2.3 ACCESSORY MATERIALS

- A. Primer Coating: For shop application at time steel products are fabricated.
 - 1. Specified Manufacturer: Tnemec Company, Inc., Kansas City, MO (local representative, TPC Consultants, Inc., Manhattan Beach, CA, 310/643-5191).
 - Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 -Product Requirements.
 - a. Ameron Protective Coatings, Brea, CA (714/529-1951 or 800/344-0025).
 - b. Carboline Company, St. Louis, MO (800/848-4645).
 - c. Primer coating for plain steel: Tnemec Series 90-97 Tneme-Zinc, two-component catalyzed epoxy coating.
 - d. Primer coating for galvanized steel: Tnemec Series 66 Epoxoline, two-component catalyzed epoxy coating.
- B. Expansion Anchors: Wedge-type anchors. Provide manufacturer, product, type and size as identified on Structural Drawings. If products are not indicated on Drawings, then provide anchors as directed by the Architect (Structural Engineer) and approved by Division of the State Architect (DSA). Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements, if approved by DSA. Comply with California Building Code (CBC) Section 1923A.3 and Division of the State Architect (DSA) Interpretation of Regulations Document IR 19-1. Powder-actuated driven fasteners will not be acceptable.

PART 3 - EXECUTION

- 3.1 STEEL PIPE HANDRAILS AND GUARDRAILS
 - A. Steel Pipe Handrails and Guardrails, General: Fabricate railings in accordance with NAAMM Pipe Railing Manual and as required for specified design requirements. Provide stock pipe and tubing and manufactured components sized and arranged as indicated on Drawings and specified herein.
 - B. Round Railings: Standard weight steel pipe or tubing, unless otherwise noted.
 - C. Internal Stiffeners: Cast iron, malleable iron, pipe or tube. Fit snugly.
 - D. Dimensions, Spacing and Configuration: As shown on Drawings and as specified herein.
 - 1. Handrails: For stairs and ramps, size as indicated on the Drawings, minimum 1-1/4 inches net outside diameter to maximum 1-1/2 inches net outside diameter, configured for 1-1/2 inches clear from side walls.
 - 2. Top Rails: Run continuously over posts, level and not less than minimum height indicated on the Drawings and required by California Building Code (CBC).
 - 3. Vertical Members: Lay out as shown, evenly spacing verticals in each run Where two runs are adjacent to each other, align verticals on each side. Set posts as required for design requirements and a maximum of 60-inches on center. Fabricate verticals for plumb and true installation.

- 4. Bottom Railing: Parallel to top rail and with floor surface or stair stringer, as applicable.
- 5. Alignment: Centerline of members within each railing run shall be in same vertical plane.
- E. Cutting and Fitting:
 - 1. Power cut throughout; gas cutting not permitted at joint.
 - 2. Cope to fit intersecting members. Bevel ends to receive full fillet weld.
 - 3. Provide corners neatly mitered, coped, welded and ground smooth.
 - 4. Provide connections with fittings or, at Contractor's option, neatly coped, welded and ground.
- F. Fabrication:
 - 1. Fabricate railings in largest practicable sections to minimize field joints.
 - 2. Fabricate rails in true, straight alignment.
 - 3. Provide for field-welded joints. Fabricate to hairline tolerances before welding.
 - 4. Grind projections, terminations and edges smooth.
 - 5. Provide closures on exposed ends.
 - 6. Do not use exposed fastening plates except as specifically detailed. Use concealed plug or direct welding as applicable.
- G. Welding: Provide backup or stiffeners at joints to hold joint in perfect alignment during welding. Weld all around joint. Grind all welds smooth and dressed.

3.2 SLEEVES AND POST HOLES

A. Sleeves for Removable Railing Sections: Steel pipe sleeve, oversized to provide minimum of 1/8-inch difference between inside diameter of sleeve and outside diameter of removable post or bollard.

3.3 SHOP PAINTING

- A. Shop Painting, General: Conform to SSPC Painting Manual.
- B. Products to be Primed: Prime paint all parts after fabrication.
- C. Preparation for Priming: Thoroughly prepare by removing all oil, grease, weld slag and other deleterious substances.
- D. Steel Embedded in Concrete: Coat concealed faces with bituminous coating.
- E. Priming: Spray apply shop prime Provide two coats where product will not be finish painted or will be concealed in completed Work. Sand and re-prime areas where coverage is incomplete or where runs occur.
- F. Primer Paint Application:
 - 1. Spray apply primer paint, to minimum thickness recommended by primer manufacturer, without holidays, drips, runs.
 - 2. Apply one coat typically and two coats where coated product will not be finish painted.

- 3. Do not prime surfaces to be in contact with concrete.
- 4. Sand and re-prime areas where coverage is incomplete or where runs occur.
- G. Drying: Allow paint to thoroughly dry before handling

END OF SECTION

DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements

06 11 00 – WOOD FRAMING

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Rough carpentry for the following structural purposes:
 - 1. Framing with lumber for walls and roofs.
 - 2. Sheathing with plywood or other wood panel products.
 - B. Rough carpentry for non-load bearing wood stud partitions and ceiling joists.
 - C. Related framing anchors and connectors.

PART 2 - PRODUCTS

- 2.1 DIMENSIONED LUMBER
 - A. Dimensioned Lumber: Provide lumber manufactured in compliance with PS 20 American Softwood Lumber Standard and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
 - B. Lumber Species and Grades: Wood species and stress grades as noted on the (Structural) Drawings. Regrade large members when cut or ripped.
 - C. Lumber Markings:
 - 1. Provide lumber with each piece factory-marked with grade stamp of inspection agency, evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 2. For exposed lumber furnish pieces with grade stamps applied to ends or back of each piece; or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.
 - D. Lumber Sizes: Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
 - E. Lumber for Load-Bearing Members: Species as indicated on the Structural Drawings, conforming to WCLIB or WWPA grading standards as applicable.
 - F. Surfacing: Provide dressed lumber, S4S, unless otherwise indicated.
 - G. Moisture Content: All lumber shall be kiln-dried to percent specified below. Air season in place, protected from rain and high humidity conditions, no less than 15 days before applying finish materials.

- 1. Concealed lumber: 19 percent maximum moisture content at time of dressing and shipment, unless otherwise indicated.
- 2. Exposed lumber and timber: 15 percent at time of delivery, unless otherwise indicated.
- H. Sill Plates: Pressure preservative treated, No. 1 or Better, douglas fir.
- I. Exposed Framing: Provide material complying with the following requirements:
 - 1. Definition: Exposed framing refers to dimension lumber that is not concealed by other construction and is indicated to receive a stained or natural finish.
 - 2. Grading: Material hand-selected at factory from lumber of species and grade indicated below that complies with Appearance grade requirements of ALSC National Grading Rule; issue inspection certificate of inspection agency for selected material.
 - 3. Species: Provide same species and grade as indicated for structural framing.
- J. Non-load Bearing and Furring: Douglas fir, No. 1 and Better grade, unless otherwise indicated on Drawings.
- K. Miscellaneous Framing: For site structures and other exposed conditions, provide No. 1 grade douglas fir-larch or better, selected for appearance. At site structures, provide light sandblast finish on exposed wood framing.
- L. Wane: Limit wane to 5 percent of members in accordance with WWPA standards. Do not locate members with wane at plywood sheathing joints, at solid blocking or at double plates.

2.2 STRUCTURAL PANELS

- A. Plywood Materials, General: APA Performance-Rated Panels, Group 1 Series, PS 1-95, species and thickness as indicated on Drawings and as specified herein.
- B. Plywood Panels for Roof Sheathing: Douglas fir, Structural I, APA RATED SHEATHING.
 - 1. Exposure Durability Classification: EXTERIOR with exterior glue.
 - 2. Thickness: As indicated on the Drawings.
 - 3. Edge detail, low slope roofs: Square if all edges supported on framing or tongue-andgroove (T&G) if edges are unsupported. Plyclips will not be acceptable.
- C. Plywood Panels for Wall Sheathing: Douglas fir, Structural I, APA RATED SHEATHING.
 - 1. Exposure Durability Classification: EXTERIOR.
 - 2. Thickness: As indicated on the Drawings.
 - 3. Edge detail: Square.

2.3 PRESERVATIVE TREATED WOOD PRODUCTS

- A. Wood Treatments, General: Where used for exposed locations, treatment materials shall be types guaranteed to not adversely affect durability and appearance of applied finishes.
 - 1. Treatment materials having a highly persistent, noticeable residual odor will not be permitted.
 - 2. After treatment, kiln or air dry lumber and plywood to a moisture content of 19 percent or less.

- B. Preservative Treatment, Members Intended for Finishing: Water-borne salt preservatives for painted, stained, or exposed natural wood product, AWPB LP-2, above ground application and AWPB LP-22, ground contact application.
- C. Preservative Treatment, Members Not Intended for Finishing: Oil-borne preservatives for any construction except when in contact with salt water, AWPB LP-33, ground contact application, light petroleum solvent.
- 2.4 CONNECTORS
 - A. Framing Connectors:
 - Specified Manufacturer: Simpson Strong-Tie Co., Pleasanton, CA (510/460-9912 or 800/999-5099; local representatives, Brea, CA (714/871-8373 or 800/999-5099). Or equal
 - Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 - Product Requirements. Substitutions shall have equivalent values according to current ICBO Research Report and shall be used only with prior approval of Architect, based on review by Structural Engineer, and shall be approved by Division of the State Architect (DSA).
 - 3. Light framing connectors: Simpson Strong-Tie Connectors, formed of sheet steel, catalog numbers as indicated on the Drawings or, if not indicated, to suit Project conditions and approved by Architect and Division of the State Architect (DSA).
 - 4. Heavy framing connectors: Simpson Strong-Tie Connectors, formed of steel plate or heavy gage steel sheet, catalog number as indicated on the Drawings and to suit Project conditions. Provide custom or special-order framing connectors as indicated on the Drawings or, if not indicated, as necessary to suit Project conditions and approved by Architect and Division of the State Architect (DSA).
 - a. Stock framing connectors: Simpson Strong Tie Connectors, catalog numbers as indicated on the Drawings or, if not indicated, to suit Project conditions as approved by Architect and DSA.
 - b. Custom framing connectors and connectors for decorative purposes: Fabricated as indicated on Drawings and as specified in Section 05 50 00 Metal Fabrications.
 - 5. Finishes:
 - a. Light framing connectors: Provide manufacturer's standard galvanized finish.
 - b. Heavy framing connectors, exterior: Hot-dipped galvanized, equivalent to ASTM A525, Coating Designation G90.
 - c. Heavy framing connectors, interior: Plain steel with shop primer paint finish, as specified in Section 05 50 00 Metal Fabrications.
 - d. Custom framing connectors: Fabricated as specified in Section 05 50 00 Metal Fabrications. At interior and concealed locations, provide plain steel with shop primer paint finish. At exterior locations, provide hot-dipped galvanized finish.

2.5 FASTENERS AND ANCHORS

- A. Fasteners, General: Size and type as required by California Building Code (CBC) requirements and as indicated on Drawings. Provide electro-galvanized finish at interior high humidity locations and exterior locations not directly exposed to weather. Provide hotdipped galvanized at exterior locations directly exposed to weather. Plain finish may be provided elsewhere.
- B. Anchor Bolts: ASTM A307 or as indicated on Drawings, galvanized steel at exterior locations.
 - 1. Do not upset threads on bolts.
 - 2. Anchor bolts for hold-downs shall be headed.
- C. Machine Bolts: ASTM A307, hex head and nut, full bearing on unthreaded shank, length for maximum 1-1/2 inch beyond nut, with steel washer under head and nut. Provide hot-dipped galvanized finish at exterior locations.
- D. Nails, Typical: Common wire, sizes as indicated on Drawings and as required by California Building Code (CBC) Chapter 23A, Table No. 23A-II-B-1 and applicable reference standard.
 - 1. No box nails shall be used.
 - 2. Machine applied nailing will be subject to approval as specified on the Drawings and as approved by Division of the State Architect (DSA).
- E. Roofing Nails: As noted on (Structural) Drawings.
- F. Expansion Anchors: As specified in Section 05 05 23 Metal Fastenings.
- G. Powder-Driven Fasteners: Provide powder-driven fasteners only if approved by Architect. Generally, powder-driven fasteners will not be permitted at load-bearing conditions. See Section 05 05 23 – Metal Fastenings for fasteners. If permitted, provide fasteners of type and size as indicated and as recommended by manufacturer for Project conditions.
- H. Construction Adhesive: APA Spec. AFG-01.
- I. Grout for Sill Plates: Type S mortar cement grout in accordance with California Building Code (CBC) Table 21A-A.
- J. Lag Bolts and Screws: Fed Spec FF-S-588, size as indicated on Drawings and as specified in Section 05 05 23 – Metal Fastenings. Provide hot-dipped galvanized finish at exterior locations.
- K. Screws: Fed Spec FF-S-85, Fed Spec FF-S-92 and Fed Spec FF-S-111, type and grade best suited for the purpose, size as indicated on Drawings and as specified in Section 05 05 23 – Metal Fastenings.
- L. Cast Iron Washers and Spacers: Alhambra Foundry Co., Ltd., Alhambra, CA (818/289-4294), black iron as shown on Drawings.
- M. Bevel and Angle Washers: Alhambra Foundry Co., Ltd., Alhambra, CA (818/289-4294), as shown on Drawings.
- N. Cast Iron Spool: Alhambra Foundry Co., Ltd., Alhambra, CA (818/289-4294), as shown on Drawings.

PART 3 - EXECUTION

3.1 WOOD PRESERVATIVE TREATMENTS

- A. Wood Preservative Treatments, General: Where lumber or plywood is indicated as preservative-treated or is specified to be treated, comply with applicable requirements of AWPA C2 (Lumber) and AWPA C9 (Plywood).
 - 1. Mark each treated item with the Quality Mark Requirements of an inspection agency approved by American Lumber Standards Committee (ALSC) Board of Review.
 - 2. Comply with California Building Code (CBC), Section 2303A.1.3, Section 2317A and Section 2326A.6.
- B. Wood Members Located Above Ground: Pressure-treat above ground items with waterborne preservatives to a minimum retention of 0.25 pcf. After treatment, kiln dry lumber and plywood to a maximum moisture content of, respectively, 19 percent and 15 percent. Treat indicated items and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping and similar members related to roofing, flashing, vapor barriers and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
 - 3. Wood floor plates installed over concrete slabs directly in contact with ground.
- C. Wood Members Located in Contact with Ground: Pressure-treat wood members in contact with ground or fresh water with water-borne preservatives to a minimum retention of 0.40 pcf.
- D. Coordination with Fabrication: Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces in compliance with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

END OF SECTION

06 11 11 – WOOD BACKING, BLOCKING AND CURBING

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Blocking for wall and roof openings.
 - B. Roof curbs and cants.
 - C. Wood furring and grounds.
 - D. Construction panels for non-structural deck and wall sheathing and backing.
 - E. Related framing anchors and connectors.

PART 2 - PRODUCTS

- 2.1 DIMENSION LUMBER AND BOARDS
 - A. Dimension Lumber and Boards, General: Provide douglas fir or douglas fir/larch, grade as appropriate for intended use. Blocking stock shall be solid and without defects detrimental for use to secure attached products.
 - B. Lumber Standards: Furnish lumber manufactured to comply with PS 20 American Softwood Lumber Standard, and with applicable WCLIB Grading Rules or WWPA Grading Rules.
 - 1. Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 2. Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:
 - a. WCLIB West Coast Lumber Inspection Bureau.
 - b. WWPA Western Wood Products Association.
 - C. Lumber Sizes: Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
 - D. Surfacing: Provide dressed lumber, S4S, unless otherwise indicated.
 - E. Moisture Content: All lumber shall be kiln-dried to percent specified below. Air season in place, protected from rain and high humidity conditions, no less than 15 days before applying finish materials.
 - 1. Concealed lumber: 19 percent maximum moisture content at time of dressing and shipment, unless otherwise indicated.

- 2. Exposed lumber and timber: 15 percent at time of delivery, unless otherwise indicated.
- F. Wane: Limited to a minimum of 5 percent of members in accordance with WWPA rules. Do not locate members with wane at plywood sheathed joints, at solid blocking, or at double plates.

2.2 CONSTRUCTION PANELS

- A. Construction Panels, General: APA Performance-Rated Panels, species and thickness as indicated on Drawings and as specified herein.
 - 1. Comply with PS 1-95 Series for plywood (cross-laminated wood veneer) panels.
 - 2. Comply with PS 2-92 for composite (veneer faces bonded to wood strand core) and oriented strand board (OSB) panels.
- B. Roof Crickets and Curbs: Provide construction panels for roof crickets and sheathing at curbs.
 - 1. Provide panel thickness and span rating to suit framing spacing but not less than 1/2 inch thick.
 - 2. Coordinate thickness with requirements for roofing fire and wind uplift ratings.

2.3 CONNECTORS AND ANCHORS

- A. Framing Connectors: As specified in Section 06 11 00 Wood Framing.
- B. Fasteners, General: Size and type as required by California Building Code (CBC) requirements and as indicated on Drawings. Provide electro-galvanized finish at interior high humidity locations and exterior locations not directly exposed to weather. Provide hot-dipped galvanized at exterior locations directly exposed to weather. Plain finish may be provided elsewhere.
- C. Anchor Bolts: ASTM A307 or as indicated on Drawings, galvanized steel at exterior locations.
- D. Nails, Typical: Common wire, size as indicated on Drawings and as required by California Building Code (CBC), Chapter 23A, Table No. 23A-II-B-1.
- E. Roofing Nails: 10d by 3-inches long, common wire nails at gable and hip roofs and ring shank plywood nails at flat roofs.
- F. Machine Bolts: ASTM A307, hex head and nut, full bearing on unthreaded shank, length for maximum 1-1/2 inch thread beyond nut. Provide iron washer under head and nut. length for maximum 1-1/2 inch beyond nut, with steel washer under head and nut.
- G. Lag Bolts and Screws: Fed Spec FF-S-588, size as indicated on Drawings.
- H. Screws: Fed Spec FF-S-85, Fed Spec FF-S-92 and Fed Spec FF-S-111, type and grade best suited for the purpose.
- I. Powder-Actuated Fasteners: As specified in Section 05 05 23 Metal Fastenings. Use only if approved by Architect, generally not permitted where not specifically indicated or in load-bearing installations.
- J. Construction Adhesive: APA Spec. AFG-01.

2.4 WOOD TREATMENTS

- A. Wood Treatments, General: Where used for exposed locations, treatment materials shall be types guaranteed to not adversely affect durability and appearance of applied finishes.
 - 1. Treatment materials having a highly persistent, noticeable residual odor will not be permitted.
 - 2. After treatment, kiln or air dry lumber and plywood to a moisture content of 19 percent or less.
 - 3. Type A (Surface Applied Preservative): Apply to pretreated lumber and plywood members after cutting, shaping, and bolting.
 - 4. Type B (Pressure Treated Preservative): Provide pressure preservative treated lumber and plywood at all locations where wood members have contact with concrete, masonry or grout.
- B. Surface-Applied Wood Preservative (Type A): For field application.
 - 1. Non-aqueous solution containing not less than five percent pentachlorophenol, commercially prepared and formulated to repel water and inhibit decay.
 - 2. Suitable for application by either brush or dip methods.
 - 3. Integral coloring to allow visual inspection of treated members.
- C. Pressure-Treated Wood Preservative (Type B): For factory application.
 - 1. Required for lumber and plywood where indicated or specified and not otherwise required to be fire-retardant pressure treated.
 - 2. Concealed Locations: Any process acceptable in accordance with UBC Standard 25-12 and meeting specified requirements.
 - 3. Exposed Locations: Treated members shall be milled smooth within limits permitted by process manufacturer.

PART 3 - EXECUTION na

END OF SECTION

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements.

07 52 20 – MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 - GENERAL

1.1 DISTRICT REPRESENTATIVE

A. In this specification section, "District Representative" means the project manager assigned by the District. If the project manager is not from the Maintenance Department, then "District Representative" means both the project manager assigned to the project and a representative assigned by the Maintenance Department. Both individuals must be invited to all meetings where the District Representative is present and both individuals must receive all correspondence related to the roofing.

1.2 SCOPE OF WORK

- A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Provide all labor, equipment, insulation, and materials to install modified bitumen roof system over the properly prepared substrate.
- C. All debris to be swept clean down to deck.
- D. All decking to be inspected before roofing.
- E. Recover deck with HPR Modified Bitumen Roofing System.
- F. Roof deck shall have new coping installed by roofing contractor.
- G. Install HPR felts, SBS+SIS+ES rubber modified Mineral membrane, and Title 24 Coating.
- H. All membrane shall conform to Title 24.
- I. Contractor shall be responsible for proper handling of all gas lines, and electrical system in accordance with applicable codes.
- J. Contractor is to ensure all gas, electrical, and other utilities involved, as part of this contract will be in the same working condition, after roofing project is completed.
- K. There shall be a minimum 8 inches flashing height on all curbs.

1.3 RELATED WORK

- A. Furnish and install specified roofing and related components. Coordinate related work specified in other parts of this specification including, but not limited to, the following:
 - 1. Properly prepared, and clean deck.
 - 2. Repair, re-attach or replace defective decking, if needed.
 - 3. Install new pitch pockets, and fabricate lead flashing at ALL ANGLE support.
 - 4. Correctly anchor all conduit lines onto blocking. All new wood sleepers are required.
 - 5. Wood curbs for conduits, shall match existing that is being replaced.
 - 6. Properly support all pipes and equipment with blocking set on protection pads.

- 7. All existing roof mounted gas lines shall be in the same working condition as when the project commenced.
- 8. All drains are to be replaced with new drain assemblies. Note this includes: basket, clamps, rings, nuts, bolts, pots and all other accessories. Drain manufacturer shall be JR Smith, or equal. All drains and downspouts are to be tested before roof tearoff. If leakage is detected, owner's representative is to be contacted. After roof assembly is completed, drains are to be tested again and if leakage is detected, owner's representative is to be contacted.
- 1.4 REFERENCES
 - A. ASTM D 41 Specifications for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
 - B. ASTM D 312 Specification for Asphalt Used in Roofing
 - C. ASTM D 451 Test Method for Sieve Analysis of Granular Mineral
 - D. ASTM D 1079 Terminology Relating to Roofing, Waterproofing, and Bituminous Materials
 - E. ASTM D 1227 Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
 - F. ASTM D 1863 Specification for Mineral Aggregate Used on Built-Up Roofs
 - G. ASTM D 2178 Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
 - H. ASTM D 2822 Specification for Asphalt Roof Cement
 - I. ASTM D 2824 Specification for Aluminum-Pigmented Asphalt Roof Coating
 - J. ASTM D 4601 Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
 - K. ASTM D 5147 1991 Test Method for Sampling and Testing Modified Bituminous Sheet Materials All submittals for approval shall come from independent testing agency, no data tested in manufacturer's facility or underwritten, or witnessed in manufacturer's laboratory shall be accepted.
 - L. ASTM E 108 Test Methods for Fire Test of Roof Coverings
 - M. NRCA National Roofing Contractors Association
 - N. UL Underwriters Laboratories
 - O. WH Warnock Hersey

1.5 SUBMITTALS

- A. Submit under provisions of district standards.
- B. Product Data for each type of product specified include manufacturer's technical product data, installation instructions, and recommendations for each type of roofing product required. Include data substantiating that materials comply with specified requirements.
- C. Show evidence that the products and materials are manufactured in the United States and that materials provided conform to all requirements specified herein, and are chemically and

physically compatible with each other and are suitable for inclusion within the total roof system specified herein.

- D. Show evidence that the Installer specializes in modified bituminous roof application with a minimum 5 years of experience and who is certified by the roofing system manufacturer as qualified to install manufacturer's roofing materials.
- E. Submit certification that the roof system furnished is Tested and Approved by Factory Mutual as a Class 1A roof system with 1-60 Wind Uplift Requirements, or Listed by Underwriters Laboratories or Warnock Hersey for external fire tests of ASTM E-108
- F. Any deficiencies in performance, warranty terms or improper submittal procedure will constitute grounds for immediate rejection or alternate.
- G. For all modified bituminous sheet roofing include independent test data according to ASTM D-5147 "Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material" substantiating that material comply with specified requirements.
- H. Unexecuted Manufacturer's warranty
- I. Certified copy of ISO 9001
- J. Provide a sample of each product, including but not limited to:
 - 1. A sample of each modified membrane sheet.
 - 2. A sample of modified integrated base flashing.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Roofing system manufacturer shall have a minimum of 10 years of experience in manufacturing modified bitumen roofing products in the United States and be ISO 9001 certified.
- B. Installer Qualifications: Installer (Roofing) shall be specializing in modified bituminous roof application with minimum 5 years of experience and who is certified by the roofing system manufacturer as qualified to install manufacturer's roofing materials.
- C. It is the intent of this specification to provide a roof system with an external fire rating. The components shall be as required by the membrane manufacturer to provide a Class A fire resistance rating.
- D. Installer's Field Supervision: Require Installer to maintain a full-time Supervisor/Forman on the job site during all phases of modified bituminous sheet roofing work and at any time roofing work is in progress: proper supervision of workmen shall be maintained. A copy of the specification shall be in the possession of the Supervisor/Foremen and on the roof at all times.
- E. It shall be the Contractor's responsibility to respond immediately to correction of roof leakage during construction.
- F. Pre-application Roofing Conference: Approximately 2 weeks before scheduled commencement of modified bitumen sheet roof system and associated work, meet at Project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work if any), District Representative, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where

applicable) Owner's insurers, test agencies, and governing authorities. Objectives to include:

- 1. Review foreseeable methods and procedures related to roofing work.
- 2. Tour representative areas of roofing substrates (decks) inspect and discuss condition of substrate, roof drains, curbs, penetrations, and other preparatory work performed by other trades.
- 3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
- 4. Review roofing systems requirements (drawings, specifications, and other contract documents).
- 5. Review required submittals, both completed and yet to be completed.
- 6. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- 7. Review required inspection, testing, certifying, and material usage accounting procedures.
- 8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).
- 9. Record (contractor) discussion of conference, including decisions and agreements (or disagreements) reached, and furnishes copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
- 10. Review notification procedures for weather or non-working days.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.
- B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to ensure no possibility of significant moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover all goods with a canvas tarpaulin or other breathable material (not polyethylene).
- C. Do not leave unused rolled goods on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.
- D. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.
- 1.8 Manufacturer's Inspections
- A. When the project is in progress, the Roofing System Manufacturer will provide the following:
 - 1. Keep the District Representative informed as to the progress and quality the work as observed.
 - 2. Provide daily job site inspections.

- 3. Report to the District Representative/Architect in writing, any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
- 4. Confirm, after completion of the project and based on manufacturer's observations and tests, that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.9 PROJECT CONDITIONS

- A. Weather Condition Limitations: Do not apply roofing membrane during inclement weather or when a 40% chance of precipitation is expected.
- B. Do not apply roofing membrane to damp deck surface.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
- D. Proceed with roofing work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.
- E. (Metal Decks) Mechanically attach 2" of Polyisocyanurate insulation, into metal deck, with #12, or #14 olympic fastener, at the rate of 1 each every square foot. Then in Type III Asphalt, mop ½" fiberboard insulation, to ISO board at the rate of 25bs/ 100 square feet. Mop Garland Base Sheet, Mop 2 each Type VI Felts, and Garland Cap Sheet, with Pyramic Coating 1.5 gallons/ 100 square feet. (2 Coats) (As specified)
- F. (Structural Concrete Decks) Prime existing deck with Primer, at the rate of 1 gallon/ 100 square feet. Sprinkle Mop 1/2" fiberboard insulation, in Type III Asphalt. Mop Garland Base Sheet, Mop 2 each Type VI Felts, and Garland Cap Sheet, with Pyramic Coating 1.5 gallons/100 square feet. (2 Coats) (As specified)
- G. (Wood Decks). Roll out red rosin paper, then mechanically attach Garland's HPR-Tri Base Premium. Mop 2 each Type VI Felts, and Garland Cap Sheet, with Pyramic Coating, 1.5 gallons/100 square feet. (2 Coats) (As specified)
- H. (Metal Decks with Lightweight Concrete) Mechanically attach 1" of Polyisocyanurate insulation, down through lightweight concrete, into metal deck, with #12 or #14 olympic fastener, at the rate of 1 every square foot. Mop ½" fiberboard insulation, in Type III Asphalt at the rate of 25 lbs/100 square feet. Mop Garland Base Sheet. Mop 2 each Type VI Felts, and Garland Cap Sheet, with Pyramic Coating 1.5 gallons/100 square feet. (2 Coats) (As specified).
- I. (If Applicable) all slopes of greater than 1-1/2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral shank one-inch cap nails, or screws and plates at a rate of one (1) fastener per ply (including the modified membrane), at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and (4) ft o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 1:12, strapping plies is recommended to help prevent slippage. Install for (4) additional fasteners at the upper edge of the modified bitumen sheet when strapping the plies.

1.10 SEQUENCING AND SCHEDULING

A. Sequence installation of modified bituminous sheet roofing with related units of work specified in other sections to ensure that roof assemblies, including roof accessories,

flashing, trim, and joint sealers, are protected against damage from effects of weather, corrosion, and adjacent construction activity.

B. All work must be fully completed on each day. Phased construction will not be accepted. Contractor must glaze any exposed felts, before next day's work.

1.11 WARRANTY

- A. Membrane manufacturer, upon completion of installation, and acceptance by the District Representative, will supply to the Owner a 20-year partnership pledge warranty. Upon completion of installation, and acceptance by the owner all metal integrated base flashings, adhesive, modified sheet, wall cover panels, coping, shall be from single source of responsibility. All coping and metal accessories to be sourced, from The Membrane Manufacturer.
- B. Contractor will submit a minimum of a five-year labor warranty to the membrane manufacturer with a copy directly to District Representative.

PART 2 - PRODUCTS

- 2.1 GENERAL
 - A. When a particular trade name or performance standard is specified it shall be indicative of a standard required.
 - B. Provide products, and independent test data confirming tear strength, and tensile strength, along with all other pertinent data as specified.
 - C. Any item or materials submitted as an alternate to the manufacturer specified must comply in all respects as to the quality and performance, including job site investigation of the brand name specified.
- 2.2 Description
 - A. Modified bituminous roofing work including but not limited to:
 - 1. (Wood Deck) Mechanically attach Garland's HPR Tri-Base Premium, and Mop two plies of Type VI in Type III Steep Asphalt, mop Garland's Title cap sheet, (Title 24 Coating) install Garland's Mineral Cap Sheet Base Sheet and coping. All mineral cap sheet shall be painted with Garland's pyramic. 1.5 gallon/ 100 square feet, (2 coats perpendicular).
- 2.3 BITUMINOUS MATERIALS
 - A. Asphalt Primer: V.O.C. compliant, ASTM D-41.
 - B. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D-2822, and Type II.
 - C. Asphalt: Shall meet ASTM Specification D-312 Type III.
- 2.4 SHEET MATERIALS
 - A. Base Sheet: Type II HPR Tri-Base sheet properties (finished membrane)

			Machine Direction	Cross Machine Direction		
1		Load Strain at 77 degrees F	318.6	322.1		
2	2.	Elongation at Max Load%	5.4	6.2		
3	3.	Tear Strength at 77 degrees F, lbf.	575.1	603.1		
Ν	Modified Sheet: Modified Smooth Membrane Properties (Finished Membrane)					
			Machine Direction	Cross Machine Direction		
1		Load Strain at 77 degrees F	327.7	314.3		
		-				
2	2.	Max Load, lbf.	3.8	3.9		
2 3	2. 3.	Max Load, lbf. Tear Strength at 77 degrees F	3.8 600.8	3.9 594.4		

4. Low Temperature Flexibility degrees F Passes -30

C. Felts Type VI Felts

1. Minimum 2 plies of ASTM D2178, Type VI glass fiber roofing felt bonded to prepared substrate with hot bitumen, to be sourced, and purchased from the membrane manufacturer.

2.5 SURFACING

Β.

A. Mineral Cap Sheet, will be coated with pyramic, Title 24 Coating at the rate of 1.5 gallon / 100 square feet, (2 Coats).

2.6 RELATED MATERIALS

- Α. All flashings, (drip edge, wall flashings), shall be a high gloss white, steel flashing system with a self-ventilation, movement absorbing design. This shall be applicable for the drip edge, and base flashings, if their existing conditions are metal flashings. All base flashings, that have existing mineral cap sheet flashings, shall be replaced by Title 24 Mineral Cap sheet base flashings. If metal base flashings the flashing system shall be comprised of aluminum-zinc alloy steel. The modified sheet attached to the termination strip shall be either torched into the field membrane, or set in hot or cold adhesive. Sheet shall be pained, by the contractor with urethane coating, to be purchased from the membrane manufacturer. The installation shall be 1 gallon/100 square feet. 2 Coats are required. Metal wall cover panels, shall be stucco embossed, pre-fab wall cover panel designed for additional rigidity with no exposed fasteners. Panels shall have 13" coverage width (3" in S-Lock), up to 12 feet. Metal wall panels will be installed, by certified licensed membrane contractor. Metal wall panels will be warranted, and manufactured, by the modified membrane sheet manufacturer. All stucco walls are to be covered by wall covering panel, with inside, and outside corner panels, which shall be (.0157 nom.) They will be pre-fab inside, and outside corner pieces for wall covering panels. (Female interlock each side accepts male edge of wall cover panel or adjoining corner panel.) New coping will be installed. All coping to be sourced, and warranted by the modified membrane manufacturer.
- B. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel. Nails and fasteners shall be flush-driven through flat metal discs of not less than 1-inch diameter. Metal discs may be omitted

when one piece composite nails or fasteners with heads not less than 1-inch diameter are used.

C. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than 28 gauges and not less than 1-inch in diameter. Discs shall be formed to prevent dishing. Bell or cup-shaped caps are not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate surfaces to receive modified bitumen sheet roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION REQUIREMENTS

- A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing modified bitumen roofing system.
- B. Insurance/Code Compliance: Where required, install and test modified bitumen roofing system to comply with governing regulations and specified insurance requirements.
- C. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installations of modified bituminous roofing system work. Note: Where there are existing roof curbs that have been roofed, they are to be demolished, new decking installed, and to be re-roofed per specifications.
- D. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets and insulation with two (2) plies of #15 organic felt set in full moppings of bitumen and with joints and edges sealed with roofing cement. Remove cut offs immediately before resuming work. Install new counter-flashing, furnished, and warranted by membrane manufacturer.
- E. Asphalt Bitumen Heating: Heat and apply bitumen according to EVT Method as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 5° F at point of application) more than 1 hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either by information from manufacturer or by suitable test. Do not exceed recommended temperature limits during bitumen heating. Do not heat to a temperature higher than 25° below flash point. Discard bitumen that has been held at temperature exceeding finishing blowing temperature (FBT) for more than 3 hours. Keep kettle lid closed except when adding bitumen.
- F. Bitumen; Mopping Weights: For interply mopping, apply bitumen at the rate of approximately 25 lbs of asphalt per roof square (plus or minus 25 percent on a total job average
- G. Substrate joint penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

- H. Apply roofing materials as specified herein, unless recommended otherwise by manufacturer's instructions. Keep roof material dry before and during application. Do not permit phased construction. Complete application or roofing plies, modified sheet and flashing in a continuous operation. Begin and apply only as much roofing in one day as can be completed that same day. If phased construction is desired, roofing contractor shall glaze felts prior to leaving jobsite and beginning following day's work.
- I. Cut-Offs At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets. Provide temporary covering of two plies of #15 organic roofing felt set in full moppings of bitumen with joins and edges sealed.
- J. All curbs extended shall be a minimum of 8 inches in height. New curbs, to be mechanically attached, with treated lumber, and Flashed with Garland's Mineral Cap Sheet. Metal pans to be mechanically attached to curbs, and drip edge shall be 3.5 inches below field of curb.
- K. All designated conduit, shall be carefully lifted, during tear off process, and conduit will be placed on new wood blocks to match existing.

3.3 SAFETY REQUIREMENTS

- A. All application, material handling, and associated equipment shall conform to and be operated in conformance with OSHA safety requirements.
- B. Comply with federal, state, local, and fire, and safety requirements.
- C. Advise owner whenever work is expected to be hazardous to owner, employees, and/or operators.
- D. Maintain a crewman as a floor area guard whenever roof decking is being repaired or replaced.
- E. Maintain fire extinguisher within easy access whenever power tools are being used.

3.4 WASTE DISPOSAL

A. Do not re-use, re-cycle or dispose of material manufacturer's product containers except in accordance with all applicable regulations. The user of manufactured products is responsible for proper use and disposal of product container. Asbestos material shall be treated in accordance with local codes.

3.5 CALIFORNIA PROPOSITION 65

A. Contractor will post notices, make all communications and otherwise comply with California Proposition 65 requirements concerning notification of those who may be exposed to Prop 65 listed chemicals, as revised from time to time. Contractor will also comply with requirements concerning the safe use and handling of roofing material, including preventing vapors from entering buildings.

3.6 PREPARATION

- A. Contractor shall have sole responsibility of accuracy of all measurements and estimates of materials, quantities and sizes. Make sure roof is cleaned down to deck, and insulation.
- B. Plug all drains to prevent debris entry and remove all clamping rings and related materials and store for later re-installation. Install new drains, with lead flanges.

- C. Sweep deck clean to remove all dirt and debris and dispose of away from site.
- D. Deck Repair: Replace all defective decking with like materials, following manufacturer's recommendation.

3.7 FELT PLY INSTALLATION

- A. Mop Garland's base sheet and install (2) each HPR Type VI fiberglass ply sheets, in 25 lbs per square of bitumen shingled uniformly to achieve two plies throughout over the prepared substrate. Shingle in proper direction to shed water on each area of the roof.
- B. Lap ply sheet end eight inches (8"). Stagger end laps twelve inches (12") minimum.
- C. Extend plies two inches (2") beyond top edges of wall and projection bases.
- D. Install Mineral Cap Sheet Title 24 base flashings, and wall cover panels.
- E. The modified membrane shall then be solidly bonded to the base layers with specified asphalt at the rate of 35lbs/ 100 square feet. The roll must push a puddle of asphalt in front of it with asphalt slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane. Apply pressure to all seams to ensure that laps are solidly bonded to substrate. Subsequent rolls of modified membrane shall be installed across the roof, as above, with a minimum of four inch (4") side laps and eight inch (8") end laps. The end laps shall be staggered. The modified membrane shall be laid in the same direction as the underlayments, but the laps shall not coincide with the laps of the base layers. Apply asphalt no more than five feet ahead of each roll being embedded. The modified membrane will be coated with pyramic Title 24 Coating, at the rate of 1.5 gallons per 100 square feet. (2 Coats)

3.8 PLUMBING STACK, AND ALL OTHER MISCELLANEOUS STACKS

- A. Minimum stack height is twelve inches.
- B. Run roof system over the roof. Seal the base of the stack with elastomeric sealant.
- C. Prime flange of new sleeve. Install properly-sized sleeves set in a 1/4" base of elastomeric sealant.
- D. Install base flashing ply bitumen.
- E. Install modified membrane in bitumen.
- F. Caulk the intersection of the membrane and the base flashing with elastomeric sealant.
- G. Turn sleeve a minimum of one inch down inside of stack.
- 3.9 SCUPPER THROUGH WALL
 - A. Inspect the nailer to assure proper attachment and configuration.
 - B. Run one ply over nailer up the overflow, in the scupper hole and flash up. Install a scupper box in ¼ inch bed of mastic. Assure all box seams are soldered and have a minimum four (4) inch flange. Make sure all corners are closed and soldered. Prime scupper at a rate of one hundred square feet per gallon and allow to dry. Fasten flange of scupper box every three inches o.c. staggered. Strip in flange of scupper box with base flashing ply covering entire area with six inch overlap on to the field of the roof and wall flashing. Install a second

ply of modified flashing ply in bitumen over the base flashing ply, nine inches on to the field of the roof. Apply a three-course application of mastic and mesh at all seams.

3.10 ROOF DRAIN

- A. Plug drain to prevent debris from entering plumbing
- B. Install to drain minimum of twenty four inches from center of drain.
- C. Run roof system plies over drain. Cut out plies inside drain bowl.
- D. Set lead/copper flashing (30-inch square minimum) in ¼ inch bed of mastic. Run lead/copper into drain a minimum of two inches. Prime lead/copper at a rate of one hundred square feet per gallon, and allow to dry. Install base flashing 40-inch square minimum in bitumen. Install clamping ring and assure that all plies are under the clamping ring. Remove drain plug and install strainer.

3.11 HEAT STACK

- A. Minimum stack height is twelve inches
- B. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
- C. Prime flange of new sleeve. Install properly sized sleeves set in ¹/₄ inch bed of roof cement.
- D. Install base flashing ply in bitumen.
- E. Install modified membrane in bitumen.
- F. Caulk the intersection of the membrane with elastomeric sealant.
- G. Install new collar over cape. Weld collar or install stainless steel draw brand.

3.12 CLEANING

- A. Remove drippage of bitumen from all walls, windows, floors, ladders and finished surfaces.
- B. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

3.13 FINAL INSPECTION

- A. At completion of roofing installation and associated work, meet with installer, installers of associated work, district representative, roofing system manufacturer's representative and other representatives directly concerned with the performance of the roofing system.
- B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each representative attending inspection.
- C. The roofing system manufacturer reserves the right to request a thermographic scan of roof during final inspection to determine if any damp or wet materials have been installed. The thermoraphic scan shall be provided by the roofing contractor at roofing contractor's expense.

- D. Repair, or replace, as required, deteriorated or defective work found at time of inspection to a condition free of damage and deterioration at time of substantial completion and according to warranty requirements.
- E. The contractor is to notify the district's facilities department upon completion of corrections.
- F. Following the final inspection, acceptance will be made in writing by the material manufacturer.

END OF SECTION

07 52 30 – MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 - GENERAL

1.1 DISTRICT REPRESENTATIVE

A. In this specification section, "District Representative" means the project manager assigned by the District. If the project manager is not from the Maintenance Department, then "District Representative" means both the project manager assigned to the project and a representative assigned by the Maintenance Department. Both individuals must be invited to all meetings where the District Representative is present and both individuals must receive all correspondence related to the roofing.

1.2 SCOPE OF WORK

- A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Provide all labor, equipment, insulation, and materials to install modified bitumen roof system over the properly prepared substrate.
- C. All debris to be swept clean down to deck.
- D. All decking to be inspected before roofing.
- E. Recover deck with HPR Modified Bitumen Roofing System.
- F. Roof deck shall have new coping installed by roofing contractor.
- G. Install HPR felts, SBS+SIS+ES rubber modified Mineral membrane, and Title 24 Coating.
- H. All membrane shall conform to Title 24.
- I. Contractor shall be responsible for proper handling of all gas lines, and electrical system in accordance with applicable codes.
- J. Contractor is to ensure all gas, electrical, and other utilities involved, as part of this contract will be in the same working condition, after roofing project is completed.
- K. There shall be a minimum 8 inches flashing height on all curbs.
- L. Modified sheet shall have Kevlar, and 7% post-consumer recycle content.

1.3 RELATED WORK

- A. Furnish and install specified roofing and related components. Coordinate related work specified in other parts of this specification including, but not limited to, the following:
 - 1. Properly prepared, and clean deck.
 - 2. Repair, re-attach or replace defective decking, if needed.
 - 3. Install new pitch pockets, and fabricate lead flashing at ALL ANGLE support.
 - 4. Correctly anchor all conduit lines onto blocking. All new wood sleepers are required.
 - 5. Wood curbs for conduits, shall match existing that is being replaced.

- 6. Properly support all pipes and equipment with blocking set on protection pads.
- 7. All existing roof mounted gas lines shall be in the same working condition as when the project commenced.
- 8. All drains are to be replaced with new drain assemblies. Note this includes: basket, clamps, rings, nuts, bolts, pots and all other accessories. Drain manufacturer shall be JR Smith, or equal. All drains and downspouts are to be tested before roof tearoff. If leakage is detected, owner's representative is to be contacted. After roof assembly is completed, drains are to be tested again and if leakage is detected, owner's representative is to be contacted.
- 1.4 REFERENCES
 - A. ASTM D 41 Specifications for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
 - B. ASTM D 312 Specification for Asphalt Used in Roofing
 - C. ASTM D 451 Test Method for Sieve Analysis of Granular Mineral
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 - 1. A sample of each modified membrane sheet.
 - 2. A sample of modified integrated base flashing.

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- B. Installer Qualifications: Installer (Roofing) shall be specializing in modified bituminous roof application with minimum 5 years of experience and who is certified by the roofing system manufacturer as qualified to install manufacturer's roofing materials.
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- E. It shall be the Contractor's responsibility to respond immediately to correction of roof leakage during construction.
- F. Pre-application Roofing Conference: Approximately 2 weeks before scheduled commencement of modified bitumen sheet roof system and associated work, meet at Project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work if any), District Representative, roofing system manufacturer's representative, and other

representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, test agencies, and governing authorities. Objectives to include:

- 1. Review foreseeable methods and procedures related to roofing work.
- 2. Tour representative areas of roofing substrates (decks) inspect and discuss condition of substrate, roof drains, curbs, penetrations, and other preparatory work performed by other trades.
- 3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
- 4. Review roofing systems requirements (drawings, specifications, and other contract documents).
- 5. Review required submittals, both completed and yet to be completed.
- 6. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- 7. Review required inspection, testing, certifying, and material usage accounting procedures.
- 8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).
- 9. Record (contractor) discussion of conference, including decisions and agreements (or disagreements) reached, and furnishes copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
- 10. Review notification procedures for weather or non-working days.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.
- B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to ensure no possibility of significant moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover all goods with a canvas tarpaulin or other breathable material (not polyethylene).
- C. Do not leave unused rolled goods on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.
- D. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.
- 1.8 Manufacturer's Inspections
- A. When the project is in progress, the Roofing System Manufacturer will provide the following:
 - 1. Keep the District Representative informed as to the progress and quality the work as observed.

- 2. Provide daily job site inspections.
- 3. Report to the District Representative/Architect in writing, any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
- 4. Confirm, after completion of the project and based on manufacturer's observations and tests, that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.9 PROJECT CONDITIONS

- A. Weather Condition Limitations: Do not apply roofing membrane during inclement weather or when a 40% chance of precipitation is expected.
- B. Do not apply roofing membrane to damp deck surface.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
- D. Proceed with roofing work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.
- E. (Metal Decks) Mechanically attach 2" of Polyisocyanurate insulation, into metal deck, with #12, or #14 olympic fastener, at the rate of 1 each every square foot. Then in Type III Asphalt, mop ½" fiberboard insulation, to ISO board at the rate of 25bs/ 100 square feet. Mop Garland Base Sheet, Mop Type VI Felts, and Garland Cap Sheet, with Pyramic Coating 1.5 gallons/ 100 square feet. (2 Coats) (As specified)
- F. (Structural Concrete Decks) Prime existing deck with Primer, at the rate of 1 gallon/ 100 square feet. Sprinkle Mop 1/2" fiberboard insulation, in Type III Asphalt. Mop Garland Base Sheet, Mop Type VI Felts, and Garland Cap Sheet, with Pyramic Coating 1.5 gallons/100 square feet. (2 Coats) (As specified)
- G. (Wood Decks). Roll out red rosin paper, then mechanically attach Garland's HPR-Tri Base Premium. Mop 2 ea. Type VI Felts, and Garland Cap Sheet, with Pyramic Coating, 1.5 gallons/100 square feet. (2 Coats) (As specified)
- H. (Metal Decks with Lightweight Concrete) Mechanically attach 1" of Polyisocyanurate insulation, down through lightweight concrete, into metal deck, with #12 or #14 olympic fastener, at the rate of 1 every square foot. Mop ½" fiberboard insulation, in Type III Asphalt at the rate of 25 lbs/100 square feet. Mop Garland Base Sheet. Mop 2 each Type VI Felts, and Garland Cap Sheet, with Pyramic Coating 1.5 gallons/100 square feet. (2 Coats) (As specified).
- I. (If Applicable) all slopes of greater than 1-1/2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral shank one (1) inch cap nails, or screws and plates at a rate of one (1) fastener per ply (including the modified membrane), at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and (4) ft o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 1:12, strapping plies is recommended to help prevent slippage. Install for (4) additional fasteners at the upper edge of the modified bitumen sheet when strapping the plies.

1.10 SEQUENCING AND SCHEDULING

- A. Sequence installation of modified bituminous sheet roofing with related units of work specified in other sections to ensure that roof assemblies, including roof accessories, flashing, trim, and joint sealers, are protected against damage from effects of weather, corrosion, and adjacent construction activity.
- B. All work must be fully completed on each day. Phased construction will not be accepted. Contractor must glaze any exposed felts, before next day's work.

1.11 WARRANTY

- A. Membrane manufacturer, upon completion of installation, and acceptance by the District Representative, will supply to the Owner a 30-year partnership pledge warranty. Upon completion of installation, and acceptance by the owner all metal integrated base flashings, adhesive, modified sheet, wall cover panels, coping, shall be from single source of responsibility. All coping and metal accessories to be sourced, from The Membrane Manufacturer.
- B. Contractor will submit a minimum of a five-year labor warranty to the membrane manufacturer with a copy directly to District Representative.

PART 2 - PRODUCTS

- 2.1 GENERAL
 - A. When a particular trade name or performance standard is specified it shall be indicative of a standard required.
 - B. Provide products, and independent test data confirming tear strength, and tensile strength, along with all other pertinent data as specified.
 - C. Any item or materials submitted as an alternate to the manufacturer specified must comply in all respects as to the quality and performance, including job site investigation of the brand name specified.
- 2.2 Description
 - A. Modified bituminous roofing work including but not limited to:
 - 1. Mop Garland's HPR Tri-Base Premium, and Mop two plies of Type VI in Type III Steep Asphalt, mop Garland's Title cap sheet, (Title 24 Coating) install Garland's R-MerPly, Base, Drip edge flashings, and coping. Any asphalt spillage, shall be painted, with Garland's pyramic coating. Wall panels to have 13" coverage width.
- 2.3 BITUMINOUS MATERIALS
 - A. Asphalt Primer: V.O.C. compliant, ASTM D-41.
 - B. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D-2822, and Type II.
 - C. Asphalt: Shall meet ASTM Specification D-312 Type III.

2.4 SHEET MATERIALS

A. Base Sheet: Type II HPR Tri-Base sheet properties (finished membrane)

		Machine Direction	Cross Machine Direction		
	1.	Load Strain at 77 degrees F	318.6	322.1	
	2.	Elongation at Max Load%	5.4	6.2	
	3.	Tear Strength at 77 degrees F, lbf.	575.1	603.1	
В.	Modified Sheet: Modified Smooth Membrane Properties (Finished Memb				
		Machine Direction	Cross Machine Direction		
	1.	Load Strain at 77 degrees F	1018.1	1145.4	
	2.	Max Load, lbf.	8.7	9.5	
	3.	Tear Strength at 77 degrees F	1766.8	1826.6	
	4.	Low Temperature Flexibility degrees	s F Passes -40		
	5.	Compound Stability degrees F	Passes 225		

C. Felts Type VI Felts

1. Minimum 2 plies of ASTM D2178, Type VI glass fiber roofing felt bonded to prepared substrate with hot bitumen, to be sourced, and purchased from the membrane manufacturer.

2.5 SURFACING

A. Mineral Cap Sheet, will be coated with pyramic, Title 24 Coating at the rate of 1.5 gallon / 100 square feet, (2 Coats).

2.6 RELATED MATERIALS

- All flashings, (drip edge, wall flashings), shall be a high gloss white, steel flashing system Α. with a self-ventilation, movement absorbing design. This shall be applicable for the drip edge, and base flashings, if their existing conditions are metal flashings. All base flashings, that have existing mineral cap sheet flashings, shall be replaced by Title 24 Mineral Cap sheet base flashings. If metal base flashings the flashing system shall be comprised of aluminum-zinc alloy steel. The modified sheet attached to the termination strip shall be either torched into the field membrane, or set in hot or cold adhesive. Sheet shall be pained, by the contractor with urethane coating, to be purchased from the membrane manufacturer. The installation shall be 1 gallon/100 square feet. 2 Coats are required. Metal wall cover panels, shall be stucco embossed, pre-fab wall cover panel designed for additional rigidity with no exposed fasteners. Panels shall have 13" coverage width (3" in S-Lock), up to 12 feet. Metal wall panels will be installed, by certified licensed membrane contractor. Metal wall panels will be warranted, and manufactured, by the modified membrane sheet manufacturer. All stucco walls are to be covered by wall covering panel, with inside, and outside corner panels, which shall be (.0157 nom.) They will be pre-fab inside, and outside corner pieces for wall covering panels. (Female interlock each side accepts male edge of wall cover panel or adjoining corner panel.) New coping will be installed. All coping to be sourced, and warranted by the modified membrane manufacturer.
- B. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel. Nails and fasteners shall be flush-driven through flat metal discs of not less than 1-inch diameter. Metal discs may be omitted

when one piece composite nails or fasteners with heads not less than 1-inch diameter are used.

C. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than 28 gauges and not less than 1-inch in diameter. Discs shall be formed to prevent dishing. Bell or cup-shaped caps are not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate surfaces to receive modified bitumen sheet roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION REQUIREMENTS

- A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing modified bitumen roofing system.
- B. Insurance/Code Compliance: Where required, install and test modified bitumen roofing system to comply with governing regulations and specified insurance requirements.
- C. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installations of modified bituminous roofing system work. Note: Where there are existing roof curbs that have been roofed, they are to be demolished, new decking installed, and to be re-roofed per specifications.
- D. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets and insulation with two (2) plies of #15 organic felt set in full moppings of bitumen and with joints and edges sealed with roofing cement. Remove cut offs immediately before resuming work. Install new counter-flashing, furnished, and warranted by membrane manufacturer.
- E. Asphalt Bitumen Heating: Heat and apply bitumen according to EVT Method as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 5 °F at point of application) more than 1 hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either by information from manufacturer or by suitable test. Do not exceed recommended temperature limits during bitumen heating. Do not heat to a temperature higher than 25° below flash point. Discard bitumen that has been held at temperature exceeding finishing blowing temperature (FBT) for more than 3 hours. Keep kettle lid closed except when adding bitumen.
- F. Bitumen; Mopping Weights: For interply mopping, apply bitumen at the rate of approximately 25 lbs of asphalt per roof square (plus or minus 25 percent on a total job average
- G. Substrate joint penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

- H. Apply roofing materials as specified herein, unless recommended otherwise by manufacturer's instructions. Keep roof material dry before and during application. Do not permit phased construction. Complete application or roofing plies, modified sheet and flashing in a continuous operation. Begin and apply only as much roofing in one day as can be completed that same day. If phased construction is desired, roofing contractor shall glaze felts prior to leaving jobsite and beginning following day's work.
- I. Cut-Offs At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets. Provide temporary covering of two plies of #15 organic roofing felt set in full moppings of bitumen with joins and edges sealed.
- J. All curbs extended shall be a minimum of 8 inches in height. New curbs, to be mechanically attached, with treated lumber, and Flashed with garland's R-MerPly Base Flashing. Metal pans to be mechanically attached to curbs, and drip edge shall be 3.5 inches below field of curb.
- K. All designated conduit, shall be carefully lifted, during tear off process, and conduit will be placed on new wood blocks to match existing.

3.3 SAFETY REQUIREMENTS

- A. All application, material handling, and associated equipment shall conform to and be operated in conformance with OSHA safety requirements.
- B. Comply with federal, state, local, and fire, and safety requirements.
- C. Advise owner whenever work is expected to be hazardous to owner, employees, and/or operators.
- D. Maintain a crewman as a floor area guard whenever roof decking is being repaired or replaced.
- E. Maintain fire extinguisher within easy access whenever power tools are being used.

3.4 WASTE DISPOSAL

A. Do not re-use, re-cycle or dispose of material manufacturer's product containers except in accordance with all applicable regulations. The user of manufactured products is responsible for proper use and disposal of product container. Asbestos material shall be treated in accordance with local codes.

3.5 CALIFORNIA PROPOSITION 65

A. Contractor will post notices, make all communications and otherwise comply with California Proposition 65 requirements concerning notification of those who may be exposed to Prop 65 listed chemicals, as revised from time to time. Contractor will also comply with requirements concerning the safe use and handling of roofing material, including preventing vapors from entering buildings.

3.6 PREPARATION

A. Contractor shall have sole responsibility of accuracy of all measurements and estimates of materials, quantities and sizes. Make sure roof is cleaned down to deck, and insulation.
- B. Plug all drains to prevent debris entry and remove all clamping rings and related materials and store for later re-installation. Install new drains, with lead flanges.
- C. Sweep deck clean to remove all dirt and debris and dispose of away from site.
- D. Deck Repair: Replace all defective decking with like materials, following manufacturer's recommendation.

3.7 FELT PLY INSTALLATION

- A. Mop Garland's base sheet and install (2) each HPR Type VI fiberglass ply sheets, in 25 lbs per square of bitumen shingled uniformly to achieve two plies throughout over the prepared substrate. Shingle in proper direction to shed water on each area of the roof.
- B. Lap ply sheet end eight inches (8"). Stagger end laps twelve inches (12") minimum.
- C. Extend plies two inches (2") beyond top edges of wall and projection bases.
- D. Install R-MerPly Drip Edge Flashings, Title 24 R-MerPly base flashings, and wall cover panels.
- E. The modified membrane shall then be solidly bonded to the base layers with specified asphalt at the rate of 35lbs/ 100 square feet. The roll must push a puddle of asphalt in front of it with asphalt slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane. Apply pressure to all seams to ensure that laps are solidly bonded to substrate. Subsequent rolls of modified membrane shall be installed across the roof, as above, with a minimum of four inch (4") side laps and eight inch (8") end laps. The end laps shall be staggered. The modified membrane shall be laid in the same direction as the underlayments, but the laps shall not coincide with the laps of the base layers. Apply asphalt no more than five feet ahead of each roll being embedded. The modified membrane will be coated with pyramic Title 24 Coating, at the rate of 1.5 gallons per 100 square feet. (2 Coats)
- 3.8 PLUMBING STACK, AND ALL OTHER MISCELLANEOUS STACKS
 - A. Minimum stack height is twelve inches.
 - B. Run roof system over the roof. Seal the base of the stack with elastomeric sealant.
 - C. Prime flange of new sleeve. Install properly-sized sleeves set in a 1/4" base of elastomeric sealant.
 - D. Install base flashing ply bitumen.
 - E. Install modified membrane in bitumen.
 - F. Caulk the intersection of the membrane and the base flashing with elastomeric sealant.
 - G. Turn sleeve a minimum of one inch down inside of stack.
- 3.9 SCUPPER THROUGH WALL
 - A. Inspect the nailer to assure proper attachment and configuration.
 - B. Run one ply over nailer up the overflow, in the scupper hole and flash up. Install a scupper box in ¼ inch bed of mastic. Assure all box seams are soldered and have a minimum four (4) inch flange. Make sure all corners are closed and soldered. Prime scupper at a rate of one hundred square feet per gallon and allow to dry. Fasten flange of scupper box every

three inches o.c. staggered. Strip in flange of scupper box with base flashing ply covering entire area with six inch overlap on to the field of the roof and wall flashing. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine inches on to the field of the roof. Apply a three-course application of mastic and mesh at all seams.

- 3.10 ROOF DRAIN
 - A. Plug drain to prevent debris from entering plumbing
 - B. Install to drain minimum of twenty four inches from center of drain.
 - C. Run roof system plies over drain. Cut out plies inside drain bowl.
 - D. Set lead/copper flashing (30-inch square minimum) in ¼ inch bed of mastic. Run lead/copper into drain a minimum of two inches. Prime lead/copper at a rate of one hundred square feet per gallon, and allow to dry. Install base flashing 40-inch square minimum in bitumen. Install clamping ring and assure that all plies are under the clamping ring. Remove drain plug and install strainer.
- 3.11 HEAT STACK
 - A. Minimum stack height is twelve inches
 - B. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
 - C. Prime flange of new sleeve. Install properly sized sleeves set in ¹/₄ inch bed of roof cement.
 - D. Install base flashing ply in bitumen.
 - E. Install modified membrane in bitumen.
 - F. Caulk the intersection of the membrane with elastomeric sealant.
 - G. Install new collar over cape. Weld collar or install stainless steel draw brand.

3.12 CLEANING

- A. Remove drippage of bitumen from all walls, windows, floors, ladders and finished surfaces.
- B. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

3.13 FINAL INSPECTION

- A. At completion of roofing installation and associated work, meet with installer, installers of associated work, district representative, roofing system manufacturer's representative and other representatives directly concerned with the performance of the roofing system.
- B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each representative attending inspection.
- C. The roofing system manufacturer reserves the right to request a thermographic scan of roof during final inspection to determine if any damp or wet materials have been installed. The

thermoraphic scan shall be provided by the roofing contractor at roofing contractor's expense.

- D. Repair, or replace, as required, deteriorated or defective work found at time of inspection to a condition free of damage and deterioration at time of substantial completion and according to warranty requirements.
- E. The contractor is to notify the district's facilities department upon completion of corrections.
- F. Following the final inspection, acceptance will be made in writing by the material manufacturer.

07 52 40 – MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 - GENERAL

1.1 DISTRICT REPRESENTATIVE

A. In this specification section, "District Representative" means the project manager assigned by the District. If the project manager is not from the Maintenance Department, then "District Representative" means both the project manager assigned to the project and a representative assigned by the Maintenance Department. Both individuals must be invited to all meetings where the District Representative is present and both individuals must receive all correspondence related to the roofing.

1.2 SCOPE OF WORK

- A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Provide all labor, equipment, insulation, and materials to install modified bitumen roof system over the properly prepared substrate.
- C. All debris to be swept clean down to deck.
- D. All decking to be inspected before roofing.
- E. Recover deck with HPR Modified Bitumen Roofing System.
- F. Roof deck shall have new coping installed by roofing contractor.
- G. Install HPR felts, SBS+SIS+ES rubber modified Mineral membrane
- H. Flood coat with White-Star Polyurea, liquid adhesive over modified sheet, gravel and coat again. Polyurea shall be Title 24 energy efficiency compliant.
- I. All membrane shall conform to Title 24.
- J. Contractor shall be responsible for proper handling of all gas lines, and electrical system in accordance with applicable codes.
- K. Contractor is to ensure all gas, electrical, and other utilities involved, as part of this contract will be in the same working condition, after roofing project is completed.
- L. There shall be a minimum 8 inches flashing height on all curbs.
- M. Modified sheet shall have Kevlar, and 7% post-consumer recycle content.

1.3 RELATED WORK

- A. Furnish and install specified roofing and related components. Coordinate related work specified in other parts of this specification including, but not limited to, the following:
 - 1. Properly prepared, and clean deck.
 - 2. Repair, re-attach or replace defective decking, if needed.
 - 3. Install new pitch pockets, and fabricate lead flashing at ALL ANGLE support.
 - 4. Correctly anchor all conduit lines onto blocking. All new wood sleepers are required.

- 5. Wood curbs for conduits, shall match existing that is being replaced.
- 6. Properly support all pipes and equipment with blocking set on protection pads.
- 7. All existing roof mounted gas lines shall be in the same working condition as when the project commenced.
- 8. All drains are to be replaced with new drain assemblies. Note this includes: basket, clamps, rings, nuts, bolts, pots and all other accessories. Drain manufacturer shall be JR Smith, or equal. All drains and downspouts are to be tested before roof tearoff. If leakage is detected, owner's representative is to be contacted. After roof assembly is completed, drains are to be tested again and if leakage is detected, owner's representative is to be contacted.
- 1.4 REFERENCES
 - A. ASTM D 41 Specifications for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
 - B. ASTM D 312 Specification for Asphalt Used in Roofing
 - C. ASTM D 451 Test Method for Sieve Analysis of Granular Mineral
 - D. ASTM D 1079 Terminology Relating to Roofing, Waterproofing, and Bituminous Materials
 - E. ASTM D 1227 Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
 - F. ASTM D 1863 Specification for Mineral Aggregate Used on Built-Up Roofs
 - G. ASTM D 2178 Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
 - H. ASTM D 2822 Specification for Asphalt Roof Cement
 - I. ASTM D 2824 Specification for Aluminum-Pigmented Asphalt Roof Coating
 - J. ASTM D 4601 Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
 - K. ASTM D 5147 1991 Test Method for Sampling and Testing Modified Bituminous Sheet Materials All submittals for approval shall come from independent testing agency, no data tested in manufacturer's facility or underwritten, or witnessed in manufacturer's laboratory shall be accepted.
 - L. ASTM E 108 Test Methods for Fire Test of Roof Coverings
 - M. NRCA National Roofing Contractors Association
 - N. UL Underwriters Laboratories
 - O. WH Warnock Hersey

1.5 SUBMITTALS

- A. Submit under provisions of district standards.
- B. Product Data for each type of product specified include manufacturer's technical product data, installation instructions, and recommendations for each type of roofing product required. Include data substantiating that materials comply with specified requirements.

- C. Show evidence that the products and materials are manufactured in the United States and that materials provided conform to all requirements specified herein, and are chemically and physically compatible with each other and are suitable for inclusion within the total roof system specified herein.
- D. Show evidence that the Installer specializes in modified bituminous roof application with a minimum 5 years of experience and who is certified by the roofing system manufacturer as qualified to install manufacturer's roofing materials.
- E. Submit certification that the roof system furnished is Tested and Approved by Factory Mutual as a Class 1A roof system with 1-60 Wind Uplift Requirements, or Listed by Underwriters Laboratories or Warnock Hersey for external fire tests of ASTM E-108
- F. Any deficiencies in performance, warranty terms or improper submittal procedure will constitute grounds for immediate rejection or alternate.
- G. For all modified bituminous sheet roofing include independent test data according to ASTM D-5147 "Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material" substantiating that material comply with specified requirements.
- H. Unexecuted Manufacturer's warranty
- I. Certified copy of ISO 9001
- J. Provide a sample of each product, including but not limited to:
 - 1. A sample of each modified membrane sheet.
 - 2. A sample of modified integrated base flashing.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Roofing system manufacturer shall have a minimum of 10 years of experience in manufacturing modified bitumen roofing products in the United States and be ISO 9001 certified.
- B. Installer Qualifications: Installer (Roofing) shall be specializing in modified bituminous roof application with minimum 5 years of experience and who is certified by the roofing system manufacturer as qualified to install manufacturer's roofing materials.
- C. It is the intent of this specification to provide a roof system with an external fire rating. The components shall be as required by the membrane manufacturer to provide a Class A fire resistance rating.
- D. Installer's Field Supervision: Require Installer to maintain a full-time Supervisor/Forman on the job site during all phases of modified bituminous sheet roofing work and at any time roofing work is in progress: proper supervision of workmen shall be maintained. A copy of the specification shall be in the possession of the Supervisor/Foremen and on the roof at all times.
- E. It shall be the Contractor's responsibility to respond immediately to correction of roof leakage during construction.
- F. Pre-application Roofing Conference: Approximately 2 weeks before scheduled commencement of modified bitumen sheet roof system and associated work, meet at Project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work if any), District Representative, roofing system manufacturer's representative, and other

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- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
- D. Proceed with roofing work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.
- E. (Metal Decks) Mechanically attach 2" of Polyisocyanurate insulation, into metal deck, with #12, or #14 olympic fastener, at the rate of 1 each every square foot. Then in Type III Asphalt, mop ½" fiberboard insulation, to ISO board at the rate of 25bs/ 100 square feet. Mop Garland Base Sheet, Mop Type VI Felts, and Garland Cap Sheet, with Pyramic Coating 1.5 gallons/ 100 square feet. (2 Coats) (As specified)
- F. (Structural Concrete Decks) Prime existing deck with Primer, at the rate of 1 gallon/ 100 square feet. Sprinkle Mop 1/2" fiberboard insulation, in Type III Asphalt. Mop Garland Base Sheet, Mop Type VI Felts, and Garland Cap Sheet, with Pyramic Coating 1.5 gallons/100 square feet. (2 Coats) (As specified)
- G. (Wood Decks). Roll out red rosin paper, then mechanically attach Garland's HPR-Tri Base Premium. Mop 2 ea. Type VI Felts, and Garland Cap Sheet, with Pyramic Coating, 1.5 gallons/100 square feet. (2 Coats) (As specified)
- H. (Metal Decks with Lightweight Concrete) Mechanically attach 1" of Polyisocyanurate insulation, down through lightweight concrete, into metal deck, with #12 or #14 olympic fastener, at the rate of 1 every square foot. Mop ½" fiberboard insulation, in Type III Asphalt at the rate of 25 lbs/100 square feet. Mop Garland Base Sheet. Mop 2 each Type VI Felts, and Garland Cap Sheet, with Pyramic Coating 1.5 gallons/100 square feet. (2 Coats) (As specified).
- I. (If Applicable) all slopes of greater than 1-1/2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral shank one (1) inch cap nails, or screws and plates at a rate of one (1) fastener per ply (including the modified membrane), at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and (4) ft o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 1:12, strapping plies is recommended to help prevent slippage. Install for (4) additional fasteners at the upper edge of the modified bitumen sheet when strapping the plies.

1.10 SEQUENCING AND SCHEDULING

- A. Sequence installation of modified bituminous sheet roofing with related units of work specified in other sections to ensure that roof assemblies, including roof accessories, flashing, trim, and joint sealers, are protected against damage from effects of weather, corrosion, and adjacent construction activity.
- B. All work must be fully completed on each day. Phased construction will not be accepted. Contractor must glaze any exposed felts, before next day's work.

1.11 WARRANTY

- A. Membrane manufacturer, upon completion of installation, and acceptance by the District Representative and Maintenance Department, will supply to the Owner a 40-year partnership pledge warranty. Upon completion of installation, and acceptance by the owner all metal integrated base flashings, coping, or approved cap sheet flashings, and modified sheet. ANSI/SPRI required.
- B. Contractor will submit a minimum of a five-year labor warranty to the membrane manufacturer with a copy directly to District Representative.

PART 2 - PRODUCTS

- 2.1 GENERAL
 - A. When a particular trade name or performance standard is specified it shall be indicative of a standard required.
 - B. Provide products, and independent test data confirming tear strength, and tensile strength, along with all other pertinent data as specified.
 - C. Any item or materials submitted as an alternate to the manufacturer specified must comply in all respects as to the quality and performance, including job site investigation of the brand name specified.

2.2 Description

- A. Modified bituminous roofing work including but not limited to:
 - 1. Wood Decks Mechanically attach rosin paper, and Garland's Type II Base sheet, mop two plies of Type VI felts in Type III Steep Asphalt, mop Garland's modified smooth bitumen sheet, and flood, with Garland All-Knight/All-Stallion Primer ½ gallon/ square 2 coats. Spray White Star at 2 gallons a square. While it is still wet broadcast 200 lbs of 3/8 inch white washed gravel, (A-1grit arctic white). All Title 24 compliant.
 - 2. Metal Decks Mechanically attach 2 inches of polyisocyanurate insulation, with #12, or # 14 olympic fastener every 2 square feet. Then in Type III Asphalt, mop ½" fiberboard insulation. Mop Garlands Type II Base sheet, in Type III Asphalt mop two plies of Type VI in Type III Asphalt, mop Garland's modified smooth bitumen sheet, and flood, with Garland All-Knight/All-Stallion Primer ½ gallon/square 2 coats. Spray White Star at 2 gallons/ square, while it is still wet broadcast 200 lbs of 3/8 inch white washed gravel, (A-1 grit arctic white). All Title 24 Compliant.

2.3 BITUMINOUS MATERIALS

- A. Asphalt Primer: V.O.C. compliant, ASTM D-41.
- B. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D-2822, and Type II.
- C. Asphalt: Shall meet ASTM Specification D-312 Type III.

2.4 SHEET MATERIALS

A. Base Sheet: Type II HPR Tri-Base sheet properties (finished membrane)

	Machine Direction	Cross Machine Direction		
1.	Load Strain at 77 degrees F	318.6	322.1	
2.	Elongation at Max Load%	5.4	6.2	
3.	Tear Strength at 77 degrees F_{i} lbf.	575.1	603.1	

B. Modified Sheet: Modified Smooth Membrane Properties (Finished Membrane)

Machine Direction Cross Machine Direction

1.	Load Strain at 77 degrees F	1018.1	1145.4
2.	Max Load, lbf.	8.7	9.5
3.	Tear Strength at 77 degrees F	1766.8	1826.6
4.	Low Temperature Flexibility degrees F	Passes -40	
5.	Compound Stability degrees F	Passes 225	

C. Felts Type VI Felts

1. Minimum 2 plies of ASTM D2178, Type VI glass fiber roofing felt bonded to prepared substrate with hot bitumen, to be sourced, and purchased from the membrane manufacturer.

2.5 SURFACING

A. All-Knight/All-Stallion Primer ½ gallon/ square 2 coats. Coats must be installed perpendicular to each other and avoid "puddling the primer. Install single-component, aliphatic, polyuria, liquid adhesive. Adhesive shall meet the requirement of California's Title 24 Energy Efficiency Standards. Spray, or roll White Star at 2 gallons a square. While it is still wet broadcast 200lbs of 3/8 inch white washed gravel, (A-1 grit arctic white).

2.6 RELATED MATERIALS

A. All flashings, shall be Garland R-MerPly, and coping sourced by the membrane manufacturer. Metal wall cover panels, shall be stucco embossed, pre-fab wall cover panel designed for additional rigidity with no exposed fasteners. Panels shall have 13" coverage width (3" in S-Lock), up to 12 feet. Metal wall panels will be installed, by certified licensed membrane contractor. Metal wall panels will be warranted, and manufactured, by the modified membrane sheet manufacturer. All stucco walls are to be covered by wall covering panel, with inside, and outside corner panels, which shall be (.0157 nom.) They will be pre-fab inside, and outside corner panel or adjoining corner panel.) Coping shall be bent from Garland R-MerLite Flatstock.

- B. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel. Nails and fasteners shall be flush-driven through flat metal discs of not less than 1-inch diameter. Metal discs may be omitted when one piece composite nails or fasteners with heads not less than 1-inch diameter are used.
- C. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than 28 gauges and not less than 1-inch in diameter. Discs shall be formed to prevent dishing. Bell or cup-shaped caps are not acceptable.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Examine substrate surfaces to receive modified bitumen sheet roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION REQUIREMENTS

- A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing modified bitumen roofing system.
- B. Insurance/Code Compliance: Where required, install and test modified bitumen roofing system to comply with governing regulations and specified insurance requirements.
- C. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installations of modified bituminous roofing system work. Note: Where there are existing roof curbs that have been roofed, they are to be demolished, new decking installed, and to be re-roofed per specifications.
- D. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets and insulation with two (2) plies of #15 organic felt set in full moppings of bitumen and with joints and edges sealed with roofing cement. Remove cut offs immediately before resuming work. Install new counter-flashing, furnished, and warranted by membrane manufacturer.
- E. Asphalt Bitumen Heating: Heat and apply bitumen according to EVT Method as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 5 °F at point of application) more than 1 hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either by information from manufacturer or by suitable test. Do not exceed recommended temperature limits during bitumen heating. Do not heat to a temperature higher than 25° below flash point. Discard bitumen that has been held at temperature exceeding finishing blowing temperature (FBT) for more than 3 hours. Keep kettle lid closed except when adding bitumen.

- F. Bitumen; Mopping Weights: For interply mopping, apply bitumen at the rate of approximately 25 lbs of asphalt per roof square (plus or minus 25 percent on a total job average
- G. Substrate joint penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- H. Apply roofing materials as specified herein, unless recommended otherwise by manufacturer's instructions. Keep roof material dry before and during application. Do not permit phased construction. Complete application or roofing plies, modified sheet and flashing in a continuous operation. Begin and apply only as much roofing in one day as can be completed that same day. If phased construction is desired, roofing contractor shall glaze felts prior to leaving jobsite and beginning following day's work.
- I. Cut-Offs At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets. Provide temporary covering of two plies of #15 organic roofing felt set in full moppings of bitumen with joins and edges sealed.
- J. All curbs shall be a minimum of 8 inches in height. New curbs, to be mechanically attached, with treated lumber, and Flashed with garland's R-MerPly Base Flashing. Metal pans to be mechanically attached to curbs, and drip edge shall be 3.5 inches below field of curb.
- K. All designated conduit, shall be carefully lifted, during tear off process, and conduit will be placed on new wood blocks to match existing.

3.3 SAFETY REQUIREMENTS

- A. All application, material handling, and associated equipment shall conform to and be operated in conformance with OSHA safety requirements.
- B. Comply with federal, state, local, and fire, and safety requirements.
- C. Advise owner whenever work is expected to be hazardous to owner, employees, and/or operators.
- D. Maintain a crewman as a floor area guard whenever roof decking is being repaired or replaced.
- E. Maintain fire extinguisher within easy access whenever power tools are being used.

3.4 WASTE DISPOSAL

A. Do not re-use, re-cycle or dispose of material manufacturer's product containers except in accordance with all applicable regulations. The user of manufactured products is responsible for proper use and disposal of product container. Asbestos material shall be treated in accordance with local codes.

3.5 CALIFORNIA PROPOSITION 65

A. Contractor will post notices, make all communications and otherwise comply with California Proposition 65 requirements concerning notification of those who may be exposed to Prop 65 listed chemicals, as revised from time to time. Contractor will also comply with requirements concerning the safe use and handling of roofing material, including preventing vapors from entering buildings.

3.6 PREPARATION

- A. Contractor shall have sole responsibility of accuracy of all measurements and estimates of materials, quantities and sizes. Make sure roof is cleaned down to deck, and insulation.
- B. Plug all drains to prevent debris entry and remove all clamping rings and related materials and store for later re-installation. Install new drains, with lead flanges.
- C. Sweep deck clean to remove all dirt and debris and dispose of away from site.
- D. Deck Repair: Replace all defective decking with like materials, following manufacturer's recommendation.

3.7 FELT PLY INSTALLATION

- A. Mop Garland's base sheet and install (2) each HPR Type VI fiberglass ply sheets, in 25 lbs per square of bitumen shingled uniformly to achieve two plies throughout over the prepared substrate. Shingle in proper direction to shed water on each area of the roof.
- B. Lap ply sheet end eight inches (8"). Stagger end laps twelve inches (12") minimum.
- C. Extend plies two inches (2") beyond top edges of wall and projection bases.
- D. Install R-MerPly Drip Edge Flashings, Title 24 R-MerPly base flashings, and wall cover panels.
- E. The modified membrane shall then be solidly bonded to the base layers with specified asphalt at the rate of 35lbs/ 100 square feet. The roll must push a puddle of asphalt in front of it with asphalt slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane. Apply pressure to all seams to ensure that laps are solidly bonded to substrate. Subsequent rolls of modified membrane shall be installed across the roof, as above, with a minimum of four inch (4") side laps and eight inch (8") end laps. The end laps shall be staggered. The modified membrane shall be laid in the same direction as the underlayments, but the laps shall not coincide with the laps of the base layers. Apply asphalt no more than five feet ahead of each roll being embedded. After membrane has been installed apply Garland All-Knight/All-Stallion Primer 1/2 gallon/ square 2 coats. Coats must be installed perpendicular to each other and avoid "puddling" the primer. Install single-component, aliphatic, polyurea liquid adhesive. Adhesive shall meet the requirements of California's Title 24 Energy Efficiency Standards. Spray White Star at 2 gallons a square. While it is still wet broadcast 200 lbs of 3/8 inch white washed gravel. (A-1 grit arctic white). All Title 24 Compliant.

3.8 R MISCELLANEOUS STACKS

- A. Minimum stack height is twelve inches.
- B. Run roof system over the roof. Seal the base of the stack with elastomeric sealant.
- C. Prime flange of new sleeve. Install properly-sized sleeves set in a 1/4" base of elastomeric sealant.
- D. Install base flashing ply bitumen.
- E. Install modified membrane in bitumen.
- F. Caulk the intersection of the membrane and the base flashing with elastomeric sealant.
- G. Turn sleeve a minimum of one inch down inside of stack.

3.9 SCUPPER THROUGH WALL

- A. Inspect the nailer to assure proper attachment and configuration.
- B. Run one ply over nailer up the overflow, in the scupper hole and flash up. Install a scupper box in ¼ inch bed of mastic. Assure all box seams are soldered and have a minimum four (4) inch flange. Make sure all corners are closed and soldered. Prime scupper at a rate of one hundred square feet per gallon and allow to dry. Fasten flange of scupper box every three inches o.c. staggered. Strip in flange of scupper box with base flashing ply covering entire area with six inch overlap on to the field of the roof and wall flashing. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine inches on to the field of the roof. Apply a three-course application of mastic and mesh at all seams.

3.10 ROOF DRAIN

- A. Plug drain to prevent debris from entering plumbing
- B. Install to drain minimum of twenty four inches from center of drain.
- C. Run roof system plies over drain. Cut out plies inside drain bowl.
- D. Set lead/copper flashing (30-inch square minimum) in ¼ inch bed of mastic. Run lead/copper into drain a minimum of two inches. Prime lead/copper at a rate of one hundred square feet per gallon, and allow to dry. Install base flashing 40-inch square minimum in bitumen. Install clamping ring and assure that all plies are under the clamping ring. Remove drain plug and install strainer.

3.11 HEAT STACK

- A. Minimum stack height is twelve inches
- B. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
- C. Prime flange of new sleeve. Install properly sized sleeves set in ¹/₄ inch bed of roof cement.
- D. Install base flashing ply in bitumen.
- E. Install modified membrane in bitumen.
- F. Caulk the intersection of the membrane with elastomeric sealant.
- G. Install new collar over cape. Weld collar or install stainless steel draw brand.

3.12 CLEANING

- A. Remove drippage of bitumen from all walls, windows, floors, ladders and finished surfaces.
- B. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

3.13 FINAL INSPECTION

A. At completion of roofing installation and associated work, meet with installer, installers of associated work, district representative, roofing system manufacturer's representative and other representatives directly concerned with the performance of the roofing system.

- B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each representative attending inspection.
- C. The roofing system manufacturer reserves the right to request a thermographic scan of roof during final inspection to determine if any damp or wet materials have been installed. The thermoraphic scan shall be provided by the roofing contractor at roofing contractor's expense.
- D. Repair, or replace, as required, deteriorated or defective work found at time of inspection to a condition free of damage and deterioration at time of substantial completion and according to warranty requirements.
- E. The contractor is to notify the district's facilities department upon completion of corrections.
- F. Following the final inspection, acceptance will be made in writing by the material manufacturer.

07 60 00 – FLASHING AND SHEET METAL

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES:
 - A. Flashing and sheet metal components for building construction:
 - 1. Roof and sill flashings.
 - 2. Flashings at aluminum-framed storefronts.
 - B. Sheet metal covers and counterflashings at roof mounted mechanical equipment and vent stacks.
 - C. Counterflashings for plumbing, mechanical, electrical and other roof penetrations.
 - D. Lead flashing at drains and pipes.

PART 2 - PRODUCTS

- 2.1 SHEET METAL FLASHING AND TRIM MATERIALS
 - A. Sheet Metal Materials, General: Meet or exceed minimum requirements and recommendations of reference standards.
 - B. Zinc-Coated (Galvanized) Steel: Commercial quality sheet steel with 0.20 percent copper, ASTM A526 except ASTM A527 for lock-forming; Coating Designation G60 hot-dip galvanized typically and G90 for parapet caps and concealed gutters, mill phosphatized where indicated for painting; 24 gage minimum except as otherwise indicated or recommended by SMACNA Architectural Sheet Metal Manual or as follows:
 - 1. Gutters: 20 gage.
 - 2. Parapet caps: 22 gage.
 - C. Lead: ASTM B749, Type L51121, copper-bearing sheet lead, minimum 4 lb/sq ft (0.0625inch thick) except not less than 6 lb/sq ft (0.0937-inch thick) for burning (welding) unless otherwise indicated.
 - D. Zinc Sheet and Strip: ASTM B69, Type I, minimum 0.024-inch thick.

2.2 ACCESSORY MATERIALS

- A. Accessory Materials: Provide accessory materials and other items essential to complete the sheet metal installation. Metal accessories shall be made of the same materials as the items to which they are applied.
- B. Underlayment: Asphalt saturated roofing felt (commonly referred to as #15 and #30 felt).

- C. Paper Slip Sheet: 5-lb. rosin-sized building paper.
- D. Polyethylene Underlayment: Reinforced polyethylene sheet, minimum 6 mils thick, resistant to decay when tested in accordance with ASTM E154.
- E. Fasteners, General: Use roofing nails typically.
 - 1. Sheet steel fasteners: Galvanized steel or stainless steel.
 - 2. Fasteners to wood substrate: Refer to Section 06 11 11 Wood Backing, Blocking and Curbing for requirements. See details on Drawings. Use full-threaded screws unless otherwise indicated.
 - 3. Fasteners to concrete, masonry and metal substrates: Refer to Section 05 05 23 Metal Fastenings for requirements. See details on Drawings.
 - a. Use threaded concrete and masonry anchors typically at concrete and solid masonry substrates.
 - b. Use self-drilling, self-threading fasteners typically at metal substrates.
 - c. Use sheet metal screws at wood substrates.
- F. Solder:
 - 1. For use with steel, 50 50 tin/lead solder (ASTM B32), with rosin flux.
 - 2. For use with stainless steel, provide 60 40 tin/lead solder (ASTM B32), with acidchloride type flux, except use rosin flux over tinned surfaces.
- G. Flux: FS O-F-506.
- H. Shop Primer Paint:
 - 1. Shop primer for ferrous metal at exposed exterior locations: Tnemec 90E-92, ethyl silicate zinc-rich primer, or equal.
 - 2. Shop primer for ferrous metal at concealed exterior locations and for interior locations: Tnemec Series 10, modified alkyd rust-inhibitive primer, or manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer, complying with performance requirements of FS TT-P-645.
 - 3. Shop primer for galvanized steel, for exposed exterior locations: Tnemec S-22 Galv-Gard, oil-cementitious coating.
- I. Field Primer and Finish Coatings: As specified in Section 09 90 00 Painting and Coating.
- J. Bituminous Coating: Tnemec 46-450 Heavy Tnemecol, high-build mineral-filled coal tar pitch coating, or a cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.
- K. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant, as specified in Section 07 90 00 Joint Protection.
- L. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 90 00 Joint Protection.
- M. Epoxy Seam Sealer: 2-part non-corrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.

- N. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weatherresistant seaming and adhesive application of flashing sheet.
- O. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.
- P. Roofing Cement: Asphaltic cement, asbestos-free, complying with ASTM D4586, Type 1.
- Q. Lead Flashing: ASTM B749, minimum 4# lead with 6 to 7 percent antimony content.
- R. Miscellaneous Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of the Work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.

PART 3 - EXECUTION

3.1 FABRICATION

- A. Shop Fabrication, General: Shop-fabricate sheet metal to greatest extent possible. Comply with details shown on Drawings and with applicable requirements of referenced standards and other recognized industry practices to accommodate local climatic considerations.
 - 1. Fabricate sheet metal for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the Work.
 - 2. Fabricate sheet metal items of the materials specified below. Form sheet metal Work to fit substrates.
 - 3. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Form pieces and sections in longest practical lengths, true to shape, accurate in size, square, and free from distortion or defects.
 - 5. Typically, provide sheet metal items in 8- to 10-foot lengths. Single pieces less than 8feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs.
 - 6. Fabricate vertical faces with bottom edge formed outward 1/4-inch and hemmed to form drip.
- B. Edges: Hem exposed edges on underside 1/2-inch. Miter and seam corners.
- C. Corners: Fabricated from one piece with minimum 18-inch long legs; lock seam and solder for rigidity.
- D. Seams: Typically fabricate non-moving seams in sheet metal with flat lock seams.
 - 1. Typical Seams: Overlapped and sealed seams.
 - 2. Coping Seams: Lock seams, flattened.
 - 3. Seams, Horizontal to Vertical Transitions: Solder joints.
 - 4. Soldered seams: Tin edges to be seamed, form seams, and solder.

- E. Configurations: As indicated on Drawings and as referenced to SMACNA Architectural Sheet Metal Manual.
- F. Expansion Provisions: Where lapped or bayonet-type expansion provisions in sheet metal Work cannot be used or would not be sufficiently waterproof and weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).
- G. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of sheet metal Work, form metal to provide for proper installation of elastomeric sealant, in compliance with referenced SMACNA standards.
- H. Cleats and Starter Strips: Fabricated of same material as sheet metal fabrication, minimum 4-inches wide, except at continuous strips, interlockable with sheet metal fabrication. Typically use continuous strips.
- I. Exposed Sheet Metal Items: Galvanized sheet steel.
- J. Metal Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- K. Pitch Pans: SMACNA Plates 65, 66, 67 and 68.

3.2 SHEET METAL FINISHES

- A. Sheet Metal Finish: Unless otherwise indicated, all exposed exterior sheet metal is intended to receive paint finish.
 - 1. Sheet metal at exterior walls and other locations exposed to public view: Finish as indicated on the Drawings.
 - a. Metallic paint finish shall be shop-applied and shall match metallic paint finish specified in Section 07411 Manufactured Metal Roofing System.
 - Solid color paint finish shall be field-applied coating as specified in Section 09 90 00 – Painting and Coating.
 - Sheet metal exposed at metal roofing: Factory-applied paint finish as specified in Section 07411 - Manufactured Metal Roofing System. Sheet metal shall be integral components of metal roofing system.
 - 3. Sheet metal at other locations not exposed to public view: Field coated as specified in Section 09 90 00 Painting and Coating.
- B. Preparation: Shop prepare metal surfaces for field painting by bonderizing or priming. Pretreat galvanized metal as recommended by primer paint manufacturer.
- C. Priming: All exposed sheet metal, except stainless steel and shop finished metal, is intended for field finish painting. Shop prime all sheet metal to receive field finish coating. Exposed surfaces shall be ready for field finish coating as specified in Section 09 90 00 Painting and Coating.
- D. Backpriming: Backpaint concealed metal surfaces with bituminous coating, to a minimum dry film thickness of 15 mils.
- E. Fasteners: Exposed fasteners shall match finish of surrounding material.

07 71 00 – ROOF SPECIALTIES

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES:
 - A. Factory-manufactured reglets and counterflashing.
 - B. Factory-manufactured, formed aluminum parapet copings.

PART 2 - PRODUCTS

- 2.1 REGLETS
 - A. Specified Manufacturer: Fry Reglet Corporation, Alhambra, CA (626/289-4744 or 800/237-9773).
 - B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. O'Keefes, Inc., Aluminum Building Products, San Francisco, CA (415/822-4222 or 800/227-3305).
 - 2. MM Systems Corporation, Tucker, GA (404/938-7570 or 800/241-3460).
- 2.2 FORMED ALUMINUM PARAPET COPINGS
 - A. Specified Manufacturer: MM Systems Corporation, Tucker, GA (404/938-7570 or 800/241-3460; local representative, Specialty Building Components, Whittier, CA, 310/945-8951).
 - B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. W.P. Hickman Co., Asheville, NC (704/274-4000)

PART 3 - EXECUTION

- 3.1 REGLETS
 - A. Reglets and Flashing, General: Springlok Flashing, as manufactured by Fry Reglet Corporation, formed metal reglet with snap-in metal counter-flashing, factory-fabricated, with a minimum opening of 1/4-inch and a depth of 1-1/4 inches.
 - 1. Reglet material: Galvanized steel.

- 2. Flashing material: 0.020-inch Type 302 stainless steel.
- 3. End laps: Factory-formed, 1-inch at reglets and 3-inch at flashings.
- 4. Corners: Provide built-up mitered corner pieces for internal and external angles.
- 5. Wind clips: Provide Fry Windlok Clip, sheet metal clips to be secured to wall prior to installing flashing in reglet, and to be bent up over bottom edge of flashing.
- B. Surface-Applied Reglets, on Concrete Walls: Fry Springlok Flashing System Type SM.
- C. Recessed Reglets, in Exterior Wall Finish: Fry Springlok Flashing System Type ST.
- D. Mounting Provisions: Provide slotted mounting holes spaced 16-inches on center for fastening reglet to wall.
- E. Accessories:
 - 1. Corners: Factory-manufactured, mitered inside and outside corners.
 - 2. Splices: Factory-manufactured, integral component of reglet and flashing system.
- 3.2 FORMED ALUMINUM PARAPET COPINGS
 - A. Formed Aluminum Parapet Coping: MM Systems Snap-Lok Coping System, muliti-part coping system, style to suit size indicated on Drawings and existing wall conditions.
 - 1. Coping shall be formed from 0.063 inch (1.6 mm) aluminum sheet to profile and of thickness indicated.
 - 2. Anchor plate shall be minimum nominal 0.0276-inch (0.7-mm) thick, zinc-coated steel anchor plate or cleat located at coping joint.
 - 3. Provide formed aluminum gutter chair or gutter/splice plate or compression pad/gutter.
 - 4. Inside and outside corners shall be prefabricated, with miters welded before finishing.
 - 5. Coping system shall require no exposed fasteners.

3.3 ACCESSORY MATERIALS

- A. Accessory Materials: Manufacturer's standard anchors, fasteners, set screws, spacers, seals and filler materials, adhesive, and other accessories compatible with material in contact, as indicated or required for complete installations.
- B. Anchors and Fasteners: Comply with general requirements specified in Section 05 05 23 Metal Fastenings. Unless otherwise indicated, provide fasteners of type, grade and class required for intended use and sized and spaced as required for loads and substrate.
 - 1. For fastening galvanized steel to concrete substrate: Zinc-coated (galvanized) or stainless steel. Steel with cadmium-plating or other rust-inhibitive coating, except at aluminum materials provide
 - 2. For fastening aluminum: Stainless steel only.
- C. Screw Heads, Typical: Unless otherwise noted, exposed screws shall be phillips oval or flat head, countersunk.

- D. Bituminous Coating: Tnemec 46-450 Heavy Tnemecol, high-build mineral-filled coal tar pitch coating, or a cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.
- 3.4 FABRICATION AND FINISHING
- A. Formed Aluminum Parapet Coping Fabrication:
 - 1. Furnish units in longest practicable lengths to minimize number of end joints. Minimize site splicing.
 - 2. Provide hairline mitered corners where coping changes directions or abuts other materials.
 - 3. Provide factory splices, guttering and other components of manufactured coping system. Installed coping shall present continuous faces and edges, with no apparent joints from ground level.
 - 4. Back paint components in contact with cementitious materials to prevent electrolysis.
- B. Metal Finishes, General: Comply with NAAMM Metal Finishes Manual, for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are fabricated. Protect finishes on exposed surfaces with protective covering before shipment.
- C. Aluminum Finishes:
 - 1. Concealed aluminum components: AA-M10 (unspecified mill finish).
 - 2. Exposed aluminum components: Thermoplastic organic coating system containing minimum 70 percent Kynar 500/Hylar 5000 polyvinylidine fluoride (PVDF) resin, factory-applied, complying with American Architectural Manufacturers Association (AAMA) standard AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels and Architectural Spray Coaters Association (ASCA) standard ASCA 96 Voluntary Specification for Superior Performance of Organic Coatings. Provide custom color to match color used for field painted exterior metal products.
- D. Concealed Steel Components: Hot-dipped galvanized or stainless steel.

07 84 00 – FIRESTOPPING

PART 4 - GENERAL

- 4.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 4.2 Section includes:
 - A. Penetration seals through fire and smoke barriers, including:
 - 1. Voids around:
 - a. Pipes.
 - b. Ducts.
 - c. Conduit.
 - d. Cables and wires not in conduit.
 - e. Structural framing.
 - 2. Joints between smoke barriers and other construction.
 - 3. Other joints and openings, as required by authorities having jurisdiction and as necessary to maintain fire-resistive integrity of wall, ceiling and floor construction.
 - B. Firesafing as draftstop to subdivide concealed construction to prevent passage of smoke, fumes and flame during fire.

PART 5 - PRODUCTS

- A. Acceptable Manufacturers: Products of the manufacturers listed below will be acceptable, subject to approval of Division of the State Architect (DSA). Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 Product Requirements.
 - 1. Bio Fireshield, Inc., Concord, MA (508/369-7700 or 800/221-8408).
 - 2. The Carborundum Company, Niagra Falls, NY (716/278-2000).
 - 3. GE Silicones, Waterford, NY (800/255-8886).
 - 4. Nelson Firestop Products, Tulsa, OK (918/627-5530 or 800/331-7325).
 - 5. Semco Division/Products Research and Chemical Corporation, Glendale, CA (818/247-7140 or 800/423-2411).
 - 6. Fire Protection Products Group, 3M Ceramic Materials Department, St. Paul, MN (612/733-1110).
 - 7. Hilti, Inc., Tulsa, OK (800/333-1150).

PART 6 - EXECUTION

- 6.1 FIRESTOPPING AND SMOKE SEALS MATERIALS
- A. Firestopping and Smoke Seals Materials, General:
 - 1. Materials shall be asbestos-free.
 - 2. All firestopping and smokestopping materials, assemblies and installation details shall comply with the requirements of authorities having jurisdiction, including the Building Official and the Fire Marshal having jurisdiction over the facility.
 - 3. It shall be the Contractor's responsibility to determine the types of penetrations and gaps to be sealed and to select appropriate firestopping and smokestopping system designs.
 - 4. All firestopping and smokestopping products shall be from a single manufacturer throughout the project, regardless of system or trade responsible for the penetrating components through the fire or smoke barrier.
 - 5. Provide products which:
 - a. Allow normal expansion and contraction movement of the penetrating or adjoining elements without failure of the penetration or gap seal.
 - b. Emit no hazardous, combustible, or irritating by-products during installation or curing period.
 - c. Do not require special tools for installation or maintenance, including removal and reinstallation of firestopping or smokestopping products to accommodate addition or deletion of penetrating components.
 - 6. Where gunnable or pourable sealant is used, provide only fully-curing types of sealant where penetration accessible in the finished Work.
- B. Through-Penetration Firestopping at Fire-Rated Construction: Provide firestopping materials and assemblies to seal all penetrations at all fire barriers. Firestopping assemblies shall be listed in the UL Fire Resistance Directory under categories XHCR and XHEZ, providing that such assemblies conform to the construction type, penetration type, annular space requirements and fire rating requirement for each distinct condition, and that the system shall be symmetrical for wall applications.
 - 1. Fire-resistance ratings of each firestopping assembly shall be determined by testing in the configurations necessary for Project conditions and fire-resistance ratings shall be at least as high as that of the fire barrier in which the firestopping assembly is installed.
 - 2. If a tested assembly is not available for a particular penetration configuration, modify the penetration configuration to suit available assemblies, as acceptable to authorities having jurisdiction. Do not modify assembly configuration except as specifically stated in the test report or as approved by authorities having jurisdiction.
- C. Construction Gap Firestopping at Fire-Rated Construction: Provide firestopping materials and assemblies to seal all gaps between building elements at all fire barriers. Firestopping assemblies shall be listed in the UL Fire Resistance Directory and shall conform to the construction type, type of gap and fire rating requirement for each distinct condition.

- D. Smokestopping at Smoke Partitions: Provide firestopping assemblies to seal all penetrations at all smoke barriers. Sealing materials shall be any firestopping assembly using the same materials as used for firestopping in fire-rated construction, specified above, provided that such assembly includes rating as a smoke seal and is acceptable to authorities having jurisdiction. Fire resistance time may be disregarded.
- E. Warning Labels: Self-adhesive or wired-on labels, providing warning that penetration or gap has been sealed with firestopping or smokestopping and providing pertinent information about such firestopping or smokestopping.
 - 1. Label shall be as acceptable by authorities having jurisdiction, including size of label, size of lettering and color of lettering.
 - 2. At a minimum, label shall include:
 - a. Product used for sealing penetration or gap.
 - b. "WARNING" and "DO NOT REMOVE".
 - c. Installer's firm name.
 - d. UL classification number.
 - e. Hour rating, if fire barrier.
 - f. Date.

07 90 00 – JOINT PROTECTION

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Exterior joints sealers in vertical surfaces and nontraffic horizontal surfaces.
 - B. Exterior joints in horizontal traffic surfaces.
 - C. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - D. Interior joints in horizontal traffic surfaces.

PART 2 - PRODUCTS

- 2.1 MATERIALS, GENERAL
 - A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - B. Colors: Standard or custom colors as selected by Architect to match or suit surrounding finish materials.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those referenced for Type, Grade, Class, and Uses.
- B. One-Part Neutral-Curing Silicone Sealant (Sealant Types A1 and A2): Type S, Grade NS, Class 25; suitable for Uses T, NT, M, G, A, and, as applicable to joint substrates indicated, O.
 - 1. Sealant Type 1A: Dow Corning 790 Silicone Building Sealant. No substitutions will be considered.
 - 2. Sealant Type 1B: Dow Corning 795 Silicone Building Sealant, by Dow Corning Corp., GE Silpruf by General Electric Company, or Pecora 895 by Pecora Corporation.
- C. One-Part Mildew-Resistant Silicone Sealant (Sealant Type 2): Type S, Grade NS, Class 25; suitable for Uses NT, G, A, and, as applicable to non-porous joint substrates indicated, O; formulated with fungicide; intended for sealing interior joints with non-porous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes; Dow Corning 786 Mildew Resistant Silicone Sealant, by Dow Corning Corp. or GE

Silicones 1700 Sanitary Sealant, by General Electric Company or 898 Silicone, by Pecora Corporation.

D. One-Part Moisture-Cured Polyurethane (Sealant Type 3): Type M, Grade NS, Class 25; Sikaflex -2c NS/SL by Sika Corporation or Sonneborn SL-2 by Sonneborn Building Products.

2.3 LATEX JOINT SEALANTS

- A. Acrylic-Emulsion Sealant (Sealant Type 4): Manufacturer's standard, one part, non-sag, mildew-resistant, acrylic-emulsion sealant complying with ASTM C834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior locations involving joint movement of not more than plus or minus 5 percent; one of the following:
 - 1. Chem-Calk 600, by Bostik Construction Products Div.
 - 2. AC-20, by Pecora Corp.
 - 3. Sonolac, by Sonneborn Building Products Div.; Rexnord Chemical Products, Inc.
 - 4. Tremco Acrylic Latex 834, by Tremco Inc.

2.4 JOINT SEALANTS FOR PAVING

- A. Specified Manufacturer: L.M. Scofield Company, Los Angeles, CA, (213/720-3000 or 800/800-9900).
- B. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 Product Requirements.
- C. Three-Component Paving Joint Sealant (Sealant Type 5): Lithoseal Trafficalk-3G by L.M. Scofield Company, three-component urethane formulation with proprietary hybrid polymer,, which cures to a firm, flexible, tear-resistant rubber, complying with ASTM C920 Type M, Grade NS, Class 25, suitable for Use T.
 - 1. Consistency: Gun-grade.
 - 2. Shore hardness: $40 + \frac{1}{-5}$.
 - 3. Joint movement capability: +/-25 percent.
 - 4. Ultimate elongation: 500 percent plus.
 - 5. Service temperature range: -40 to 158 degrees F (-22 to 70 degrees C).
 - 6. Paving Joint Sealant Color: As selected by Architect from manufacturer's full 72 color selection.

2.5 JOINT SEALANT BACKING

- A. Joint Sealant Backing, General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-waxing, non-extruding strips of flexible, non-gassing plastic foam of material indicated below; non-absorbent to

water and gas; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

- 1. Specified Manufacturer and Product: Applied Technologies, Inc., Sof Rod, proprietary, reticulated, closed-cell polymeric foam, non-outgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D1623, and with water absorption less than 0.02 gms/cc in accordance with ASTM C1083.
- 2. Acceptable Manufacturer and Product: None identified. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
- C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to -26 degrees F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- 2.6 JOINT FILLERS FOR PAVING
 - A. Joint Fillers for Paving, General: Provide joint fillers of thickness and widths indicated.
 - B. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D1751, asphalt saturated fiberboard.
- 2.7 MISCELLANEOUS MATERIALS
 - A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate tests and field tests.
 - B. Cleaners for Non-porous Surfaces: Provide non-staining, chemical cleaners of type which are acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent non-porous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
 - C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surfaces adjacent to joints.

PART 3 - EXECUTION (na)

DIVISION 08 - OPENINGS

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements.

08 11 00 – METAL DOORS AND FRAMES

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Flush hollow steel doors, fire-rated and non-rated.
 - B. Rolled steel door, sidelight and fixed window frames, welded construction ("hollow metal" frames).
 - C. Vision lights and louvers in doors.

PART 2 - PRODUCTS

- 2.1 METAL DOOR AND FRAME MATERIALS
 - A. Sheet Steel for Doors and Frames: Prime quality cold rolled, annealed, stretcher leveled steel, conforming to Commercial Standard CS 242 or CS 211, with bonderized finish.
 - B. Hot-Rolled Steel Sheets and Strip: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
 - C. Cold-Rolled Steel Sheets: ASTM A 366, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
 - D. Metallic-Coated Steel Sheets: ASTM A 653/, Commercial Steel (CS), Type B, with an zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.
 - E. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.
 - F. Supports and Anchors: Galvanized sheet steel, minimum 18-gage sheet.
 - G. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are built into exterior walls, hot-dip galvanize in compliance with ASTM A153, Class C or D as applicable.
 - H. Shop Applied Paint: Apply after fabrication, rust-inhibitive enamel or paint, either air-drying or thermosetting, suitable as a base for specified finish paints, complying with ANSI A224.1
 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- 2.2 DOOR LOUVERS AND VISION LIGHTS
 - A. Specified Manufacturer: Anemostat Door Products, Division of Dynamics Corporation of America, Carson, CA (562/775-7441 or 800/982-9000).

- B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. Air Louvers, Inc., Pico Rivera, CA (562/948-3495): Louvers and vision lights.
 - Construction Specialties, Inc. (C/S), San Marcos, CA (619/744-0300; local representative, Integrated Marketing Concepts, Inc., Laverne, CA 909/392-5500): Aluminum louvers.
 - 3. K.N. Crowder Mfg., Inc. (KNC), Lewiston, NY (716/754-8247):
 - 4. Leslie-Locke, Inc., Atlanta, GA (404/953-6366 or 800/321-3415): Louvers and vision lights.
 - 5. The Airolite Company, Marietta, OH (614/373-7676): Door louvers.

PART 3 - EXECUTION

- 3.1 FLUSH STEEL DOORS
 - A. Flush Steel Doors: Full flush panel steel doors, complying with requirements indicated below by reference to ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level.
 - 1. Interior steel doors: Level 2 and Physical Performance Level B (Heavy Duty), Model 1 Full Flush, 16 gage steel.
 - 2. Exterior steel doors: Level 2 and Physical Performance Level B (Heavy Duty), Model 1 Full Flush, 14 gage steel. Provide flush top and bottom, not open channel, to prevent water intrusion at exterior steel doors.
 - B. Facing Material:
 - 1. Interior steel doors: Plain steel sheet or electrolytic zinc-coated steel sheet.
 - 2. Exterior and damp location steel doors: Metallic-coated steel sheets.
 - C. Internal Construction: Manufacturer's standard core materials according to ANSI 250.8, as follows:
 - 1. Interior doors:
 - a. Resin-impregnated paper honeycomb, at non-fire rated doors.
 - b. Rigid mineral fiber with internal sound deadener on inside of face sheets, at firerated doors.
 - 2. Exterior doors: One of the following:
 - a. Rigid polyurethane conforming to ASTM C 591.
 - b. Rigid polystyrene conforming to ASTM C 578.
 - D. Supports and Anchors: Fabricate of not less than 18-gage sheet steel; galvanized where used with galvanized frames or at exterior, damp or wet locations.
 - E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize in compliance with ASTM A153, Class C or D as applicable.

F. Clearances:

- 1. Head and jambs: Not more than 1/8 inch (3.2 mm), except not more than 1/4 inch (6.4 mm) between non-fire-rated pairs of doors.
- 2. Bottom: Not more than 3/8 inch (19 mm) from finish surface.
- 3. Fire Doors: Provide clearances according to ANSI/NFPA 80.
- G. Shop-Applied Paint: After fabrication apply rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints, complying with ANSI A224.1 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- H. Shop Painting:
 - 1. Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
 - 2. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
 - 3. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.
 - 4. Apply finish coat to doors indicated as prefinished by electrostatically spraying and baking, to produce a paint thickness of 1.25 mils.

3.2 WELDED STEEL FRAMES

- A. Welded Steel Frames: Full-formed sheet steel frames for doors, transoms, sidelights, borrowed lights, fixed windows and other openings, of types and styles as shown on Drawings and schedules, with concealed fastenings, welded construction, complying with ANSI A250.
 - 1. Exterior Frames: 14 gage minimum gage steel, galvanized steel, shop primer finish.
 - 2. Interior Frames: 16 gage minimum steel, primer painted steel finish.
- B. Shapes: As indicated on the Drawings.
- C. Fabrication: Mitered and welded corners.
- D. Reinforcements, General: Provide in accordance with SDI 107.
 - 1. Hinge Reinforcements: 9 gage, full mortise.
 - 2. Closer Reinforcements: 9 gage.
 - 3. Strike Reinforcement: 11 gage.
- E. Wide Openings: Reinforce frames wider than 48 inches with roll formed steel channels, minimum 12 gage, fitted tightly into frame head, or provide frames of minimum 14 gage steel.
- F. Preparations for Door Hardware: Comply with ANSI A115. Provide factory-prepared cutouts from hardware instructions and templates. Refer to Section 08 70 00 Hardware. Prepare cutouts with fully drilled and tapped fittings.
- G. Plaster Guards: 24 gage, at strike and head cutouts, welded to back of hardware openings at locations where grouted frame only turn out to be rusted frames, due to the moisture

against the metal, plaster or other materials might interfere with hardware installation and operation. Provide plaster guards at cement plaster (stucco} and mortar-set tile conditions, typically.

- H. Anchors, General: Provide in accordance with SDI 105. Anchors at fire rated frames shall also conform to UL Standard 10B.
- I. Anchors at Stud Partitions: Provide at least 3 wall anchors per jamb at hinge and strike levels.
- J. Anchors at Door Frames in Concrete or Masonry: Frames erected after concrete or masonry.
 - 1. Floor anchors: 12 gage angle welded to frame, full width of frame section, one each jamb.
 - 2. Jamb anchors: 12 gage channel or Z welded to frame full width of frame section less wall finish thickness with tube sleeve welded to anchor and to flame stop, drilled and deep dimpled for anchor and flat head screw for completely concealed fastening.
 - 3. Head Anchors: Provide anchors same as for wall, located at center of head, for pairs of doors only.
- K. Anchors at Door Frames in Concrete or Masonry: Frames erected before concrete or masonry.
 - 1. Jamb anchors: 12 gage T-anchor, loose in frame, full width of frame engaging frame returns, T-leg equal to wall thickness less 2-inches or frame width whichever is less. T-leg shall be 6-inches long with 1/2-inch diameter hole for reinforcement bar dowel, 3 per jamb.
 - 2. Head anchors: Provide T-anchor same as wall anchors, located at center of head, at pairs of doors only.
- L. Frames For Interior Borrowed Lights and Windows: Full formed, 16 gage cold rolled steel with concealed fastenings, welded corners, fabricated as for door frames, shapes as detailed and scheduled on Drawings.
 - 1. Jamb anchors: Same as for door frames for respective wall condition, except jamb anchors located within 6-inches of head and sill plus spaced not more than 24-inches on center.
 - 2. Head and sill anchors: Same as for door frames for respective wall condition, except located within 6-inches of jambs plus spaced not more than 24-inches on center.
- M. Glazing Stops: Channel glazing stops, miter at corners, drill and countersink for oval head screws, completely fit ready for removal and glazing at site.
- N. Built-up Transom and Sill Bars: Fabricate from same material as for frames as detailed. Fabricate concealed portions from tube stock, double channels, roll formed sections or break shape; maintain structural adequacy. Fabricate exposed portions, break shape to profile detail.
- O. Double Mullions: Fabricate same as frame, back to back with welded and filled seam.
- P. Door Silencers: Drill stops at frames to receive button-type silencers specified in Section 08 70 00 - Hardware.
 - 1. Provide three silencers on strike jamb stop for single leaf doors and two at head stop for pairs of doors.

- 2. Omit silencers where head and jamb where door seals (weatherstripping and smoke or sound seals) are specified.
- 3. Omit silencers where in violation of fire rating.

3.3 DOOR LOUVERS AND VISION LIGHTS

- A. Louvers, Exterior Flush Steel Doors: Anemostat Model PLSL, inverted split-Y blade design, 12 gage steel frame with 18 gage steel louver blades, galvanized sheet steel with factory prime finish, through-bolt security screw fasteners and 18-14 bronze mesh screen mounted on interior face.
- B. Louvers, Interior Flush Steel Doors: Anemostat Model AFDL, inverted-Y blade, 14 gage steel frame with 16 gage steel louver blades, with manufacturer's standard gray primer finish.
- C. Louvers, Interior Wood Doors: At Contractor's option, provide one of the following:
 - 1. Anemostat Model AFDL, inverted-Y blade, extruded aluminum frame and blades, clear anodized finish, for doors with stained and varnished wood veneer finish.
 - 2. Anemostat Model AFDL, inverted-Y blade, 18 gage steel frame with 20 gage steel louver blades, with manufacturer's standard gray primer finish for doors with opaque painted finish, for field finish painting to match door face at painted doors as specified in Section 09 90 00 Painting and Coating.
- D. Vision Lights:
 - 1. Fire Rated: Anemostat Model BFL-123 for 1/4-inch thick glass and Anemostat Model FGS-IS for thicker glass, with UL or Warnock-Hersey classification to suit fire rating of door. Confirm glass type and thickness with notes at Door Schedule in the Drawings.
 - 2. Non-Rated: Anemostat Model BFL-123, for 1/4-inch thick glass.
 - 3. Finish: At Contractor's option, provide either plated finish to match door hardware (satin chrome), brushed stainless steel or manufacturer's standard gray primer finish with field-applied finish paint to match door face, as specified in Section 09 90 00 Painting and Coating.

08 31 00 – ACCESS DOORS AND PANELS

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Access doors and panels in walls and partitions.
 - B. Access doors and panels in ceilings.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
 - A. Specified Manufacturer: Karp Associates, Inc., Maspeth, NY (718/784-2105 or 800/888-4212).
 - B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. Milcor Limited Partnership, Lima, OH (419/228-1411).
 - 2. Samson Products (Affiliate of JL Industries), Pico Rivera, CA (310/801-6226).
 - 3. Larsen's Manufacturing Co., Minneapolis, MN (612/571-1181).
 - 4. Cesco Products, Minneapolis, MN (612/424-4919).

PART 3 - EXECUTION

- 3.1 WALL ACCESS DOORS AND PANELS
 - A. Interior Gypsum Board Walls, (Non-Fire Rated) Access Door, Flush Face, for Service and Utility Spaces: Karp DSC-214M, or approved equal, primer paint finished flush steel door, size as indicated on Drawings. Unless otherwise indicated, door is intended to be field finish painted to match surrounding wall finish.
 - B. Interior Gypsum Board Walls, (Non-Fire Rated) Access Door, Flush Face, for Toilet, Sanitary and Damp Spaces: Karp DSC-214M, or approved equal, stainless steel finish flush steel door, size as indicated on Drawings.
 - C. Interior Gypsum Board Walls, (Fire-Rated) Access Door: Karp KRP-150FR, or approved equal, surface-mounted, primer paint finish, UL-listed B-Label assembly for walls, 20 gage steel door in 16 gage steel frame, filled with 2-inch thick fire-rated insulation, with automatic closer, self-latching bolt-type latch operated by flush key device, size as indicated

on Drawings. Unless otherwise indicated, door is intended to be field finish painted to match surrounding wall finish.

- D. Interior Ceramic Tile Wall, (Fire-Rated) Access Doors: Karp KRP-150FR, or approved equal, surface-mounted, stainless steel finish, UL-listed B-Label assembly for walls, 20 gage steel door in 16 gage steel frame, filled with 2-inch thick fire-rated insulation, with automatic closer, self-latching bolt-type latch operated by flush key device, size as indicated on Drawings.
- E. Interior Ceramic Tile Wall, (Non-Fire Rated) Access Doors Karp DSB-214SM, or approved equal, flush-mounted with face of tile, stainless steel finish, size as indicated on Drawings.
- F. Lock, Non-Rated Access Doors: Manufacturer's standard cam-action latch with keyed lock cylinder.
- G. Lock, Fire-Rated Access Doors: Manufacturer's standard flush key device.
- 3.2 CEILING ACCESS DOORS AND PANELS
 - A. Interior Gypsum Board Ceiling, (Non-Fire Rated) Access Door, Dry Locations: Karp KDW Flush Drywall Access Door, or approved equal, primer paint finished flush steel door, size as indicated on Drawings. Unless otherwise indicated, door is intended to be field finish painted to match surrounding ceiling finish.
 - B. Interior Gypsum Board Ceiling, (Non-Fire Rated) Access Door, Toilet Room, Sanitary and Damp Locations: Karp DSC-214M, or approved equal, flush stainless steel door face, size as indicated on Drawings.
 - C. Lock, Non-Rated Access Doors: Manufacturer's standard cam-action latch with keyed lock cylinder.
 - D. Lock, Fire-Rated Access Doors: Manufacturer's standard flush key device.
08 51 13 – ALUMINUM WINDOWS

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Commercial-grade, fixed and operable aluminum windows.

PART 2 - PRODUCTS

- 2.1 MANUFACTURER
 - A. Specified Manufacturer: Kawneer Company, Inc., Norcross, GA (770/449-5555).
 - B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below (or others) will be acceptable in accordance with the "or equal" provision specified in the Divisions 0 and 1.
 - 1. EFCO Corporation, Monett, MO (417/235-3193 or 800/221-4169; local representative, Yorba Linda, CA, 714/985-9141).
 - 2. TRACO, Warrendale, PA (412/776-7000).

2.2 ALUMINUM WINDOWS

- A. Fixed Aluminum Windows: Kawneer Sealair Series 5200, AAMA Specification HC 65/AW65 minimum, deflection limited to L/175 at 20 pounds per square foot wind load, stacked combinations and configurations as indicated on the Drawings.
 - 1. Fixed aluminum windows: AAMA Specification F HC60 minimum.
 - 2. Project-out aluminum windows: AAMA Specification P C40 minimum.
- B. Aluminum Window Framing: Extruded aluminum extrusions, alloys and tempers as determined by manufacturer to provide strength, extrudability, corrosion resistance and suitability for specified finishes.
- C. Hinges: Concealed four-bar friction hinges (2 per ventilator) located on each jamb near the top rail, complying with AAMA 904.
- D. Locks:
 - 1. Operable sash, windows less than 72 inches (1800 mm) above finish floor: Combination lever handle and cam-action lock with concealed pawl.
 - 2. Operable sash, windows 72 inches (1800 mm) and more above finish floor: Poleoperated, face-mounted transom latch.
- E. Limit Devices: Provide limit devices designed to restrict sash or ventilator opening.

- 1. Safety Devices: Limit clear opening to 6 inches (150 mm) for ventilation; with custodial key release.
- F. Pole Operators: Provide one pole operator and pole hanger for every room that has operable windows more than 72 inches (1800 mm) above the floor. Fabricate pole of tubular anodized aluminum with a rubber cap at the lower end and standard push-pull hook to match the hardware design at the top end. Provide sufficient length for window operation without reaching more than 60 inches (1500 mm) above the floor.
- G. Shop Sealants: Provide non-hardening sealants as standard with the manufacturer, equivalent to or exceeding minimum qualities of those specified in Section 07 90 00 Joint Protection, conforming to AAMA Specification 803.2 and as required to achieve AAMA performance ratings.
- H. Anchors, Clips, Shims and Fasteners:
 - 1. Fasteners to surrounding construction: Concealed stainless steel or galvanized steel protected from direct contact with aluminum, or high-strength aluminum protected from contact with other metals and cementitious materials.
 - 2. Internal fasteners: Concealed, stainless steel or other corrosion-resistant metal, compatible with aluminum.
 - 3. Size and spacing of anchors, clips, and fasteners: Suitable for each aluminum window to withstand wind load equal to Performance Class number.
- I. Flashing: For head and sill.
 - 1. Provide galvanized sheet metal flashing as indicated on Drawings and as specified in Section 07 60 00 Flashing and Sheet Metal.
 - Provide flexible flashing as indicated on the Drawings and as specified in Section 07 60 00 - Flashing and Sheet Metal.
- 2.3 GLASS AND GLAZING MATERIALS
 - A. Glass: Provide glass as specified in Section 08 80 00 Glazing and as indicated on Drawings.
 - B. Safety Glass: Provide safety glass as required by California Building Code (CBC) and as indicated on Drawings. Safety glazing may be tempered glass or laminated safety glazing as indicated and as permitted by Building Code. See Section 08 80 00 Glazing.
 - C. Glazing Materials:
 - 1. Glazing materials shall be compatible with aluminum and those joint sealers and sealing materials used in composite structure which have direct contact with the gasket.
 - 2. Standard exterior and interior glazing gaskets shall be dry glazed elastomer complying with ASTM C509.
 - 3. Interior air sealants shall be silicone and shall comply with AAMA 802.5 (Type II).
 - 4. Glazing bead shall be extruded aluminum and shall be minimum 0.050-inch thick.
 - 5. Provide glazing colors approximate to that of aluminum window framing.

PART 3 - EXECUTION

3.1 FABRICATION

- A. Fabrication, General: Fabricate aluminum windows to produce weathertight, rigid, factory glazed or field glazed units in which the glass can be replaced without dismantling the ventilator.
- B. Fabrication for Performance Requirements: In addition to the performance requirements for each aluminum window Type, Grade, and Performance Class in AAMA 101, fabricate units to drain intruding water to the exterior and to fill openings fully.
- C. Expansion and Contraction Provisions: Make provisions for assemblies to expand and contract within a temperature range of 20 degrees F to 165 degrees F.

3.2 ALUMINUM FINISH

A. Anodized Finish: Identified as "Anodized Finish" on Drawings, Architectural Class I, black color coating conforming to AA standard AA-M10 C22 A42/A44 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class I Architectural, film thicker than 0.7 mil with integral color or electrolytically deposited color) complying with AAMA 606.1 or AAMA 608.1.

08 70 00 – HARDWARE

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES:
 - A. Door hardware for hollow steel and wood doors.
 - B. Thresholds.
 - C. Weather, smoke and sound seals.
 - D. Hardware for miscellaneous applications, such as padlocks for roof hatch and gates.

PART 2 - PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS
 - A. Acceptable Manufacturers: Listed below are specified manufacturers, whose products are the basis of the design, and acceptable manufacturers, whose equivalent products the Contractor may use in accordance with the "or equal" provision specified in Section 01600 Product Requirements. Other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 Product Requirements.

Product	Specified Manufacturer	Acceptable Manufacturer
Butt Hinges 5 Knuckle Bearing Hinges	Hager Hinge Company	Stanley Hardware Division/The Stanley Works
Anchor Hinges		McKinney Products Ccompany
Mortise Latchsets and Locksets	Sargent Manufacturing Co.	No substitutions allowed
Lock Cylinders	Sargent Manufacturing Co.	No substitutions allowed
Exit Devices	Sargent Manufacturing Co.	No substitutions allowed
Trilogy Lock	Alarm Lock	No substitutions allowed
Automatic Flush Bolts	H.B. Ives Co.	Door Controls

		International	
Coordinators	H.B. Ives Co.	Door Controls International	
Surface Overhead Door Closers	Sargent Manufacturing Co.	No substitutions allowed	
Surface Pulls	H.B. Ives Co.	Trimco	
Vandal-Resistant Pulls	H.B. Ives Co.	Trimco	
Push/Pull Plates	H.B. Ives Co.	Trimco	
Kick Plates	H.B. Ives Co.	Trimco	
Stops and Holders	H.B. Ives Co.	Trimco	
Overhead Stops	Glynn-Johnson	Rixson or	
		H.B. Ives Co.	
Thresholds	Pemko	Reese Enterprises, Inc. or Zero International	
Weather Seals and Smoke Seals	Pemko	Reese Enterprises, Inc. or Zero International	
Silencers	H.B. Ives Co.	Trimco	

PART 3 - EXECUTION (na)

- 3.1 DEMOLITION
 - A. REMOVE ALL Continuous hinges. We have found that continuous hinges are maintenance headache
- 3.2 DOOR HARDWARE, GENERAL
 - A. Door Hardware, General:
 - 1. Provide all door hardware necessary to complete the Work.
 - 2. Provide door hardware complying with accessibility requirements of California Building Code (CBC), including Sections 1133B.2.1, 1133B.2.5.1 and 1003.3.1.8.
 - 3. Provide door hardware as scheduled in DOOR HARDWARE SCHEDULE located at the end of PART 3 of this Section.
 - B. Manufacturers: Obtain all items of each type from the same manufacturer.
 - 1. Manufacturer's Name Plates: Do not use products which have manufacturer's name or trade name displayed in a visible location.
 - 2. Exception: Required fire labels.
 - 3. Exception: As directed by or acceptable to the Architect.
 - 4. Exception: Manufacturer's identification on rim of lock cylinders.

- C. Manufacturer's Catalog Numbers: Catalog numbers are indicated in the DOOR HARDWARE SCHEDULE to establish operation, function, quality, weight, size, pattern, design, material, and finish required.
- D. Standards Conformance: Provide hardware manufactured to conform to published templates.
- E. Templates: All hardware applied to metal doors or jambs shall be made to template and secured by machine screws. Furnish templates to the metal door and frame manufacturer for application at the factory, unless otherwise requested.
- F. Scope: Provide all hardware necessary to complete Work. Products not specifically identified but necessary shall be provided of type and quality generally recognized in door hardware industry for service duty of Project type, location and usage, as selected by Contractor and subject to acceptance by Owner and Architect.
- G. Adaptation: Should specified hardware conflict with configuration of doors, frames and surrounding construction, provide comparable alternative hardware which maintains intended function of door, as selected by Contractor and subject to review and acceptance by Owner and Architect.
- 3.3 FASTENERS
 - A. Fasteners, General: Furnish type, quality, size and quantity for long-life installation under hard usage. Conform to manufacturer's instructions and recommendations for fasteners and installation and the following minimum requirements. Provide fasteners which are suitable for the substrate.
 - B. Expansion Shields, Hex Bolts and Other Anchors: Provide anchors and fasteners as recommended by hardware manufacturer, subject to review by Architect, and in conformance to fastener requirements specified in Section 05 05 23 Metal Fastenings. Do not use toggle anchors or powder-actuated fasteners.
 - C. Concrete and Masonry Substrates: Furnish hardware with machine screws and expansion anchors.
 - D. Fastener Finishes: Match hardware item, typically. Provide stainless steel fasteners at aluminum and stainless steel hardware. Provide corrosion-resistant (zinc-plated steel or stainless steel) at exterior exposure, unheated spaces and damp atmospheres such as rooms with food service cooking and cleaning equipment.
 - E. Fasteners at Fire Doors: Conform to labeling requirements of door, frame and hardware. At wood doors, provide sex-nut through-bolts for operating hardware typically unless permitted otherwise by hardware listing.

3.4 HARDWARE FINISHES

- A. Hardware Finishes, General: Provide finishes matching ANSI/BHMA A156.18 designations indicated in DOOR HARDWARE SCHEDULE.
 - 1. Metal finishes: At Contractor's option, stainless steel may be provided instead of satin chrome plating. Where stainless steel is indicated, substitution of satin chrome plating will not be acceptable.
 - 2. Plastic and painted finishes: Color shall be selected by Architect from manufacturer's full selection, if not otherwise indicated.

- B. Chrome, Satin Finish: Scheduled as 626.
 - 1. Plated on steel: BHMA 652 (US26D).
 - 2. Plated on brass or bronze: BHMA 626 (US26D).
- C. Stainless Steel: Scheduled as 630. Provide as scheduled and as alternative to Satin Finish Chrome finish at Contractor's option.
 - 1. Polished: BHMA 629 (US32).
 - 2. Brushed: BHMA 630 (US32D).
- D. Aluminum:
 - 1. Manufacturer's standard finish: Indicated as AL or ALUM, either satin anodized or clear coated as standard with product manufacturer.
 - 2. Satin anodized, natural metal color: BHMA 628.
 - 3. Clear coated: BHMA 673.
 - 4. Manufacturer's standard finish: Indicated as ALUM, either satin anodized or clear coated as standard with product manufacturer.
 - 5. Powder coated: Proprietary powdered stainless steel (PemKote).
- E. Primer Coat:
 - 1. Primer on steel: BHMA 600 (PC).
 - 2. Primer on brass or bronze: BHMA 163 (PC).
- F. Mill Finish: For brass and aluminum, as noted, MILL.
- G. Colored Finishes:
 - 1. Factory Colored Coatings: Color code as indicated, corresponding to specified manufacturer's coating type and color.
 - 2. Surface Door Closers: Factory powder coated on exposed metal components, to match door hardware finish color, unless otherwise noted.

3.5 FIRE-RATED HARDWARE

- A. Fire-Rated Hardware: Provide UL-listed and approved hardware for fire-labeled assemblies in compliance with NFPA 80.
 - 1. Confirm that hardware provided conforms to fire tested assembly (coordinate with doors provided).
 - 2. Where exit devices are provided on fire-rated doors, provide door with UL fire door label indicating, "Fire Door to be Equipped with Fire Exit Hardware", and provide door hardware with UL exit device label indicating "Fire Exit Hardware".
- B. Hinges at Fire-Rated Assemblies: Steel base material only.
- C. Closers: Bolted (not screwed) to door reinforcement or through-bolted with sex-nut fasteners.
- D. Latchbolts and Deadbolts: 1/2-inch minimum throw or as required for fire rated assembly label.

3.6 EXIT DOOR HARDWARE

- A. Exit Door Hardware: Provide UL listed and approved hardware for exit (panic) door operation.
- B. Exit Door Hardware Operation: Exit doors shall be openable at all times from the inside without use of key or special knowledge or effort.
- C. Door Closers at Exit Doors: Closers shall comply with California Building Code (CBC), wheelchair accessibility regulations and door pull forces at accessible doors, including CBC Sections 1133B.2.1, 1133B.2.5 and 1133B.2.5.1. Pressure required at doors with closers shall not exceed:
 - 1. Fire-rated doors: 15 pounds.
 - 2. All other exterior doors: 8.5 pounds.
 - 3. All other interior doors: 5 pounds.
- 3.7 BUTT HINGES
 - A. Butt Hinges, General: Full-mortise, 5-knuckle design, templated. See DOOR HARDWARE SCHEDULE for specific products. Provide shims and shimming instructions for proper door adjustment.
 - 1. Typical interior butt hinges: Standard weight, steel base metal, steel pin, plated.
 - 2. Typical exterior butt hinges: Stainless steel, with stainless steel pin.
 - B. Non-Removable Pins (NRP) at Butt Hinges:
 - 1. Exterior doors: Provide non-removable pins at all outswing exterior doors.
 - 2. Interior doors: Provide non-removable pins at all interior doors with locksets where hinges are exposed on key side of door.
 - C. Low-Friction Hinges: Provide ball bearing hinges at all doors with closers.
 - D. Butt Hinge Height and Weight: As scheduled. If not scheduled or otherwise indicated, provide height and weight of butt hinges as follows:

Door Thickness	Door Width	Hinge Height	Hinge Weight
1-3/4 inches	to 36-inches	4-1/2 inches	Standard
1-3/4 inches	37-inches to 42-inches	5-inches	Heavy
1-3/4 inches	over 42-inches	5-inches	Extra heavy

- E. Butt Hinge Width: Unless otherwise specified, the width of butt hinges shall be sufficient to clear frame and trim projection when door swings 180 degrees.
- F. Butt Hinge Quantity: As scheduled. If not scheduled or otherwise indicated, provide three hinges per leaf to 7'-6" height. Add one for each additional 30-inches in height or fraction thereof.
- G. Hinge Tips: Standard flat tips.

H. Fire Rated Doors: Use half surface half mortise hinges sex bolted through the door.

3.8 LATCHSETS AND LOCKSETS

- A. Latchsets and Locksets, General: Exit doors shall be openable from the inside without the use of a key or any special knowledge or effort, in compliance with California Building Code (CBC) Section 1003.3.1.8.
- B. Mortise Latchsets/Locksets: Sargent Series and lever handle design to match existing campus standard latchsets and locksets. See DOOR HARDWARE SCHEDULE for latchset/lockset catalog numbers and functions.
- C. Latchbolts: Throw shall conform to fire label requirements.

3.9 LOCK CYLINDERS, KEYING AND KEYS

- A. Lock Cylinders: Match existing school campus lock cylinder type, keyway and keying.
 - 1. District uses a restricted keyway.
 - 2. Obtain letter of authorization from District for Contractor (hardware supplier) to purchase locks with restricted keyway and keys.

B. Keying:

- 1. Consult with Owner (District Locksmith) for keying and ordering instructions.
- 2. Comply with Owner's instructions for key and lock control.
- 3. Provide building masterkeying as directed by Owner, to suit keying of existing school campus.
- 4. Final keying shall be by District Lock Shop.
- C. Keys: Standard bow. Identify keys as directed by district lockshop.
- D. Key Quantities:
 - 1. Construction keys: Twenty.
 - 2. Extractor keys: Two.
 - 3. Keying by district lockshop.
- E. Temporary Construction Keying:
 - 1. Internal construction keying function: Provide temporary construction lock cylinder feature on door locks as necessary for security during construction.
 - 2. Removal of internal construction keying: Prior to Substantial Completion review or Owner occupancy, whichever is earliest, extract construction key blank and establish permanent lock keying.
- 3.10 EXIT DEVICES
 - A. Exit Devices (Panic Hardware): Manufacturer and series as scheduled, lever handle to match building locksets, quiet return, deadlocking latchbolt, stainless steel touchpads, non-handed. See DOOR HARDWARE SCHEDULE for products.

- 1. Unlatching force for exit devices shall not exceed 15 pounds applied in the direction of travel, in compliance with UBC Standard 10-4.
- 2. Exit devices shall comply with CBC Section 1003.3.1.9.
- 3.11 ACCESS CONTROL LOCKS
 - A. Access Control Locks to be Networx series as manufactured by Alarm Lock Systems
 - B. Locks shall conform to ANSI A.156 Grade 1
 - C. Provide configuration of lock as required by hardware group
 - 1. Cylindrical lock type
 - a. Proximity/keypad Model Series PDL6100
 - 2. Mortise lock type
 - a. Proximity/keypad Model Series PDL6500
 - 3. Exit device trim type
 - a. Proximity/keypad Model Series ETPDLN
 - 4. Keypad switch type
 - a. Digital keypad only Model Series NETPDK
 - D. Programming
 - 1. All programming, including user credentials, scheduling and audit trail retrieval, shall be performed using Alarm Lock DL-Windows software version 4.1.8x or higher.
 - 2. Communication of all programming from computer containing software to locks shall be through Alarm Lock Gateway model appropriate for building's network system.
 - E. Gateway
 - 1. Ethernet connected gateway Model Series AL-IME
 - 2. Power over Ethernet connected gateway, plenum rated Model Series AL-IMEPOEP
 - F. Lock Features
 - 1. Locks, except keypad switch type, to be battery powered by 4 each "C" size batteries providing 5 year life under normal operating conditions.
 - 2. Locks to support up to 5000 users with 3-6 digit numeric PIN code, or HID format proximity credential, or both for dual credential requirement.
 - 3. Locks to support up to 500 event schedules.
 - 4. Locks to support in non-volatile memory 35,000 event audit trail.
 - 5. Locks to be weatherproof for indoor or outdoor use in operating temperature range of -31 to +151 degrees Fahrenheit.
 - 6. Locks shall continue to operate as last instructed including maintaining schedules and audit trail, independent of building network system failure.
 - 7. Locks shall be capable of providing a system-wide global emergency lockdown/unlock within 10 seconds when initiated by authorized user from any lock, or from the DL-Windows software.

- 8. Locks shall adjust schedules automatically to correspond with daylight savings time.
- 9. Locks shall have remote release capability through hard-wired connection.
- 10. Locks shall have a single pole, double throw relay output to provide external functions through hard-wired connection.
- G. Gateway Features
 - 1. Each gateway shall support up to 63 locks.
 - 2. Each gateway to communicate to software through the building's network system.
 - 3. Ethernet connected gateway
 - a. Interface: Ethernet 10Base-T or 100Base-TX
 - b. Protocols: TCP/IP, UDP/IP, DHCP
 - 4. Security: IEEE 802.11 PSK with 128-bit AES Rijndael Encryption
 - 5. Each gateway to communicate to locks through 900 MHz GFSK proprietary 128-bit encryption.
 - a. 50 channels
 - b. 10mW power output
 - 6. Environment
 - a. Indoor installation
 - b. Operating temperature: -4 to +140 degrees Fahrenheit
- H. Software
 - 1. Software to be Alarm Lock DL-Windows supporting 2000 locks per system account with a maximum of 50 gateways per system account.
 - 2. Contractor shall provide end user software training by an Alarm Lock Networx Certified dealer or instructor.Installation
- I. Provide consulting services by Alarm Lock Networx Certified dealer or instructor to end user IT Department for installation of DL-Windows software and connection of Gateway(s) to building network system.
- 3.12 FLUSH BOLTS
 - A. Automatic-Latching Flush Bolts: ANSI A115.4, UL listed. See DOOR HARDWARE SCHEDULE for products.
 - B. Flush Bolt Strikes:
 - 1. Head Strikes: Manufacturer's standard.
 - 2. Sill Strikes: Dustproof.
- 3.13 COORDINATORS
 - A. Coordinators, General: Automatic coordinating device for sequential closing of paired doors; prevent active leaf from closing ahead of inactive leaf. See DOOR HARDWARE SCHEDULE for products.

- B. Coordinators at Typical Locations: Provide at pairs of labeled fire doors, selection suitable for flush bolts and exit devices installed on doors. See DOOR HARDWARE SCHEDULE for products.
- C. Accessories: Provide carry-bar and strike at exit doors, as appropriate. Provide additional hardware for stop (soffit) applied coordinator for complete and proper installation in accordance with UL labeling requirements.

3.14 SURFACE OVERHEAD DOOR CLOSERS

- A. Surface Overhead Door Closers: Rack and pinion type with removable non-ferrous case and cast iron body. See DOOR HARDWARE SCHEDULE for products.
 - 1. Provide closers non-handed, non-sized and adjustable.
 - 2. Locate closers inside building and rooms.
 - 3. Exterior door closers shall have been successfully tested to 100 hours of ASTM B117 salt spray test.
 - 4. Exterior doors shall not require seasonal adjustments in temperatures from 120 degrees F to -30 degrees F.
 - 5. Provide through-bolts at wood doors unless doors are furnished with blocking for closers.
 - 6. Provide flush transom offset brackets where parallel arm closers are listed for doors with fixed panels over.
 - 7. Provide drop brackets at narrow head rails.
 - 8. Provide screw spacers as necessary for parallel-arm brackets.
- B. Wheelchair and Persons with Disabilities Accessibility Provisions: Reduced operating force design, complying with California Building Code (CBC) for wheelchair accessibility and dependent persons use. See DOOR HARDWARE SCHEDULE for products.
 - 1. Maximum effort to operate doors shall not exceed 8-1/2 pounds for exterior doors and 5 pounds for interior doors, such pull or push effort being applied at right angles to hinged doors and at the center plane of sliding or folding doors.
 - 2. Compensating devices or automatic door operators may be utilized to meet the above standards.
 - 3. When fire doors are required, the maximum effort to operate the door may be increased not to exceed 15 pounds.
- C. Door Closer Finishes: Provide metal covers and exposed arms painted to approximate plated finish.

3.15 PUSH/PULL PLATES

- A. Stainless Steel Push/Pull Plates: 0.050-inch, fully rounded top and bottom. See DOOR HARDWARE SCHEDULE for products and sizes.
- B. Plated Brass Push/Pull Plates: Cold-forged, 0.050-inch. See DOOR HARDWARE SCHEDULE for products and sizes.

3.16 KICKPLATES

- A. Kickplates: 0.50-inch thick stainless steel, with four beveled edges. Provide machine or wood screws of stainless steel. See DOOR HARDWARE SCHEDULE for products.
- B. Kickplate Sizes:
 - 1. Single doors: Door width less 2-inches.
 - 2. Double doors: Door width less 1-inch.
 - 3. Height: As scheduled, 10-inches typically.
- 3.17 DOOR BUMPERS AND DOOR STOPS
 - A. Door Bumpers and Door Stops: See DOOR HARDWARE SCHEDULE for products.
 - 1. Unless otherwise noted in the DOOR HARDWARE SCHEDULE, provide floor type with appropriate fasteners.
 - 2. Where floor type cannot be used, provide wall type.
 - 3. If neither wall nor floor type can be used, provide overhead type.
 - B. Fasteners:
 - 1. Anchors to concrete and masonry substrates: Provide expansion anchors. Refer to Section 05 05 23 Metal Fastenings.
 - 2. Anchors to steel framing: Provide sheet metal screws into framing or into sheet metal backing. Provide expansion anchor.
 - 3. Anchors to wood framing: Provide wood screws or sheet metal screws into framing or into solid wood backing.
 - 4. Do not use toggle or molly-type anchors. Do not use powder-actuated driven fasteners.
- 3.18 THRESHOLDS
 - A. Thresholds, General: Wheelchair-accessible design, complying with California Building Code (CBC) Section 1133B.2.4.1. See DOOR HARDWARE SCHEDULE for products. Provide closed end returns where threshold extends beyond face of door frame.
 - B. Threshold Finish: Non-slip grit surfacing.
 - C. Fasteners:
 - 1. Non-ferrous, 1/4-inch fasteners, Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (FHSL).
 - 2. Provide countersunk, corrosion-resistant fasteners.
 - 3. At concrete slab on grade, provide expansion anchors.
 - 4. Fasteners shall comply with general requirements for anchors and fasteners specified in Section 05 05 23 Metal Fastenings.
- 3.19 WEATHER, SOUND AND SMOKE SEALS

- A. Weather Seals: Provide at all exterior doors. See DOOR HARDWARE SCHEDULE for products.
- B. Sound Seals: Provide at interior doors as scheduled. See DOOR HARDWARE SCHEDULE for products.
- C. Smoke Seals: See DOOR HARDWARE SCHEDULE for products. Provide UL-listed and UL-labelled smoke seals at all fire-rated door assemblies.
 - 1. Contractor shall provide intumescent seals complying with test requirements of door frame and door.
 - 2. Intumescent seals shall be concealed when door is closed and not rely upon exposed fasteners.

3.20 SILENCERS

- A. Silencers, General: Provide silencers (mutes) typically at all doors which do not have weather, sound or smoke seals. See DOOR HARDWARE SCHEDULE for products. Provide three silencers for single doors and two silencers at pairs of doors. Omit silencers at fire-rated door assemblies.
- B. Wired Glass Sealant: Fire-resistant compound which passes ASTM E152 or E163 when tested with wired glass in metal fire rated door vision lites or fire rated windows.

08 80 00 – GLAZING

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES:
 - A. Vision glass: Clear, low-E coated and clear wired.
 - B. Safety glass: Tempered glass.
 - C. Sealed insulating glass ("double-glazed") units.
 - D. Glazing materials.
 - E. Field installation of glazing for doors and windows provided open for field glazing. Commercial-grade, fixed and operable aluminum windows.

PART 2 - PRODUCTS

- 2.1 GLASS, GENERAL
 - A. Primary Glass Standard: Provide primary glass which complies with ASTM C1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.
 - B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.
 - C. Tempered Glass: Provide tempered glass where required by California Building Code (CBC), Section 2406 - Safety Glazing, and US Consumer Product Safety Commission Standard 16CFR1201 CI and CII, including all openings of non-rated doors, all glazed openings within 4 feet of the side of a door and all glazed openings within 18-inches of the floor or walkway adjacent and wherever safety glazing or tempered glass is indicated or specified.

2.2 VISION GLASS

- A. Vision Glass, General: Vision glass shall conform to ASTM C1036 or ASTM C1048, as applicable. Thicknesses, where shown, are minimum. Determine thickness in conformance to applicable California Building Code (CBC) requirements and standards. Provide clear glass typically.
- B. Clear Float Glass: Q3 (Glazing Select) quality, annealed, heat-strengthened or tempered as indicated. Provide double-strength (DS) glass, minimum 3/16-inch thick, with actual thickness according to manufacturer's span tables.
- C. Clear Low-E Float Glass: Viracon Solarscreen 2000 Low-E VE 1-2M, low-emissivity clear glass, 70 percent light transmittance, Q3 (Glazing Select) quality, annealed, heat-

strengthened or tempered as indicated. Provide 6.0 mm (1/4-inch) thick low-E glass typically.

- D. Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1 or 2, Quality q3, 1/4inch thick unless otherwise noted.
 - 1. Provide tempered glass where required by Code, including in all openings of non-rated doors, all glazed openings within 4 feet of the side of a door and all glazed openings within 18-inches of the floor or walkway adjacent and wherever safety glazing or tempered glass is indicated or specified.
 - 2. Temper glass by horizontal (roller hearth, "tongless") process, to be free of tong marks.
 - 3. Label all tempered glass by permanent method, indicating glass type, manufacturer and compliance with applicable standard.
- E. Wired Glass: ASTM C1036, Type II, Class 1, Form 1, Quality q8, Mesh m2, rolled, polished glass with completely embedded layer of square mesh bright steel wires that will retard fire and be retained in frame upon fracture, Polished Misco by Hordis, or approved equivalent.
 - 1. Thickness: 6.0 mm, or 1/4-inch nominal.
 - 2. Fire resistance: Certified by producer as capable of passing ASTM E152 or ASTM E163 fire resistance test, including hose stream test.
 - 3. Label all wired glass used in fire-rated assembly, by permanent method, indicating glass type, manufacturer and compliance with applicable standard.

2.3 SEALED INSULATING GLASS UNITS

- A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with Sealed Insulating Glass Manufacturers Association (SIGMA) standards for construction and insulating value. Insulating glass unit design shall have passed class CBA test in accordance with ASTM E774. Label each insulating glass unit.
 - 1. Provide double-glazed sealed insulating glass units as standard with glass fabricator. Units shall be 1-inch net thickness.
 - 2. Units shall consist of outboard light of clear glass and inboard light of specified low-E (low-emissivity) clear glass, with low-E coating at inside (no. 3) face.
 - 3. Provide units fabricated with tempered safety glass where required.
- B. Sealing System: Dual seal, with primary and secondary sealants as standard with manufacturer.
- C. Spacer Specifications: Manufacturer's standard spacer material and construction, using aluminum with black color-anodized finish.
 - 1. Desiccant: Molecular sieve or silica gel, or blend of both.
 - 2. Corner construction: Manufacturer's standard corner construction.

2.4 GLAZING MATERIALS

A. Glass Setting Blocks, Edge Blocks, Spacers and Gaskets: Chloroprene (neoprene), EPDM or silicone.

- 1. Applicable standard: ASTM C864.
- 2. Hardness of setting blocks: Sufficient to compress no more than 20% under weight of glass.
- B. Shims and Spacers for Leveling and Securing Framing Members: Aluminum, compatible stainless steel, or other plated or corrosion resistant non-resilient material. Do not use wood for shims.
- C. Compressible Filler Rod: Closed-cell or waterproof-jacketed foam of polyethylene, butyl rubber, neoprene, polyurethane or vinyl, tested for compatibility with specified glazing sealants, of 5 to 10 psi compression strength (25 percent deflection), recommended by sealant manufacturer for use in glazing channel to prevent sealant exudation from the channel.
- D. Cleaners and Solvents: As recommended by glazing material producer for each type of glass, glazing material and substrate.

2.5 GLAZING ACCESSORIES

- A. Glazing Accessories, General: Provide accessories as required for a complete installation. Accessories shall include glazing points, clips, shims, angles, beads, and spacer strips.
- B. Metal Accessories: Provide noncorroding metal accessories.
- C. Primer-Sealers and Cleaners: As recommended by the glass and sealant manufacturers.
- 2.6 COMPRESSION GASKET AND PREFORMED GASKET DRY GLAZING
 - A. Compression Gasket and Preformed Gasket Dry Glazing: Chloroprene (neoprene), EPDM, or silicone compression gaskets in a soft and a dense formulation for the two sides of the glass. Select soft gasket to compress 25 to 40 percent when glass and dense gasket are in place.
 - 1. Where small lites (as in doors) can be glazed with a continuous preformed elastomeric glazing extrusion, use a gasket of the dense formulation, compressed to watertightness outside and inside, with either a bent joint or a tightly compressed cut joint at corners.
 - B. Applicable Standards:
 - 1. Soft gaskets: ASTM C509.
 - 2. Dense gaskets: ASTM C864.
- 2.7 WIRED GLASS SEALANT
- A. Wired Glass Sealant: Fire-resistant compound which passes ASTM E152 or E163 when tested with wired glass in metal fire rated door vision lites or fire rated windows.

PART 3 - EXECUTION (na)

DIVISION 09 - FINISHES

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements.

09 22 16 – NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Lightgage metal stud framing for gypsum board attachment at interior walls and partitions.
 - B. Related backing and bridging.
 - C. Furring at structural steel framing, masonry and concrete construction for gypsum board attachment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Products of the manufacturers listed below will be acceptable. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.
 - 1. California Expanded Metal Products Co. (CEMCO), City of Industry, CA (818/369-3564).
 - 2. National Gypsum Co. (Gold Bond), Charlotte, NC (704/365-7315 or 800/628-4662; local sales office, Long Beach, CA 310/435-4465).
 - 3. Western Metal Lath Co., La Mirada, CA (310/944-6117 or 714/523-2160).
 - 4. Delta-Star, Inc., Belmont, CA (800/892-8673).

PART 3 - EXECUTION

- 3.1 LIGHT GAGE METAL FRAMING, 20 GAGE AND LIGHTER
 - A. Framing Members (Studs/Joists): ASTM C645, minimum yield strength 33 ksi, types, and sizes as indicated on Drawings, gage as indicated on Drawings and as required to meet span and deflection limitations, punched web unless otherwise indicated, with screw-type flanges.
 - B. Tracks, Sills and Headers: Unpunched channels sized for stud flanges, gage the same as studs unless otherwise noted. Under structural framing members and decking, provide deflection track at head of partition, as indicated on the Drawings.
 - C. Flexible Track:

- 1. Specified Manufacturer: Superior Metal Trim by Delta-Star, Inc., Belmont, CA (800/892-8673).
- Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.
- 3. Flexible Head Track: Superior SFT Series, gage to match studs, width to suit stud framing.
- D. Finish: Aluminum-zinc corrosion resistant coating, ASTM A792 or hot dipped galvanized ASTM A525 G60.
- E. Screws: As recommended or required by manufacturer, self-drilling, self-tapping in accordance with manufacturer's recommendations and ML/SFA specifications.
- 3.2 LIGHT GAGE METAL FRAMING, 18 GAGE AND HEAVIER
 - A. Studs: ASTM C645, minimum yield strength 33 ksi, types, sizes and gages as indicated on Drawings, punched web unless otherwise indicated, with screw-type flanges.
 - B. Finish: Hot dipped galvanized, ASTM A525, coating weight G60.
 - C. Standard Structural Steel Shapes and Plates: As specified in Section 05 50 00 Metal Fabrications.
 - D. Fabricated Steel Items: As specified in Section 05 50 00 Metal Fabrications, ASTM A283, grade optional.
 - E. Flat-Rolled Carbon Steel Sheets: ASTM A611.
 - F. Cold-Rolled Carbon Steel Sheets: ASTM A366.
 - G. Other Fasteners: Provide all bolts, nuts, screws, clips, washers and any other fastenings necessary for proper erection of items specified herein. See S Section 05 05 23 Metal Fastenings for additional requirements.

3.3 ACCESSORIES

A. Backing Plates: 16 gage galvanized sheet metal covering full width of stud spacing by 4inches wide minimum, for attachment and support of products to be attached to framing.

09 22 26 – SUSPENSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SECTION INCLUDES

- A. Grid suspension system for direct attachment of gypsum board at suspended interior soffits and ceilings.
- B. Suspended cold-rolled steel channels and screwable furring for furring at exterior plaster soffits.
- C. Related backing and bridging.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
 - A. Grid Suspension System for Interior Ceilings: Subject to compliance with requirements, provide one of the following:
 - 1. Armstrong World Industries, Inc.; Furring Systems/Drywall.
 - 2. Chicago Metallic Corporation; Drywall Furring 640 or Drywall Furring 660 System, as appropriate to duty rating; Fire Front 630, Fire Front 650 or Fire Front 670 System as appropriate to duty rating and fire rating.
 - 3. USG Interiors, Inc.; Drywall Suspension System.
 - B. Metal Furring
 - 1. Specified Manufacturer: United States Gypsum Company (USG), Chicago, IL (312/606-4000; local representative, Glendale, CA 818/956-1882 or 800/964-4874).
 - 2. Acceptable Manufacturers: Products of the manufacturers listed below will be acceptable.
 - a. Angeles Metal Systems, Los Angeles, CA (213/268-1777).
 - b. California Expanded Metal Products Co. (CEMCO), City of Industry, CA (818/369-3564).
 - c. National Gypsum Co. (Gold Bond), Charlotte, NC (704/365-7315 or 800/628-4662; local sales office, Long Beach, CA 310/435-4465).
 - d. Western Metal Lath Co., La Mirada, CA (310/944-6117 or 714/523-2160).

PART 3 - EXECUTION

3.1 GRID SUSPENSION SYSTEM OF INTERIOR CEILINGS

A. Provide direct-hung system composed of main beams and cross-furring members that interlock complying with ASTM C645.

3.2 METAL FURRING

- A. Channels: 1-1/2 inch cold rolled steel channel, hot dipped galvanized.
- B. Hat Section Furring Channels: 1-5/8 inch steel stud or 7/8-inch deep special furring shape, cold rolled light gage steel, minimum 25 gage, galvanized, with matching track as required.
- C. Z-Shape Furring Channels: Cold rolled light gage steel, minimum 25 gage, galvanized, with matching track, depth to suit insulation thickness or as indicated.
- D. Furring Channel Clip: United States Gypsum Company (USG) Metal Furring Channel Clip, or equal.
- E. Wall Furring Bracket: United States Gypsum Company (USG) product, or equal.
- 3.3 BRACES AND SUPPORTS:
 - A. Galvanized steel, size and type to suit application, to rigidly support and secure acoustic ceiling system including support of integral mechanical and electrical components with maximum deflection of 1/360 and to seismically brace ceiling in accordance with applicable Code requirements.
 - B. Hanger Rods: Mild steel, zinc coated, or protected with rust- inhibitive paint.
 - C. Flat Hangers: Mild steel, zinc coated, or protected with rust inhibitive paint.
 - D. Angle Hangers: Angles with legs not less than 7/8-inch wide, formed with 0.0365-inch-thick galvanized steel sheet complying with ASTM A446, Coating Designation G90, with bolted connections and 5/16-inch-diameter bolts.
 - E. Hangers Wires: ASTM A 641, soft temper, pre-stretched, Class 1 coating, sized so that stress at 3-times hanger design load (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage (0.1055-inch diameter).
 - F. Tie Wire: 18 gage annealed low carbon steel, galvanized.
 - G. Screws: ITW/Buildex, USG or equal, self-drilling, self-tapping, low profile head where covered by gypsum board, length in accordance with manufacturer's recommendations and ML/SFA specifications.
 - H. Nails: Annular ring drywall nail, length in accordance with framing manufacturer's recommendations and ML/SFA specifications.

3.4 ACCESSORIES

A. Backing Plates: 16 gage galvanized sheet metal covering full width of stud spacing by 4inches wide minimum, for attachment and support of products to be attached to framing.

09 23 00 – GYPSUM PLASTERING

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
 - A. Gypsum plasterwork on expanded-metal lath, to repair existing gypsum plaster.
 - B. Patching of existing gypsum plaster.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
 - A. Expanded-Metal Lath, General (ASTM C 847). Acceptable Manufacturers: Provide lath produced by one of the following or equivalent product in compliance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. Alabama Metal Industries Corporation (AMICO).
 - 2. California Expanded Metal Products Company (CEMCO).
 - 3. Unimast, Inc.
 - 4. Western Metal Lath & Steel Framing Systems.
 - B. Zinc and Zinc-Coated (Galvanized) Accessories: Provide lath produced by one of the following or equivalent product in compliance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. Alabama Metal Industries Corporation (AMICO).
 - 2. California Expanded Metal Products Company (CEMCO).
 - 3. Unimast, Inc.
 - 4. Western Metal Lath & Steel Framing Systems.
 - C. Paper Backing: Reinforced kraft-type paper with asphalt-treated core, complying with UBC Standard 14-1, or equivalent product in compliance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. Super Jumbo-Tex, Fortifiber Corporation, Incline Village, NV (775/833-6161 or 800/443-4079)
 - D. Gypsum Ready-Mixed Plaster. Acceptable manufacturers and products: Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. National Gypsum Company; Gold Bond Gypsolite.

- 2. United States Gypsum Co.; Structo-Lite.
- E. Gypsum Neat Plaster: For use with job-mixed aggregates. Acceptable manufacturers and products: Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. National Gypsum Company; Gold Bond Two-Way Hardwall Plaster.
 - 2. United States Gypsum Co.; Red Top Two-Purpose Plaster.
- F. High-Strength Gypsum Neat Plaster: With a minimum, average, dry compressive strength of 2800 psi (19 MPa) per ASTM C 472 for a mix of 100 lb (45 kg) of plaster and 2 cu. ft. (0.06 cu. m) of sand. Acceptable manufacturer and product: Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. United States Gypsum Co.; Structo-Base.
- G. Gypsum Gauging Plaster: ASTM C 28/C 28M. Acceptable manufacturers and products: Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.
 - 1. National Gypsum Company; Gauging Plaster (Super-White).
 - 2. United States Gypsum Co.; Champion Gauging, Red Top Gauging Gypsum or Star Gauging Plaster, as recommended by manufacturer for application conditions.
- H. Gypsum Ready-Mixed Finish Plaster: Manufacturer's standard, mill-mixed, gauged, interior finish. Acceptable manufacturers and products: Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. National Gypsum Company; Gold Bond Kal-Kote Smooth, Kal-Kote Texture, Uni-Kal or X-KALibur, as recommended by manufacturer for application conditions.
 - 2. United States Gypsum Co.; Imperial Finish Plaster, Diamond Brand Interior Finish Plaster or Red Top Finish, as recommended by manufacturer for application conditions.
- I. High-Strength Gypsum Gauging Plaster: ASTM C 28/C 28M, with a minimum, average, dry compressive strength of 5000 psi (34 MPa) per ASTM C 472 for a neat mix.
- J. Acceptable manufacturer and product: Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. United States Gypsum Co.; Structo-Gauge.
- K. Lime: ASTM C 206, hydrated finishing type.
 - Type S: Autoclaved, double-hydrate lime. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.
 - a. United States Gypsum Co.; Ivory or Snowdrift Finish Lime, as recommended by manufacturer for application conditions.
 - Type N: Normal, single-hydrate lime. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 -Product Requirements.
 - a. United States Gypsum Co.; Grand Prize Finish Lime.

PART 3 - EXECUTION

- 3.1 GENERAL
 - A. Profice lath and accessories where indicated on the drawings.
 - B. Finish: ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.

3.2 LATH

- A. Diamond-Mesh Lath: Self-furring, weighing 3.4 lb/sq. yd. (1.8 kg/sq. m).
- B. Flat Rib Lath: Rib depth of not more than 1/8 inch (3.1 mm), weighing 3.4 lb/sq. yd. (1.8 kg/sq. m).

3.3 ACCESSORIES

- A. Accessories, General: Comply with ASTM C 841 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Zinc and Zinc-Coated (Galvanized) Accessories:
 - 1. Cornerite: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
 - 2. Striplath: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
 - 3. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
 - a. Provide small nose cornerbead with expanded flanges, unless otherwise indicated.
 - b. Provide small nose cornerbead with perforated flanges on curved corners.
 - c. Provide small nose cornerbead with expanded flanges reinforced by perforated stiffening rib at on columns and for finishing unit masonry corners.
 - d. Provide bull nose cornerbead, radius 3/4 inch (19.1 mm) minimum, with expanded flanges at locations indicated on Drawings.
 - 4. Casing Beads: Fabricated from zinc-coated (galvanized) steel, square-edged style, with expanded flanges.
 - 5. Control Joints: Fabricated from zinc or zinc-coated (galvanized) steel, one-piece-type, folded pair of unperforated screeds in M-shaped configuration, with perforated flanges and removable protective tape on plaster face of control joint.
 - 6. Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel, folded pair of unperforated screeds in M-shaped configuration, with expanded flanges.

3.4 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Bonding Compound: ASTM C 631.

- C. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened, with pan head that is suitable for application, in lengths required to achieve penetration through joined materials of not fewer than three exposed threads.
- D. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 841.
- E. Paper backing: Provide paper backing to reduce plaster "push-through" or "blow-through" waste.
- 3.5 BASE-COAT PLASTER MATERIALS
 - A. Base-Coat Plasters, General: ASTM C 28/C 28M.
 - B. Gypsum Ready-Mixed Plaster: With mill-mixed perlite aggregate.
 - C. Gypsum Neat Plaster: For use with job-mixed aggregates.
 - D. High-Strength Gypsum Neat Plaster: With a minimum, average, dry compressive strength of 2800 psi (19 MPa) per ASTM C 472 for a mix of 100 lb (45 kg) of plaster and 2 cu. ft. (0.06 cu. m) of sand.
 - E. Aggregates for Base-Coat Plasters: ASTM C 35.
- 3.6 FINISH-COAT PLASTER MATERIALS
 - A. Gypsum Gauging Plaster: ASTM C 28/C 28M.
 - B. Gypsum Ready-Mixed Finish Plaster: Manufacturer's standard, mill-mixed, gauged, interior finish.
 - C. High-Strength Gypsum Gauging Plaster: ASTM C 28/C 28M, with a minimum, average, dry compressive strength of 5000 psi (34 MPa) per ASTM C 472 for a neat mix.
 - D. Lime: ASTM C 206, hydrated finishing type. Type S or Type N as specified.
 - E. Aggregates for Float Finishes: ASTM C 35; graded per ASTM C 842.

3.7 PLASTER MIXES

- A. Plaster Mixes, General: Comply with ASTM C 842 and manufacturer's written instructions for applications indicated.
- B. Base-Coat Mixes over Expanded-Metal Lath: High-strength gypsum plaster with job-mixed sand for scratch and brown coats of three-coat plasterwork.
- C. Base-Coat Mix over Unit Masonry: Gypsum neat plaster with job-mixed sand or readymixed plaster, for single base coats of two-coat plasterwork.
- D. Finish-Coat Mix for Smooth-Troweled Finishes: Gypsum ready-mixed finish plaster or 1 part high-strength gypsum gauging plaster to 1 part lime.
- E. Finish-Coat Mix for Float Finishes: 1 part gypsum gauging plaster, 2 parts lime, and 6 parts sand.
- F. Finish-Coat Mix for Sprayed Finishes: Gypsum ready-mixed finish plaster.
- G. Finish-Coat Mix for Textured Finishes: Gypsum ready-mixed finish plaster.

3.8 PATCHING AND REPAIRING OF EXISTING GYPSUM PLASTER

- A. Patching and Repairing of Existing Gypsum Plaster: Refer to general requirements specified in Section 01 73 29 Cutting and Patching and Section 02 41 00 Demolition.
 - 1. Cut, patch, replace, and repair plaster as necessary to accommodate other Work and to restore cracks, dents, and imperfections.
 - 2. Repair or replace plaster to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.
 - 3. Remove all loose plaster.
 - 4. Install new paper backing and separate metal lath.

09 24 00 – PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES:

- A. Metal lath and accessories.
- B. Stucco finishes.
- C. Soffit suspension system

1.3 SUBMITTALS

- A. Product Data for each product specified.
- B. Samples for initial selection in the form of manufacturer's color charts consisting of actual units or sections of units at least 12 inches square showing the full range of colors, textures, and patterns available for each type of finish indicated.
- C. Samples for verification in units at least 12 inches square of each type of finish; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
- D. Material Certificates: Submit certificate signed by manufacturer for each kind of plaster aggregate certifying that materials comply with requirements.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Where fire-resistance-rated portland cement plaster assemblies are used, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 REGULATORY REQUIREMENTS

A. Comply with requirements of CBC Chapter 25.

1.6 PROJECT CONDITIONS

- A. Environmental Requirements, General: Comply with requirements of referenced plaster application standards and recommendations of plaster manufacturer for environmental conditions before, during, and after plaster application.
- B. Cold-Weather Requirements: Provide heat and protection, temporary or permanent, as required to protect each coat of plaster from freezing for at least 24 hours after application. Distribute heat uniformly to prevent concentration of heat on plaster near heat sources; provide deflection or protective screens.

- C. Warm-Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.
- D. Exterior Plaster Work: Do not apply plaster when ambient temperature is below 40 deg F.
- E. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work.

PART 2 - PRODUCTS

- 2.1 LATH
 - A. Expanded-Metal Lath: Comply with ASTM C 847 for material, type, configuration, and other characteristics indicated below.
 - 1. Diamond-Mesh Lath: Comply with the following requirements:
 - a. Configuration: Flat.
 - 1) Weight: 3.4 lb/sq. yd.
 - b. Configuration: Self-furring.
 - 1) Weight: 3.4 lb/sq. yd.
 - B. Woven-Wire Lath: ASTM C 1032, fabricated into 1-1/2-inch hexagonal-shaped mesh with minimum 0.0510-inch- diameter, galvanized steel wire.
 - C. Paper Backing: Where paper-backed lath is indicated, provide the following material factory bonded to back of lath. Comply with FS UU-B-790, Type I, grade and style as indicated below:
 - 1. Vapor-Retardant Paper: Grade B, Style 1 with flame-spread rating of 25 per ASTM E 84.

2.2 ACCESSORIES

- A. General: Comply with material provisions of ASTM C 1063 and the requirements indicated below; coordinate depth of accessories with thicknesses and number of plaster coats required.
 - 1. Aluminum Components: Alloy, temper, and finish recommended by manufacturer with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for alloy and temper 6063-T5.
 - 2. Galvanized Steel Components: Fabricated from zinc-coated (galvanized) steel sheet complying with ASTM A 653, G40 minimum coating designation.
 - 3. Zinc-Alloy Components: ASTM B 69, 99 percent pure zinc.
- B. Metal Corner Reinforcement: Expanded, large-mesh, diamond-metal lath fabricated from zinc-alloy or welded-wire mesh fabricated from 0.0475-inch- diameter, zinc-coated

(galvanized) wire and specially formed to reinforce external corners of portland cement plaster on exterior exposures while allowing full plaster encasement.

- C. Cornerbeads: Small nose cornerbeads fabricated from the following metal, with expanded flanges of large-mesh diamond-metal lath allowing full plaster encasement.
 - 1. Zinc Alloy: Minimum 0.0207 inch thick.
 - 2. Galvanized Steel: Minimum 0.0172 inch thick.
 - 3. Material: Any material above.
- D. Casing Beads: Square-edged style, with expanded flanges of the following material:
 - 1. Zinc Alloy: Minimum 0.0207 inch thick.
 - 2. Galvanized Steel: Minimum 0.0172 inch thick.
 - 3. Material: Any material above.
- E. Control Joints: Prefabricated, of material and type indicated below:
 - 1. Zinc Alloy: Minimum 0.0207 inch thick.
 - 2. Galvanized Steel: Minimum 0.0172 inch thick.
 - 3. Material: Any material above.
 - 4. One-Piece Type: Folded pair of nonperforated screeds in M-shaped configuration, with expanded or perforated flanges.
 - a. Provide removable protective tape on plaster face of control joints.
- F. Foundation Sill (Weep) Screed: Manufacturer's standard profile designed for use at sill plate line to form plaster stop and prevent plaster from contacting damp earth, fabricated from zinc-coated (galvanized) steel sheet.
- G. Lath Attachment Devices: Material and type required by ASTM C 1063 for installations indicated.
- 2.3 PLASTER MATERIALS
 - A. Base-Coat Cements: Type as indicated below:
 - 1. Portland cement, ASTM C 150, Type I.
 - B. Stucco Finish Coat: Manufacturer's standard factory-packaged stucco, including portland cement, aggregate, coloring agent, and other proprietary ingredients.
 - C. Sand Aggregate for Base Coats: ASTM C 897.
- 2.4 MISCELLANEOUS MATERIALS
 - A. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminates, manufactured for use in portland cement plaster.
 - B. Water for Mixing and Finishing Plaster: Potable.
 - C. Bonding Agent: ASTM C 932.
 - D. Steel drill screws complying with ASTM C 1002 for fastening metal lath to wood.

2.5 PLASTER MIXES AND COMPOSITIONS

- A. General: Comply with ASTM C 926 for base- and finish-coat mixes as applicable to plaster bases, materials, and other requirements indicated.
- B. Base-Coat Mixes and Compositions: Proportion materials for respective base coats in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated. Adjust mix proportions below within limits specified to attain workability.
- C. Fiber Content: Add fiber to mixes after ingredients have mixed at least 2 minutes. Comply with fiber manufacturer's written instructions but do not exceed 1 lb/cu. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.
- D. Three-Coat Work over Metal Lath: Base-coat proportions as indicated below:
 - 1. Scratch Coat: 1 part portland cement, 0 to 3/4 parts lime, 2-1/2 to 4 parts aggregate.
 - 2. Brown Coat: 1 part portland cement, 0 to 3/4 parts lime, 3 to 5 parts aggregate.
- E. Two-Coat Work over Concrete Unit Masonry: Base-coat proportions as indicated below:
 - 1. Base Coat: 1 part portland cement, 3/4 to 1-1/2 parts lime, 3 to 4 parts aggregate.
- F. Stucco Finish Coat: Add water only; comply with stucco manufacturer's written instructions.
- 2.6 MIXING
 - A. Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster manufacturer.

PART 3 - EXECUTION (na)

09 29 00 – GYPSUM BOARD

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES:
 - A. Gypsum board applied by nailing or screwing to framing and furring.
 - B. Drywall trim, fasteners and accessories.
 - C. Taping and finishing.
 - D. Drywall acoustical sealants.

PART 2 - PRODUCTS

- 2.1 MANUFACTURER
 - A. Gypsum Board
 - 1. Specified Manufacturer: United States Gypsum Company (USG), Chicago, IL (312/606-4000; local representative, Glendale, CA 818/956-1882 or 800/964-4874).
 - 2. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - B. Acoustical Sealants
 - 1. Specified Manufacturers:
 - a. United States Gypsum Company (USG), Chicago, IL (312/606-4000; local representative, Glendale, CA 818/956-1882 or 800/964-4874).
 - b. Inmont Corp.
 - c. Harry A. Lowry & Associates, Inc., Sun Valley, CA (818/768-4661, 213/875-0223 or 800/225/8231)
 - 2. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 Product Requirements.

PART 3 - EXECUTION

- 3.1 GYPSUM BOARD
 - A. Gypsum Board Materials, General: Gypsum board, joint treatment and finishing materials shall be manufactured from asbestos-free materials.

B. Typical Gypsum Board: ASTM C36, Type X (special fire-resistant), typically 48-inches wide and 5/8-inch thick, square cut ends, tapered sides.

3.2 ACCESSORIES

- A. Accessories, General: Provide accessories as recommended in reference standards and manufacturer's product data. Provide accessories as required for a complete installation and in conformance to fire resistance ratings, where indicated.
- B. Joint Treatment Materials, General: ASTM C475.
- C. Taping and Embedding Compounds: Specifically formulated and manufactured for use in embedded tape at gypsum board joints and completely compatible with tape and substrate.
- D. Finishing or Topping Compound: Specifically formulated and manufactured for use as a finishing compound.
- E. All Purpose Compound: Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape and substrate.
- F. Joint Tape, Gypsum Board: Perforated cross laminated, tapered edge, reinforced paper, or special tape recommended by the manufacturer.
- G. Gypsum Board Primer/Sealer: USG Sheetrock First Coat, flat vinyl latex paint, to equalize surface absorption and texture variations, non-asbestos.
- H. Nails: ASTM C514, annular ring drywall nail, length in accordance with framing manufacturer's recommendations, ML/SFA specifications and as required for fire-resistive construction.
- I. Screws: ASTM C646, USG Durock Flat Wafer Headscrews, Type W, steel self-drilling screws for wood substrate, low profile head, length in accordance with manufacturer's recommendations and ML/SFA specifications.
- J. Adhesive: Adhesives containing benzene, carbon tetrachloride and trichloroethylene shall not be used. Provide adhesive for laminating multi-layer installations of type as recommended by the gypsum board manufacturer and approved for fire rated construction.
- K. Hat Section Furring Channels: 1-5/8 inch steel stud or 7/8-inch deep special furring shape, cold rolled light gage steel, minimum 25 gage, galvanized, with matching track as required.
- L. Furring Channel Clip: USG Metal Furring Channel Clip,
- M. Cornerbead: USG No. 800 or equal.
- N. Edge Trim: USG No. 200-B or equal.
- O. Casing Bead: USG No. 66, square edge, or equal
- P. Control Joint: USG No. 093 or equal.
- Q. Water: Clean, fresh, potable.
- R. Acoustical Sealants:
 - 1. For gypsum board to gypsum board and gypsum board to structure joints: USG Acoustical Sealant or equal, non-hardening sealant specifically for gypsum board joints.
 - 2. For non-electrical penetrations of gypsum board at non-fire rated construction: Inmont Corp., PressTite No. 579.64.

- 3. For electrical power and signal penetrations of gypsum board at non-fire rated construction: Lowry Outlet Box Pads, polybutene-butyl sheet calking for application to exterior back, top and sides of recessed panelboards and outlet boxes for electrical power, CATV, telephone, fire alarm and other signal systems, manufactured by Harry A. Lowry & Associates, Inc.
- 4. For penetrations at fire-rated construction, provide firestopping as specified in Section 07840 Firestopping and Smoke Seals.

09 90 00 – PAINTING AND COATING

PART 1 - GENERAL

1.1 SUMMARY

- A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Section includes:
 - 1. Surface preparation for painting.
 - 2. Priming and finish painting.

1.2 WORK TO BE PAINTED

- A. Work to be Painted, General:
 - 1. Unless specifically noted, prime and finish paint all exposed surfaces of new construction whether or not colors are indicated. Specific exceptions are noted below in Article titled, WORK NOT TO BE PAINTED.
 - Unless specifically noted, prepare and repaint all existing painted surfaces whether or not colors are indicated. Specific exceptions are noted below in Article titled, WORK NOT TO BE PAINTED.
 - 3. Where products or surfaces are not specifically indicated for a specified finish, paint these the same as adjacent similar products and surfaces.
- B. Exterior Work to be Painted: Work to be painted includes the following new and existing surfaces:
 - 1. Rooftop elements, including roof hatches, pipes and vents, exposed conduit, ductwork and HVAC equipment exposed to view.
 - 2. Fascias, wood soffits, wood siding and wood trim (as applicable to Project).
 - 3. Steel door frames and steel doors.
 - 4. Wood door frames and wood doors (if applicable to Project).
 - 5. Plaster walls and soffits.
- C. Interior Work to be Painted: Work to be painted includes the following new and existing surfaces:
 - 1. Interior gypsum board [and plaster] walls, soffits and ceilings (exposed in finished construction).
 - 2. Interior concrete and masonry walls, if previously painted or specifically indicated on the Drawings to be painted.
 - 3. Wood doors, wood door frames and wood trim (as applicable to the Project), if previously painted or specifically indicated on the Drawings to be painted.

- 4. Wood doors, wood door frames and wood trim (as applicable to the Project), if previously stained and varnished or specifically indicated on the Drawings to be stained and varnished.
- 5. Existing acoustical tile, acoustical ceiling panels and acoustical ceiling grid.
- D. Interior Work to be Stripped, Sanded and Varnished:
 - 1. Existing hardwood flooring, stair treads, stair risers, stair skirts and related trim.
 - 2. Wood doors, wood door frames and wood trim (as applicable to the Project), if previously stained and varnished or specifically indicated on the Drawings to be stained and varnished.
 - 3. Wood casework, paneling and standing and running trim (as applicable to the Project), if previously stained and varnished or if specifically indicated on the Drawings to be stained and varnished, and not shop finished.
- 1.3 WORK NOT TO BE PAINTED
 - A. Work Not to be Painted: Painting is not required on the following:
 - 1. New exterior galvanized steel products.
 - 2. Concealed structural steel and steel decking, except if noted on the Drawings.
 - 3. Prefinished items.
 - 4. Plated metal surfaces and stainless steel.
 - 5. Concealed surfaces.
 - 6. Operating parts.
 - 7. Labels.
 - B. Pre-Finished Items: Unless otherwise specified or noted, do not paint factory-finished components, including the following.
 - 1. Casework and trim: Plastic-laminate covered casework and countertops; shop-finished wood casework.
 - 2. Solid surfacing fabrications.
 - 3. Toilet partitions.
 - 4. Acoustic materials: Suspended acoustical t-bar grid and acoustical panels and applied acoustical tile.
 - 5. Finished mechanical and electrical equipment.
 - 6. Light fixtures, unless specifically noted.
 - 7. Switchgear.
 - 8. Distribution cabinets.
 - C. Concealed Surfaces: Do not paint concealed surfaces, including wall or ceiling surfaces in the following generally inaccessible areas.
 - 1. Furred areas.
 - 2. Utility chases and pipe spaces.
- 3. Duct, piping and conduit shafts.
- D. Finished Metal Surfaces: Do not paint natural metal, plated metal and factory-finished metal surfaces (except where specifically indicated), including the following:
 - 1. Anodized aluminum.
 - 2. Stainless steel.
 - 3. Chromium plate.
- E. Operating Parts: Do not paint operating parts, including moving parts of operating equipment such as the following.
 - 1. Valve and damper operators.
 - 2. Linkages.
 - 3. Sensing devices.
 - 4. Motor and fan shafts.
 - 5. Fire suppression system components (i.e. sprinklers, sensors, strobes, horns, etc.) Strictly prohibited by local, state and federal fire code.
- F. Labels: Do not paint over Underwriter's Laboratories, Inc. (UL), Factory Mutual Research Organization (FM) and other code-required labels and over equipment names, identifications, performance ratings, and nomenclature plates.

PART 2 - PRODUCTS

2.1 PAINT MATERIALS

- A. Specified Manufacturer: Sherwin-Williams, Cleveland, Ohio
- B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below (or others) will be acceptable in accordance with the "or equal" provision specified in Section 01600 Product Requirements. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 Product Requirements.
 - 1. Dunn-Edwards Corporation, Los Angeles, CA (323/771-3330 or 800/372-6470).
 - 2. Vista Paint Corporation, Fullerton, California (714/680-3800).
 - 3. ICI Dulux Paints, Los Angeles, CA (213/888-8888 or 800/339-6910).
- C. Paints, Stains and Special Coatings: See PAINT SCHEDULE at end of PART 3, below, for specific primers and finish paints, stains and special coatings. All primers, paints, stains and finishes shall comply with applicable State and regional VOC regulations. Should products not comply, provide substitute products in compliance with "or equal" provision specified in Section 01600 Product Requirements.
- D. Primers and Undercoats: Primers and other undercoat paints shall be components of published system of paint manufacturer for intended use.
- E. Gloss:
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.

- 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
- 3. Semi-gloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
- 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.
- 2.2 MISCELLANEOUS MATERIALS
 - A. Thinners, General: Use only thinners approved by paint manufacturer, and use only within recommended limits.
 - B. Acrylic-based Product Thinner: Clear, potable water, free from materials detrimental to paint performance.
 - C. Putty: Acrylic, fast-drying, low shrinkage.
 - D. Painter's Calk: Joint filler, acrylic-based, as specified in Section 07 90 00 Joint Protection.
- 2.3 COLORS
 - A. Use only approved colors following existing school site color palette. If introducing new or modifying colors, it must be approved by Maintenance Department.

PART 3 - EXECUTION

3.1 PREPARATION, GENERAL

- A. Examination: Examine substrate for conditions which may adversely affect finish application durability and appearance.
 - 1. Do not proceed with surface preparation or paint application until defects are corrected. Proceeding will be interpreted to mean that substrate conditions were acceptable.
 - 2. Surfaces which cannot be prepared or painted as specified shall be immediately reported in writing to Architect and Project Inspector.
- B. Trim Removal: Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
- C. Preparation of Previously-Painted Surfaces: [Existing paint may contain lead].
 - 1. Comply with Owner's instructions regarding existing paint containing lead. If existing paint contains lead, Owner will cause paint to be removed under separate hazardous material abatement contract.
 - 2. After removal of existing paint containing lead, further clean surfaces and prepare surfaces according to paint manufacturer's instructions and recommendations.
 - 3. Surfaces which cannot be prepared or painted as specified shall be immediately reported in writing to Owner's Representative, Architect and Project Inspector.
- D. Removals: Before start of preparation, remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be

painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

- 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- E. Masking and Covering: Exercise care not to deface adjoining Work. Use suitable clean cover cloths or other approved protection materials to cover adjoining Work. Mask small items and edges to prevent and control paint coverage.

3.2 CLEANING

- A. Cleaning, General:
 - 1. Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings.
 - 2. Remove oil and grease before cleaning.
 - 3. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- B. Cleaning, Impervious Surfaces: Wash surfaces with mild detergent solution. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- C. Cleaning, Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- D. Cleaning, Galvanized Surfaces: Remove surface contamination and oils by wash with solvent.

3.3 SURFACE PREPARATION, GENERAL

- A. Surface Preparation, General: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Clean all interior wall surfaces of loose, peeling, and scaly paint, dirt, dust, rust, chalk and other foreign matter as required to provide a clean sound surface for the new coatings and paints.
 - 2. Clean all exterior walls and surfaces of loose, peeling, and scaly paint, dirt, dust, rust, chalk and other foreign matter by power washing as required to provide a clean sound surface for the new coatings and paints.
 - 3. Deteriorated or dry rotted wood shall be replaced prior to paint application. Comply with finish carpentry and woodwork specifications in Division 6 Wood, Plastics and Composites.
 - 4. Provide barrier coats over incompatible primers or remove and reprime.
- B. Concrete, Masonry and Plaster Surface Preparation:
 - 1. Prepare concrete, concrete unit masonry and cement plaster surfaces to be painted.
 - 2. Remove soiling, efflorescence, salts, alkali powder, chalk, dust, dirt, grease, oils, release agents and other foreign matter by brushing and power washing.

- 3. Remove oil and grease with solution of trisodium phosphate.
- 4. Remove rust stains with solution of sodium metasilicate after thoroughly wetting surface with water.
- 5. Flush surfaces to remove cleansing agents and allow to thoroughly dry.
- 6. Roughen as necessary to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
- 7. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
- C. Wood Surfaces Preparation: Clean wood surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - 1. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - 2. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - 3. If transparent finish is required, back prime with spar varnish.
 - 4. Back prime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
- D. Existing Hardwood Veneer Preparation: Clean surface, fill and repair damaged areas and level sand existing hardwood veneer casework, doors and related trim with transparent finish. Also comply with recommendations of manufacturer of sealer and finish coating to be applied to prepared hardwood surfaces.
- E. Ferrous Metals Preparation:
 - 1. Unprimed ferrous metals: Clean un galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
 - 2. Galvanized Surfaces: Clean galvanized surfaces with non-petroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

- 3. Previously Primed and Bare Steel Surfaces: Comply with SSPC requirements.
 - a. Sand and scrape to remove loose primer and rust.
 - b. Feather edges to make touch-up patches inconspicuous.
 - c. Clean surfaces with solvent to remove oil and grease.
 - d. Treat surfaces with phosphoric acid solution, ensuring cleaning of weld joints, bolts and nuts.
 - e. Sand each coat except not on final finish coat.
 - f. Clean surface of dust with tackrags.

3.4 SURFACE PREPARATION, SPECIFIC CONDITIONS

- A. Existing Wood Floors Preparation:
 - 1. Clean surface, sand off existing finish, fill and repair damaged areas and level sand existing hardwood flooring, stair treads, stair risers, stair skirts and related trim.
 - Comply with "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing and Resurfacing of Maple Gym Floors," current edition, published by Maple Floor Manufacturers Association (MFMA), Northbrook, IL (847/480-9138) www.maplefloor.org. Also comply with recommendations of manufacturer of sealer and finish coating to be applied to prepared hardwood flooring.
- B. Doors Preparation:
 - 1. Wood doors: Seal top and bottom edges after fitting and cleaning, using additional coat of specified varnish finish at stained finish and using additional coat of primer at painted finish.
 - 2. Steel doors: Apply additional coat of field primer at tops and bottoms of doors.
- C. Gypsum Board Surfaces Preparation: Latex fill minor defects. Spot prime defects after repair.
- D. Plaster Preparation: Fill hairline cracks, small holes and imperfections with latex patching plaster. Make surface level and blend texture to match surrounding finish. Wash and neutralize high alkali surfaces.
- E. Patching and Sanding, General: Correct minor surface defects. Major defects shall be repaired by replacement.
 - 1. Repair, patch and fill all surfaces as necessary to match existing surface texture and to present uniform surface appearance matching surrounding surfaces. Repair all cracks and voids greater than 1/32-inch as follows:
 - 2. Voids, cracks and joints up to 1/16-inch wide: Repaired using a brushable grade sealant with 2-inch wide minimum seam. Seam patch shall be feathered to zero at the edges to prevent the repair from telegraphing through top coats.
 - 3. Voids, cracks and joints exceeding 1/16-inch wide: Patched or filled using a knife grade sealant.
 - a. All exterior openings should be sealed as specified in Section 07 90 00 Joint Protection. Deteriorated sealant shall be removed and new backing material and sealant shall be installed prior to painting.

- b. Determine compatibility between paints and joint sealers. Notify Owner's Representative of incompatibilities and other conditions which are detrimental to proper joint sealing and paint adhesion.
- 4. Cracks larger than 1/8-inch wide: Scraped and widened in a V-groove pattern to promote good penetration and adhesion of the patching material. Fill groove (crack) with suitable patching material compatible with substrate material and matching surface finish.
- 5. Putty voids and nail heads.
- F. Moisture Content: Measure moisture at surfaces using an electronic moisture meter. Do not apply finishes unless moisture is below the following maximums:
 - 1. Concrete: 15 percent.
 - 2. Interior Gypsum Wallboard: 12 percent.
 - 3. Exterior Plaster: 15 percent.
- 3.5 PRIMING
 - A. Compatibility: Verify compatibility of primers with surfaces on which to be applied. If primer or finish coating is incompatible, follow manufacturer's recommendations.
 - B. Steel: Prime all bare steel surfaces. Oil base preferred. No DTM .
 - C. Galvanized Steel Substrate: If unprimed, pretreat before priming by applying coat of etching primer. Oil based preferred. No DTM.
 - D. Wood: Prime all wood scheduled to receive opaque finish. Backprime all finished wood items before installation. See Section 06200 Finish Carpentry.
 - E. Preprimed Surfaces: Touch up with matching primer. Reprime steel items which have been exposed to weather more than 7 days.
- 3.6 FINISH PAINT APPLICATION, GENERAL
 - A. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
 - B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

- 2. At metal surfaces that have been shop primed and touch-up painted, omit primer if primer is suitable for finish coats.
- 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Paint Application, General:
 - 1. Apply primers, intermediate coats and finish coats of paint as scheduled below and in compliance with paint manufacturer's instructions and recommendations.
 - 2. Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated.
 - 3. Provide total dry film thickness of the entire system as recommended by manufacturer.
- D. Prime Coat Application:
 - 1. Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been shop primed or shop painted.
 - 2. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- E. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
 - 1. Carry finish coats to natural breaks and transitions.
 - 2. Apply each coat to uniform film thickness, not less than and not exceeding amount to achieve recommended dry film thickness of paint manufacturer. Adjust applied thickness to suit substrate and ambient temperatures to minimize brush and roller marks.
 - 3. Allow each coat to cure before recoating, adjusting manufacturer's minimum time between coats to accommodate Project conditions.
- F. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
- G. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

- I. Holidays and Thin Spots: Recoat and blend in. If blending is unsuccessful, sand and recoat entire surface.
- J. Dust, Runs, Drips, Sags, Color Separation: Remove surface defects, sand and recoat entire surface.
- K. Metal Surfaces: If brush application cannot produce a smooth surface without laps or brush marks, use spray application under dust free conditions.
- L. Final Finish: Even, smooth color and finish with no apparent brush or roller marks.
- 3.7 FINISH PAINT APPLICATION, SPECIFIC CONDITIONS
 - A. Doors: Coat tops, bottoms and edges with all coats as scheduled for faces. Coat cutouts for hinges, edges of lockset holes and strikes same as for first coat.
 - B. Access Doors, Panels, Registers and Grilles: Generally paint same color as surrounding walls and ceiling. Paint interiors of ducts showing through registers and grilles flat black.
 - C. Door Trim and Primer Coated Hinges: Paint trim to match door and paint hinges to match frame, unless hinges have plated finish.
 - D. Rooftop HVAC and Airhandler Units: Field paint color as directed, if exposed to view.
 - E. Speaker Grilles: Paint to match surrounding surfaces.
 - F. Lighting Fixture (Luminaire) Trim: Paint to match surrounding surfaces, unless otherwise directed. At acoustical panels finished in factory white color, do not paint lighting fixture trim.

3.8 CLEANING, TOUCH-UP AND PROTECTION

- A. Cleaning: As Work proceeds, promptly remove paint where spilled, splashed, or spattered. Remove all paint spots, oils or stains from adjacent surfaces, leaving the Work and Work area clean and ready for Substantial Completion review.
- B. Debris and Waste: During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site. Remove empty paint containers from site.
- C. Touch-Up: At completion of Work specified in other Sections, touch-up painted and finished surfaces and restore to original condition finishes damaged or defaced.
- D. Protection: Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings used to protect adjacent surfaces and products.
- 3.9 PAINT SCHEDULE
 - A. Paint Schedule: Provide paint systems (PS) as follows and as recommended by paint manufacturer.
 - 1. Manufacturer's dry film thickness (DFT) rating and scheduled number of coats shall be minimums only. Number of finish coats listed is the minimum number of coats required. Provide additional finish coats as necessary to achieve full and complete coverage. Alter tint of each coat to facilitate evaluation of coverage.

- 2. The first (primer) coat of multi-coat system may be omitted on products shop or factory primed and on existing surfaces to be repainted. Spot prime and sand existing painted surfaces as recommended by paint manufacturer for repainting and as specified above.
- 3. Unless otherwise noted, products listed are by Dunn Edwards Paints.

PS-1 - EXTERIOR FERROUS METALS - SEMI-GLOSS FINISH (50-60% on 60 degree meter)

Primer: B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White Coat 1: B54W00151 - Pro Industrial Urethane Alkyd Enamel Extra White Coat 2: B54W00151 - Pro Industrial Urethane Alkyd Enamel Extra White

(For exteriors steel doors, steel door and window framing and other primed and unprimed ferrous metals. Provide additional coats at deep tone finish color as necessary for full and even coverage)

PS-2 - EXTERIOR GALVANIZED METAL, FLAT(1-2% on 60 degree meter)

Primer: B71Y00001 - DTM Wash Primer Yellow-Green Coat 1: A80W00116 - SuperPaint® Exterior Latex Flat Super White Coat 2: A80W00116 - SuperPaint® Exterior Latex Flat Super White

(For exterior rooftop ductwork. Provide additional coats at deep tone finish color as necessary for full and even coverage)

PS-3 - EXTERIOR GALVANIZED METAL - SEMI-GLOSS FINISH (50-60% on 60 degree meter)

Primer: B71Y00001 - DTM Wash Primer Yellow-Green Yellow-Green Coat 1: A84W00116 - SuperPaint® Latex Gloss House & Trim Paint Super White Coat 2: A84W00116 - SuperPaint® Latex Gloss House & Trim Paint Super White

(For exterior galvanized steel products, except rooftop ductwork. Provide additional coats at deep tone finish color as necessary for full and even coverage)]

PS-4 - EXTERIOR CONCRETE - FLAT FINISH (1-2% on 60 degree meter)

Primer: A24W08300 - Loxon® Concrete & Masonry Primer, Interior/Exterior Latex White Coat 1: A80W00116 - SuperPaint® Exterior Latex Flat Super White Coat 2: A80W00116 - SuperPaint® Exterior Latex Flat Super White

PS-5 - EXTERIOR PORTLAND CEMENT PLASTER - FLAT FINISH (1-2% on 60 degree meter)

Primer: A24W08300 - Loxon® Concrete & Masonry Primer, Interior/Exterior Latex White Coat 1: A80W00116 - SuperPaint® Exterior Latex Flat Super White Coat 2: A80W00116 - SuperPaint® Exterior Latex Flat Super White

PS-6 - EXTERIOR WOOD - SEMI-GLOSS FINISH (50-60% on 60 degree meter)

Primer: B42W08041 - Exterior Latex Wood Primer White Coat 1: K34W00200 - Duration® Gloss Exterior Latex Coating Super White Coat 2: K34W00200 - Duration® Gloss Exterior Latex Coating Super White

PS-7 - INTERIOR CONCRETE UNIT MASONRY - EGGSHELL FINISH (27-35% on 60 degree meter)

Primer: B51W00620 - PrepRite® ProBlock® Interior/Exterior Latex Primer/Sealer White Coat 1: B20W02651 - ProMar® 200 Zero VOC Interior Latex Eg-Shel Extra White Coat 2: B20W02651 - ProMar® 200 Zero VOC Interior Latex Eg-Shel Extra White

PS-8 - INTERIOR CONCRETE UNIT MASONRY - SEMI-GLOSS FINISH (50-60% on 60 degree meter)

Primer: B51W00620 - PrepRite® ProBlock® Interior/Exterior Latex Primer/Sealer White Coat 1: B31W02651 - ProMar® 200 Zero VOC Interior Latex Semi-Gloss Extra White Coat 2: B31W02651 - ProMar® 200 Zero VOC Interior Latex Semi-Gloss Extra White

PS-9 - INTERIOR CONCRETE - FLAT FINISH (2-3% on 60 degree meter)

Primer: A24W08300 - Loxon® Concrete & Masonry Primer, Interior/Exterior Latex White Coat 1: B30W02651 - ProMar® 200 Zero VOC Interior Latex Flat Extra White Coat 2: B30W02651 - ProMar® 200 Zero VOC Interior Latex Flat Extra White

PS-10 - INTERIOR CONCRETE - SEMI-GLOSS FINISH (50-60% on 60 degree meter)

Primer: A24W08300 - Loxon® Concrete & Masonry Primer, Interior/Exterior Latex White Coat 1: B31W02651 - ProMar® 200 Zero VOC Interior Latex Semi-Gloss Extra White Coat 2: B31W02651 - ProMar® 200 Zero VOC Interior Latex Semi-Gloss Extra White

PS-11 - INTERIOR GYPSUM BOARD - EGGSHELL LOW SHEEN FINISH (15-25% on 60 degree meter)

Primer: B51W00620 - PrepRite® ProBlock® Interior/Exterior Latex Primer/Sealer White Coat 1: B24W02651 - ProMar® 200 Zero VOC Interior Latex Low Sheen Extra White Coat 2: B24W02651 - ProMar® 200 Zero VOC Interior Latex Low Sheen Extra White

PS-12 - INTERIOR GYPSUM BOARD - SEMI-GLOSS FINISH (50-60% on 60 degree meter)

Primer: B51W00620 - PrepRite® ProBlock® Interior/Exterior Latex Primer/Sealer White Coat 1: B31W02651 - ProMar® 200 Zero VOC Interior Latex Semi-Gloss Extra White Coat 2: B31W02651 - ProMar® 200 Zero VOC Interior Latex Semi-Gloss Extra White

* Note: After application, create stipple finish with roller.

PS-13 - INTERIOR WOOD - OPAQUE SEMI-GLOSS FINISH (50-60% on 60 degree meter)

Primer: B51W00620 - PrepRite® ProBlock® Interior/Exterior Latex Primer/Sealer White Coat 1: A88W01150 - SuperPaint® Interior Latex Semi-Gloss High Reflective White Coat 2: A88W01150 - SuperPaint® Interior Latex Semi-Gloss High Reflective White

PS-14 - INTERIOR WOOD - TRANSPARENT FINISH (gloss or semi-gloss only - 45% or higher on 60 degree meter)

Coat 1: 013333000 - Minwax® Polycrylic® Water-Based Protective Finish Satin Clear Coat 2: 013333000 - Minwax® Polycrylic® Water-Based Protective Finish Satin Clear

PS-15 - INTERIOR FERROUS METALS - LOW SHEEN FINISH (25-35% on 60 degree meter)

Primer: B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White Coat 1: A87W01151 - SuperPaint® Interior Latex Satin Extra White Coat 2: A87W01151 - SuperPaint® Interior Latex Satin Extra White

PS-16 - INTERIOR FERROUS METALS - SEMI-GLOSS (50-60% on 60 degree meter)

Primer: B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White Coat 1: A88W01151 - SuperPaint® Interior Latex Semi-Gloss Extra White Coat 2: A88W01151 - SuperPaint® Interior Latex Semi-Gloss Extra White

PS-17 - INTERIOR GALVANIZED METAL - LOW SHEEN FINISH (25-35% on 60 degree meter)

Primer: B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White Coat 1: A87W01151 - SuperPaint® Interior Latex Satin Extra White Coat 2: A87W01151 - SuperPaint® Interior Latex Satin Extra White

PS-18 - INTERIOR GALVANIZED METAL - SEMI-GLOSS FINISH (50-60% on 60 degree meter)

Primer: B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White Coat 1: A88W01151 - SuperPaint® Interior Latex Semi-Gloss Extra White Coat 2: A88W01151 - SuperPaint® Interior Latex Semi-Gloss Extra White

PS-19 - INTERIOR ALUMINUM - SEMI-GLOSS FINISH (50-60% on 60 degree meter)

Primer: B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White Coat 1: A88W01151 - SuperPaint® Interior Latex Semi-Gloss Extra White Coat 2: A88W01151 - SuperPaint® Interior Latex Semi-Gloss Extra White

END OF SECTION

DIVISION 10 - SPECIALTIES

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements

10 14 53 – PARKING AND TRAFFIC SIGNAGE

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES:
 - A. Traffic and parking control, plaque signage.
 - B. Sign supports and foundations.
- 1.3 SUBMITTAL
 - A. Submit shop drawings of all signs.

PART 2 - PRODUCTS

- 2.1 TRAFFIC AND PARKING CONTROL SIGNAGE
 - A. Specified Manufacturer: Safeway Sign Company, Gardena, CA (310/321-4608). Or equal
 - B. Acceptable Manufacturers: As listed below. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. Western Highway Products, Inc., Stanton, CA (714/761-4811).
 - 2. Hawkins-Hawkins Co., Inc. / Hawkins Traffic Safety Supply, Berkeley, CA (510/525-4040 or CA 800/772-3995).
 - C. Plaque Signs: Provide manufacturer's standard silk-screened signs, baked-on enamel applied over reflectorized backing on aluminum or galvanized steel sheet.
 - D. Accessories: Provide welded galvanized steel fittings and galvanized or cadmium-plated steel bolts, nuts and washers.
 - E. Fasteners: Provide tamper-proof galvanized steel fasteners, Tufnut System (714/962-5838), Allegheny Bolt (Tampruf brand; 516/568-1052) or equal.
 - F. Sign Text, Traffic and Regular Parking Control: Comply with requirements of State of California, Department of Transportation (CALTRANS) and regulations of local authorities having jurisdiction.
 - G. Sign Text, Accessible Parking Control: Comply with requirements of California Building Code (CBC) Section 1129B.5, in addition to requirements of State of California, Department of Transportation (CALTRANS) and regulations of local authorities having jurisdiction.

2.2 SIGN SUPPORTS AND FOUNDATION

- A. Support Posts: Galvanized tube steel, sizes and configuration as indicated on the Drawings, fabricated as specified in Section 05505 Miscellaneous Metal Fabrications, with caps.
- B. Foundation Concrete: 2500 psi minimum concrete as specified in Section 03300 Cast in Place Concrete.
- C. Provide other materials as necessary for complete installation, as recommended by manufacturer and selected by Contractor, subject to review of Architect.

PART 3 - EXECUTION

- 3.1 FABRICATION
 - A. Provide signs and supports factory-prefabricated and pre-finished, ready for assembly and installation.

END OF SECTION

DIVISION 22 - PLUMBING

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements.

22 00 00 – PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SECTION INCLUDES:

- A. Furnish, install, test, and guarantee a completely operable and approved Plumbing system, which is in full compliance with all Contract Documents, as indicated on the drawings, described herein, and as otherwise required.
- B. This section describes interior and exterior plumbing systems.
- C. Provide Plumbing Submittals and Shop drawings.
- D. A complete system of sanitary sewer piping and venting.
- E. Roof drains, overflow drains and rainwater piping systems.
- F. A complete domestic hot and cold water piping distribution system, including provisions for all plumbing fixtures and equipment. Provide connections to fixtures and equipment. Provide disinfection.
- G. Condensate system for HVAC equipment.
- H. Natural gas piping systems.
- I. A complete system of acid waste including neutralization tanks and monitors.
- J. Pipe hangers and other necessary support items.
- K. Plumbing equipment such as water booster pumps, circulating pumps, water heaters and sump pumps.
- L. Excavating and backfilling.
- M. All Testing required and provide certificates.
- N. Record Drawings.

PART 2 - PRODUCTS

- 2.1 SYSTEMS
 - A. Sanitary Sewer and Vent Systems
 - Above Grade Concealed and Within Building Hubless service weight cast iron pipe and fittings, coated inside and outside er ASTM A-74. Joints shall be made with Mission Bands Model #C220hw, #C-564 neoprene rubber, #A240A band (80 lb.) or Husky heavy weight bands. Heavy weight bands shall be sleeve type assemblies of neoprene inner gaskets and 304 stainless steel multiple clamps and outer shield 304 stainless

steel. Above ground vents can have 301 stainless steel bands. All pipe and fittings to comply with California Plumbing Code 1998.

- 2. Below Grade Under Building and to Site System Hub and spigot service weight cast iron pipe and fittings per ASTM A-74, coated inside and outside, and joints made with "Ty-Seal" neoprene compression type gasket or Hubless service weight cast iron pipe and fittings with cast iron pipe couplings equal to MG Piping Products Co.
- B. Rainwater Drainage Systems
 - 1. Above Grade Concealed and Within Building Hubless service weight cast iron pipe and fittings, coated inside and outside per ASTM A-74. Joints shall be made with Mission Bands Model #C220hw, #C-564 neoprene rubber, #A240A band (80 lb.) or Husky heavy weight bands. Heavy weight bands shall be sleeve type assemblies of neoprene inner gaskets and 304 stainless steel multiple clamps and outer shield 304 stainless steel. Above ground vents can have 301 stainless steel bands. All pipe and fittings to comply with California Plumbing Code 1998.
 - 2. Above Grade Exposed or on the Outside of the Building Galvanized iron pipe and fittings, coated inside and outside per ASTM A-74. Joints shall be made with threaded joints. All pipe and fittings to comply with California Plumbing Code. All exterior pipe shall be primed with primer paint. A second coat of enamel paint shall be applied over the primer. The color of the second coat of paint shall match the color of the exterior wall.
 - 3. Below Grade Under Building and to Site System Hub and spigot service weight cast iron pipe and fittings per ASTM A-74, coated inside and outside, and joints made with "Ty-Seal" neoprene compression type gasket or Hubless service weight cast iron pipe and fittings with cast iron pipe couplings equal to MG Piping Products Co.
- C. Domestic Water System
 - 1. Above Grade Piping System Type "L" hard temper seamless copper tubing per ASTM B-88, and wrought solder joint: fittings per ANSI B16.22, or cast bronze solder joint fittings per ANSI B16.18. Use 95-5 tin-antimony solder. All exterior water pipe shall be primed with primer paint. A second coat of enamel paint shall be applied over the primer. The color of the second coat of paint shall match the color of the exterior wall.
 - Below Grade Piping System From Building to Site System: Type "K" hard temper seamless copper tubing per ASTM B-88. Fittings shall be wrought solder joint per ANSI B16.22, or cast bronze solder joint per ANSI B16.18. Use 1000oF silver solder.
 - 3. Above Grade Valves 3/4" pipe size and smaller water shut off valves shall be Nibco T-595-y-66 or equal. Above ground 1" pipe size and greater water shut off valves shall be Nibco 585 or Hammond 567 valves.
 - 4. Below Grade Valves 2" size and smaller shall be Ford Ball Valve type with F.I.P. threads on both sides. Ford Ball Valve shall be heavy cast bronze with 300 PSI working pressure. Underground water service valves 2 1/2" size shall be Jones Tee head type with F.I.P. threads on both sides. Underground water service valves 3" size and larger shall be Mueller keyed head resilient wedge gate valves Model #2360 or Clow 6100 water keyed valve. Both Mueller and Clow valve shall be certified to NSF61 and both shall meet AWWA Standard C509. Gate valves shall not be installed in water services below 2 1/2".
- D. Natural Gas System

- 1. Above Grade Piping System Within Building Schedule 40 black steel with 150-PSI malleable iron screwed or flanged fittings.
- 2. Above Grade Piping System Outside of Building Galvanized Schedule 40 steel with 150-PSI malleable iron screwed or flanged fittings. All exterior pipe shall be primed with primer paint. A second coat of enamel paint shall be applied over the primer. The color of the second coat of paint shall match the color of the exterior wall.
- 3. Below Grade Site Piping System Site system shall extend from gas meter's transition riser to pressure regulator's transition riser. Piping and fittings Polyethylene (PE) pipe shall comply with PE 2406 from the Plastics Pipe Institute Material Designation and shall comply with ASTM D2513 and ASTM D3261. PE pipe shall be rated for internal pressure of 76 PSI (3" and below) at 73 degrees F. Acceptable manufacture shall be Driscopipe 6500 from Phillps 66 and Poly Pipe PE2406. Provide only butt heat fusion joining of pipe and fittings. Sidewall fusion or tapping tees are not acceptable.
- 4. Transition Riser Below Grade to Above Grade Provide one-piece natural gas transition riser from PE pipe to steel pipe. The schedule 80 steel section of the riser shall be epoxy coated. The transition riser shall meet NFPA-58-1992 and ASTM-D2513. Transition Riser (from Polyethylene pipe to galvanized steel) Special one-piece transition riser from polyethylene pipe to epoxy coated galvanized steel pipe shall be used where the gas piping extends from below grade to above grade. Epoxy coated pipe riser shall extend to a minimum of 8" above grade.
- 5. All underground plastic pipe shall have a 14 gauge insulated tracer wire wrapped around pipe and fittings and extend to ends of pipe run. The tracer wire shall extend 6 inches above grade at the ends of the piping systems. Provide warning tape a12" above pipe.
- 6. Pressure Regulators Gas pressure regulators from 5 lbs. to 7 inches of water shall be American 1813 C.
- 7. Gas shut off valves for 5 lbs. and greater shall be Nordstrom B142. Gas shut off valves below 5 lbs. shall be McDonald valves with pressure rating of 5lbs.
- E. Condensate System
 - 1. Above Grade Type "M" hard temper seamless copper tubing. Wrought solder Type "M" fittings. Use 95-5 tin-antimony solder. Maintain a minimum slope of an 1/8" per foot.
- F. Acid Waste System
 - 1. Above and Below Grade Piping Through and in Non-Rated Walls
 - a. Polypropylene Piping System Manufacturer: Orion
 - b. Product type: Blueline Polypropylene Schedule 40 "Proxylene".
 - c. Piping systems including piping, sink arms, traps, fittings, etc. shall be fire retardant, thermoplastic material with resistance to most common organic and mineral acids, their salts, strong and weak alkalies and most organic chemicals. Proxylene qualifies for UL certification of V-2 when tested under UL Subject 94 in thickness of .150 and over. Based on parameters under ASTM D635, Proxylene also meets established industry criteria for self-extinguishing. Proxylene qualifies under ASTM D2843 smoke chamber test with a maximum value less than 50.
 - 2. Above Grade Piping Through and in Rated Walls

- a. Polyvinylidene Fluoride Piping System Manufacturer: Orion
- b. Product type: Kynar brand Polyinylidene Fluoride (PVDF).
- c. Piping systems including piping, sink arms, traps, fittings, etc. shall be certified to meet ASTM E-84 and UL 723 Standards for flame spread and smoke generation. PVDF shall be resistant to most common organic and mineral acids, their salts, strong and weak alkalies and most organic chemicals.
- 3. Above Grade Fittings Non-rated walls
 - a. Polypropylene Piping System Manufacturer: Orion
 - b. Product type: Blueline Polypropylene Schedule 40 "Proxylene".
 - c. Joints shall be mechanical type.
- 4. Above Grade Fittings Rated walls
 - a. Polyvinylidene Fluoride Piping System Manufacturer: Orion
 - b. Product type: Kynar brand Polyinylidene Fluoride (PVDF).
 - c. Joints shall be mechanical type.
- 5. Below Grade Fittings
 - a. Polyvinylidene Fluoride Piping System Manufacturer: Orion
 - b. Product type: Kynar brand Polyinylidene Fluoride (PVDF).
 - c. Joints shall be electric fuse type, "Rionfuse".
- 6. Acid Waste Monitoring System
 - a. Provide an Orion pH Monitor II with associated accessories. Provide conduit and cable from neutralization tank to Orion pH Monitor II. Orion pH Monitor II shall have a pH analyzer, low and high pH alarm light, audible alarm and silence button, NEMA 4X recessed enclosure. Provide pH probe with 35 feet of shield cable.
- G. Yard Boxes
 - 1. Provide yard boxes for all below grade valves and regulators.
 - 2. Yard boxes shall be manufactured by Associated Concrete Products, Inc. (ACP). Yard boxes shall be "Quikset" type and be constructed of "Type 2" cement. Provide adjustment rings as necessary to keep cover level with grade. Provide top ring and "TE-1000" traffic cover. Traffic cover shall be galvanized. The top of the cover shall be labeled with the type of system it is being used for.
- 2.2 PIPE SUPPORTS
 - A. Hangers shall be Clevis type equal to B-Line B3100 Standard Clevis Hanger.
 - B. Pipe Clamp shall be Bolt and Clamp type equal to B-Line B3140 Bolt Pipe Clamp.
 - C. Complete hanger system shall comply with be B-Line Seismic Restraints or equal.
 - D. Roof pipe supports shall be Pipe Pier, flexible resilient closed-cell polyethylene foam (ETHAFOAM brand trade mark of the Dow Chemical Company), with strut system built into foam block.

2.3 PLUMBING FIXTURES AND COMPONENTS

- A. General
 - 1. All water closets, urinals, lavatories and service sinks shall be of the same manufacturer. All stainless steel sinks shall be of the same manufacturer. All floor sinks and floor drains shall be of the same manufacturer. All flush valves shall be of the same manufacturer. All flush valves shall be of the same manufacturer. All accessible plumbing fixtures shall comply with all of the requirements of CBC Section 1115B. Heights and location of all fixtures shall be according to CBC Table 1115B-1.Fixture controls shall comply with CBC Section 1118B.
 - 2. No motion actuated fixtures/sensors flush values, faucets, wash sinks, showers, solenoids
- B. Water Closets
 - 1. Vitreous China Comparable fixtures manufactured by Kohler, American Standard, and Eljer are acceptable. Fixtures shall be white, unless otherwise specified. Water closet seats manufactured by Beneke and Olsonite are acceptable. Flush valves manufactured by Zurn are acceptable.
 - 2. Vitreous china siphon jet elongated bowl, top spud flush valve. White heavy duty, solid plastic, open front seat with stainless steel hinge posts and concealed check.
 - 3. Provide appropriate carriers, coordinated with pipe chase and fitting type requirements.
- C. Urinals
 - 1. Vitreous China Comparable fixtures manufactured by Kohler, American Standard, and Eljer are acceptable. Fixtures shall be white, unless otherwise specified. Flush valves manufactured by Zurn are acceptable.
 - 2. Urinals shall have brass nipples for dirty arms. No equals.
 - 3. Vitreous china urinal with top spud flush valve, and strainer with china grate.
 - 4. Provide appropriate carriers, coordinated with pipe chase and fitting type requirements.
- D. Lavatories
 - 1. Vitreous China Comparable fixtures manufactured by Kohler, American Standard, and Eljer are acceptable. Fixtures shall be white, unless otherwise specified. Faucets manufactured by Chicago are acceptable.
 - 2. Countertop Vitreous china, self-rimming oval lavatory with faucet.
 - 3. Wall Hung Vitreous china lavatory with faucet and wall carriers.
 - 4. Modified Acrylic / Polymer Solid Surface Comparable fixtures manufactured by Willoughby Industries or Bradley. Faucets shall be integral with the lavatory.
- E. Stainless Steel Sinks Comparable fixtures manufactured by Elkay or Just. All stainless steel sinks are to minimum of 18-gauge. Faucets for stainless steel sinks shall be manufactured Chicago, Elkay or Just.
 - 1. Countertop self-rimming stainless steel sink with faucet.
- F. Showers

- 1. Standard and ADA compliant with tile enclosure. Provide stainless steel showerhead with 2.2 GPM spray, chrome plated shower arm and chrome plated escutcheon. Provide pressure balance mixing valve and floor drain with chrome-plated strainer. For ADA showers provide showerhead on flex hose and slide bar. Manufactures shall be Chicago or Elkay.
- 2. Emergency Shower and eye wash. Showerhead and eye wash shall be made of ABS colored plastic. Rigid stainless steel pull rod. Galvanized metal support pipe and floor flange. Manufactures shall be Bradley or Haws.
- G. Emergency Eye Wash
 - 1. Emergency eyewash shall be made of ABS colored plastic. Countertop swing-away type. Manufactures shall be Bradley or Haws.
- H. Drinking Fountains Wall mounted drinking fountains shall be stainless steel type. Exterior pedestal mounted drinking fountains shall be exposed aggregate reinforced concrete type. Comparable fixtures shall be manufactured by Haws or Elkay.
- I. Roof and Overflow Drains Comparable items manufactured by J.R. Smith and Zurn are acceptable.
 - 1. Roof Drains Cast iron drains with flashing collar and cast iron dome. Furnish extension for insulated roofs. Under-deck clamp for all but poured-in-place installations. Outlet connection type shall be compatible with piping system. Provide lead flashing for all roof drains.
 - 2. Overflow Roof Drains Cast iron drains with flashing collar and cast iron dome. Provide 2" high water dam. Installation of the drain assembly, the top of the dam shall be a minimum of 2" above the adjacent finished roof surface. Furnish extension for insulated roofs. Under-deck clamp for all but poured-in-place installations. Outlet connection type shall be compatible with piping system. Provide lead flashing for all roof drains.
- J. Floor Drains Comparable items manufactured by J.R. Smith and Zurn are acceptable.
 - 1. Duco cast iron drain body with adjustable nickel bronze strainer. Provide trap primer connection as required per drawings. Provide no-hub outlet connection.
- K. Floor Sinks Comparable items manufactured by J.R. Smith and Zurn are acceptable.
 - 1. Cast iron flanged receptor, acid resistant coated interior, aluminum dome bottom strainer; 1/2 grate nickel bronze top when specified on drawings.
- L. Trap Primers Comparable items manufactured by J.R. Smith or PPP are acceptable.
 - 1. Trap primers shall be cast bronze. Provide ball shut off valve and union before trap primer connection. Provide 14" X 14" access panels for removal.
- M. Cleanouts Comparable items manufactured by J.R. Smith and Zurn are acceptable.
 - 1. Floor Clean Outs "FCO" (Concrete and Tile Floors) Duco cast iron cleanout with round adjustable scoriated secured nickel bronze top. Secure plate with countersunk head. Bronze plug. Spigot oulet. FCO shall be equal to JR Smith 4023S.
 - 2. Wall Cleanouts "WCO" Cast iron branch cleanout tee, with threaded bronze plug, and polished stainless steel cover plate with center, counter-sunk head securing screw. WCO shall be equal to JR Smith 4532S.
 - 3. Grade Clean Outs "GCO"

- a. Finished Concrete Areas Duco cast iron cleanout with round adjustable scoriated secured nickel bronze top. Secure plate with countersunk head. Bronze plug. Spigot oulet. GCO shall be equal to JR Smith 4023S.
- b. ii) Dirt, Grass, Asphalt and other exterior areas Duco cast iron cleanout. Bronze plug. Spigot oulet. GCO shall be equal to JR Smith 4023S. Provide precast concrete vault box with heavy-duty cast iron cover. Cover shall state "SEWER". Concrete vault shall be larger enough to get tools into box and remove bronze plug.
- N. Hose Bibb Comparable items manufactured by J.R. Smith and Acorn are acceptable.
 - 1. Provide vacuum breaker.
 - 2. Mount at 24" A.F.F. unless otherwise noted.
- O. Water Pressure Reducing Valve Comparable items manufactured by Watts or Wilkens are acceptable.
 - 1. Provide separate stainless steel strainer for each water pressure-reducing valve. Connections shall be threaded. Set pressure to maximum of 80 P.S.I. Provide pre-cast concrete yard box for water pressure reducing valves below grade.
- P. Water Hammer Arresters Comparable items manufactured by J.R. Smith and Zurn are acceptable.
 - Stainless steel completely sealed water hammer arresters. Installed on cold waterlines in an upright position at all quick closing valves, solenoids, and plumbing fixtures. Locate and size in accordance with Plumbing and Drainage Institute Standard No. WH201. Provide 14" X 14" access panels for removal. WHA shall be equal to JR Smith 5005 for fixture units 1-11, JR Smith 5010 for fixture units 12-32, JR Smith 5020 for fixture units 33-60, JR Smith 5030 for fixture units 61-113 and JR Smith 5040 for fixture units 114-154.
- Q. Plumbing Fixture Components
 - 1. Traps above floor, exposed or in cabinets, shall be a minimum of 17 gauge chrome plated brass, adjustable with cleanout plug, installed with escutcheon with set screw; all chrome plated. Provide chrome plated slip nuts. No die cast metal allowed.
 - 2. Exposed angle stops shall be loose key (requires 1/8" Allen Key) Aquaflo V-609-AB angle brass. Inlet = 1/2" F.I.P. Outlet = Hose Thread 1/2".
 - 3. Supply tubes shall be Brasscraft stainless speedi-plum.
 - 4. All water line nipples above and below grade shall be brass type. No galvanized or black steel type will be allowed.

2.4 PLUMBING EQUIPMENT

- A. Domestic Hot Water Circulating Pump Comparable items manufactured by Armstrong or Bell and Gosset are acceptable.
 - 1. Provide all bronze or stainless steel in-line circulating pump of size and capacity as scheduled on the drawings. Pump to have integral thermal overload protection and "Aquastat" (pipe line heat sensitive thermostat) for on/off operation.

B. Domestic Water Heaters - Comparable items manufactured by A.O.Smith or Lockenvar are acceptable. Make and model number of water heater to be on the State of California approved list for energy efficiencies.

PART 3 - EXECUTION

- 3.1 PIPE INSTALLATION
 - A. Cast Iron Soil Pipe Institute Pamphlet #100 and the I.A.P.M.O. IS 6 75.
 - B. Cast iron pipe shall be installed per California Plumbing Code.
 - C. Joints in copper tubing shall be made by first thoroughly reaming, removing all burrs, and cleaning the surface of the pipe and fittings; applying flux and sweating with lead free solder.
 - D. All piping shall be isolated from other piping, any part of the building, framing conduit, etc., with 2 inch wide strips of hair felt with sticky back.
 - E. Flush out all water mains and sanitary drains with water so as to obtain free flow.
 - F. Unions shall be installed after each screw type valve, connections for all equipment, appliances and as required for erection and maintenance. No unions shall be installed in concealed location.
 - G. Sleeves for piping through masonry walls or floors shall extend completely through the walls or floors. Sleeves shall finish flush on both sides. Provide risers clamps at all floor penetrations.
 - H. Unions shall be installed after each screw type valve, connections for all equipment, appliances and as required for erection and maintenance. No unions shall be installed in concealed location.
 - I. All condensate drains to have clean-outs at each horizontal run. Clean-outs shall be F.I.P. thread brass plugs.
 - J. All sanitary sewers and waste lines shall be graded at a minimum of 1/4" per foot unless otherwise noted on the drawings. The sections of the pipe shall be laid and fitted so when completed the sewer will have smooth and uniform invert.
 - K. Site natural gas piping shall have a minimum of 30" of cover or be 30" below finished floor.

3.2 VALVE INSTALLATION

- A. Provide adequate access around valve and valve handle for maintenance.
- B. Underground valves shall be installed with SA 316 stainless steel bolts, nuts and washers.
- C. Underground water service valves shall have Bit-50 applied to the valve, bolts, nuts and washers. All underground water service valves shall be wrapped with 8-mil clear plastic. The 8 mil clear plastic shall be attached to the valve with 2 wraps of 10-mil tape or one wrap of 20-mil tape.
- D. Underground water service valves shall have the shut off within 18" of finish grade. Steel valve stem extensions shall be provided with valve. Valve stem extensions to be used shall be from Pipeline Products Model #SX900 with galvanized shafts and fixed center ring.

3.3 PRESSURE REGULATORS

- A. Domestic Water: A reduced pressure regulator device with a strainer shall be installed per local code requirements as indicated on the drawings. There shall be a Nibco T-595-Y-66 shut valve before the pressure regulator. Provide 150 lb. cast brass companion flanges each side of the regulator with stainless steel bolts. As noted on drawings provide all items in a pre-cast concrete yard box with a reinforced steel lid. The lid shall have the word "WATER" on it.
- B. Natural Gas: Provide "medium to low" pressure natural gas regulators at all buildings being served by natural gas. Gas vent for regulator shall be installed with the vent pointing down. Provide a natural gas shut off valve before each pressure regulator. Provide two galvanized unions, one on each side of the pressure regulator. All pressure regulators shall be outside of buildings and mounted to the wall. Size natural gas regulator based on natural gas quantities listed on the drawings.
- 3.4 CLEANOUTS
- A. Cleanouts shall be installed where shown on plans and where required by code. Cleanouts shall be accessible in all cases and shall be brought to surface on "Y" branches. All cleanouts shall be provided with removable floor or wall plate as specified.
- 3.5 PIPE HANGERS and roof SUPPORTS
 - A. Piping shall be firmly held in place by galvanized hangers, supports and pipe rests, located adjacent fittings at each offset or change of direction, at the ends of branches over 5' long, at riser pipes and along piping where necessary to prevent sags, bends, or vibration. All hangers and supports shall be designed to support the weight of pipe, fluid and insulation.
 - B. Lateral bracing shall be provided at every fourth hanger where hanger rods are more than 18 inches in length.
 - C. Hanger Spacing
 - 1. Domestic Water, Condensate and other copper piping:
 - a. 1/2" to 2" pipe every 6' 0" or less.
 - b. 2" and larger pipe every 8' 0" or less.
 - 2. Soil, Waste, Vent, Rain Water Leaders and other cast iron horizontal installations shall be provided with a hanger for at least every joint except that when the developed length between hangers is less than 4 feet they shall be provided at every other joint. Hangers shall also be provided at each horizontal branch connection.
 - 3. Refer to B-Line Seismic Restraints manual approved by California Office of Statewide Health Planning and Development for other spacing and support conditions.
 - D. Pipe Supports on Roof:
 - 1. Roof pipe supports shall be Pipe Pier, flexible resilient closed-cell polyethylene foam (ETHAFOAM brand trademark of the Dow Chemical Company), with strut system built into foam block.
 - 2. Foam block size:
 - a. 4" high X 4" wide for 1/2" to 2" pipe diameter pipe

- b. 4" high X 6" wide for 2" and larger pipe diameter
- E. Pipe Support Spacing on Roof
 - 1. Copper pipe: 1/2" to 2" pipe every 6' 0" or less.
 - 2. Copper pipe: 2" and larger pipe every 8' 0" or less.

3.6 FIXTURE INSTALLATION

- A. All fixture piping shall be flushed-out in the presence of the School District's Representative prior to connecting any fixtures.
- B. Water piping and drain connections shall not be smaller than the sizes allowed by the plumbing code.
- C. Furnish all fixtures complete with supplies, individual stops, traps, escutcheons, trim and all other accessories to provide a complete fixture. Fixtures shall be set in place and secured to walls. Provide trap and piping wrap at lavatories and sinks per ADA requirements.
- D. All plumbing fixtures shall be bedded and caulked along joint at walls, countertops, and other intersecting surfaces with DAP Kwik-Seal Tub and Tile adhesive caulk. DAP package code number shall be 18001 white caulk.
- E. Caulk around the bases of vitreous china toilets, urinals and sinks.
- F. All faucets to be installed using "Plumber Putty" under the base of the faucet for a watertight seal.
- G. Plumbing fixture trim and exposed supplies and waste shall be brass with polished chrome plated finish. Polished chrome plated piping, fittings, and valves shall not bear tool marks.
- H. Provide backing for each plumbing fixture requiring same, at the time roughing in is done.
- I. After the fixture installation is complete, cover and protect the rims, front, and all exposed parts until the completion of the construction phase. The plumbing contractor shall be responsible for all damage to fixtures, and shall assume all related costs.

3.7 CLEANING EQUIPMENT AND PREMISES

A. Thoroughly clean all parts of piping, fixtures and equipment.

3.8 STERILIZATION OF DOMESTIC WATER SYSTEMS

A. All domestic water piping systems shall be cleaned, flushed and sterilized with chorine in accordance with the standards of the county health department or other governing codes. During the flushing period, all valves and faucets shall be opened and closed several times. Provide chlorination certificate to Architect.

3.9 TESTS AND ADJUSTMENTS

A. No piping work, fixtures, or equipment shall be concealed or covered until they have been inspected and approved by the School District's Representative who shall be notified when the work is ready for inspection. All work shall be completely installed, tested as required by this section and the State Ordinances and State Safety Orders, and shall be leak tight before inspections requested. All tests shall be repeated upon request to the satisfaction of those making the inspection.

- B. Before testing, remove or otherwise protect from damage components that are not designated to withstand the test pressures.
- C. Provide all necessary water, electric power, and other service and instruments required to perform tests.
- D. Plumbing fixture fittings and valves shall be operated to assure acceptable performance without leaks. All systems and equipment: shall be adjusted to eliminate excessive noise and vibration.
- E. Make necessary adjustments, repairs and alterations to satisfy specified testing requirements, correct defects disclosed by tests or inspections, and replace defective parts. Completely remake defective pipe joints.
- F. Repeat tests on defective portions of the work until compliance with testing requirements has been proven.
- G. Bear the cost of repairs and restoration of work of other Contractors, which were damaged by the testing procedures.
- H. Provide tests on all equipment and fixtures. Comply with all manufacturers' instructions for start-up, operating and maintaining of all equipment and fixtures.
- I. Perform oiling, lubrication, greasing etc. as required.
- J. Piping tests shall be made with the medium and under pressure listed below.
 - 1. Soil, Waste, Vent, Rainwater Leaders, and Condensate:
 - a. Gauge Pressure and test medium Minimum of 10 foot head of each joint for duration of check with water.
 - 2. Domestic Water:
 - a. Gauge Pressure and test medium 125 PSI with water
 - 3. Natural Gas:
 - a. Gauge Pressure and test medium 50 PSI with Air
 - 4. Test period length four (4) hours each system.

END OF SECTION

22 07 00 – PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SECTION INCLUDES:

A. Provide labor, equipment and materials, and perform all operations necessary for the installation of insulation as indicated. This section includes thermal insulation for piping and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Acceptable manufacturers for insulation are Manville Corporation, Ownes-Corning and Knauf.
- B. Acceptable manufacturers in addition to insulation manufacturers for adhesives, sealants and coatings are Foster and Childers Product Co.
- C. Duct tape is not an approved sealer tape and shall not be used on this project.

2.2 PIPING SYSTEM INSULATION

- A. Glass Fiber: Manville Micro-Lok meeting ASTM C547 or equal; rigid molded, noncombustible, Class 1 not to exceed 25 flame spread and 50 smoke developed.
 - 1. 'K' ('KSI') Value: 0.23 at 75 degrees F (0.033 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
 - 3. Vapor Retarder Jacket: AP-T PLUS White kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secure with self sealing longitudinal laps and butt strips or AP Jacket with outward clinch expanding staples or vapor barrier mastic as needed. All insulation and jacket material shall be plenum rated.
 - 4. Provide 18 gauge galvanized metal insulation shields at pipe hangers. Insulation shields shall provide an expanded surface area to carrier the weight of the piping without distorting or damage to insulation.
- B. Elastomeric Foam: Rubatex R-180-FS/R-1800-FS meeting ASTM C534 or equal; flexible, cellular elastomeric, molded or sheet, Class 1 not to exceed 25 flame spread and 50 smoke developed:
 - 1. 'K' ('KSI') Value: 0.28 at 75 degrees F (0.04 at 24 degrees C).
 - 2. Maximum Service Temperature of 220 degrees F (104 degrees C).

- 3. Connection: Waterproof vapor retarder adhesive, as needed; RUBATEX R-373 Adhesive.
- 4. UV-Protection: Outdoor protective coating; Rubatex 374 Coating.
- 5. Provide 18 gauge galvanized metal insulation shields at pipe hangers. Insulation shields shall provide an expanded surface area to carrier the weight of the piping without distorting or damage to insulation.

2.3 FIRE STOPPING INSULATION

A. Fire stop insulation shall be ceramic fiber blanket equal to Schuller "Cerablanket" or USG Therma-fiber 6 lb. density. Class 1 not to exceed 25-flame spread and 50 smoke developed.

PART 3 - EXECUTION

- 3.1 EXAMINATION AND PREPARATION
 - A. Verify that ductwork has been pressure tested for leakage in accordance with SMACNA standards before applying insulation materials.
 - B. Verify that all surfaces are clean, dry and free of foreign material. Apply insulation on clean, dry surfaces free of any foreign matter and only after tests and approvals required by the specifications have been completed.
- 3.2 GENERAL INSTALLATION
 - A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.
 - B. Continue insulation vapor barrier through penetrations except where prohibited by code.
 - C. Insulation shall be installed by workmen regularly engaged in this kind of work in accordance with the manufacturer's recommendations.
 - D. All exposed raw edges shall be finished with finishing cement.
 - E. If staples are used, all must be coated with adhesive to maintain vapor barrier integrity. Thickness per ASHRAE Standards Table.

3.3 PIPING SYSTEM INSULATION INSTALLATION AND SCHEDULE

- A. Pipe insulation shall be continuous through walls and floor openings except where walls and floors are required to be fire stopped or required to have a fire resistance rating. Where this occurs, the open space remaining between the sleeve and pipe shall be filled with fire stop insulation.
- B. Insulation on piping indicated must be applied with a continuous, unbroken vapor seal. Supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation.
- C. Insulated pipes shall be insulated continuously through hangers. Rigid insulation inserts and metal shields are to be provided at all pipe hangers and supports. Pipe insulation shall abut the rigid insulation insert. Apply a wet coat of vapor barrier lap cement on all butt joints and seal the joints with 3" wide vapor barrier tape or band.

- D. Butt all joints firmly together and smoothly, secure all jacket laps and joint strips with lap adhesive.
- E. Factory premolded one-piece insulated fitting covers are to be used; the proper factory precut insulation shall be applied to the fitting. The ends of the insulation shall be tucked snugly into the throat of the fitting and the edges adjacent to the pipe covering, tufted and tucked in, fully insulating the pipefitting. Covers shall overlap the adjoining pipe insulation and jackets and on cold pipes shall be sealed at all seam edges with vapor barrier adhesive. The circumferential edges of all covers shall be sealed with pressure sensitive vinyl tape. The tape shall overlap the jacket and the cover at least one inch.
- F. Valves may be insulated with sections of Fiberglass pipe insulation complete with service jacket. Raw ends shall be coated with vinyl acrylic mastic CP-11 for hot piping or shall be coated with vapor barrier mastic (CP-30 or Fosters 30-35) for cold piping.
- G. Locate insulation and cover seams in least visible locations.
- H. Neatly finish insulation at supports, protrusions, and interruptions.
- I. Provide insulated pipes conveying fluids below ambient temperature with vapor retardant jackets with self-sealing laps. Insulate complete system.
- J. For insulated pipes conveying fluids above ambient temperature, secure jackets with selfsealing lap or outward clinched, expanded staples. Bevel and seal ends of insulation at equipment, flanges, and unions.
- K. Provide shield between isolation inserts and hanger supports. Shields shall be minimum of 20-gauge galvanized metal. Fabricate of Manville Thermo-12 or other heavy density insulating material suitable for temperature. Insulation inserts shall not be less than the following lengths;
 - 1. 1/2" to 2 1/2" pipe size 10" long
 - 2. 3" to 6" pipe size 12" long
 - 3. 8" to 10" pipe size 16" long
 - 4. 12" and over 22" long
- L. For pipe exposed in equipment rooms or unfinished spaces provide field applied aluminum jacket.
- M. For exterior piping applications (refrigeration suction piping), provide field applied protection jacket or coating. Insulated pipe, fittings, joints, and valves shall be covered with field applied aluminum jacket. Jacket seams shall located on bottom side of horizontal piping.
- N. For return air plenum areas provide non-combustible jacket.
- O. Fittings and valves shall be covered with premolded one-piece insulated covers.
- P. Piping Insulation Schedule
 - 1. Fiber Glass Insulation
 - a. Domestic Hot Water (supply and return piping):
 - 1) pipe: up to 2" 1 inch thick
 - 2) pipe: 2 1/2" to 4" 1 1/2 inch thick
 - b. Condensate piping system

- 1) pipe: up to 2" 3/4 inch thick
- 2. Elastomeric Foam
 - a. Refrigerant Suction
 - 1) all sizes 1 inch thick
 - b. Refrigerant Hot Gas
 - 1) all sizes 3/4 inch thick
- Q. The above listed insulation thickness and finish are required. If however, the thickness, density and finish are more restrictive in the current edition of the California Mechanical Code Section 1005 Table No. 10-D and Table 2-53D of the Building Energy Efficiency Standards these values shall be used.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements.

23 00 00 – COMMISSIONING OF HVAC

PART 1 - GENERAL

- 1.1 This section covers testing and balancing of environmental systems including air distribution systems, and the equipment and apparatus connected thereto. The testing and balancing of all environmental systems shall be the responsibility of one Testing, Balancing and Adjusting (TBA) firm. The minimal standards to be met are those set forth in Chapter 40 in the latest edition of the ASHRAE Systems Handbook.
- PART 2 PRODUCTS (na)

PART 3 - EXECUTION

- 3.1 The balancing, testing and adjustments of the complete mechanical systems shall be the direct responsibility of the Contractor and he shall engage the services of an independent firm specializing in this work. The definition of independent shall mean the firm is not associated with any contracting or manufacturing firm and derives its income solely from testing, adjusting and balancing mechanical systems. Acceptable testing, adjusting and balancing firms are those that are AABC certified. NEBB firms must also be AABC certified.
- 3.2 The balancing work shall be performed by the same firm having total professional responsibility for the final testing, adjusting, and balancing of the entire system.
- 3.3 Testing and balancing work shall be directly supervised and the results confirmed by a Registered Professional Mechanical Engineer who shall represent the TBA firm in progress meetings as requested, and shall be available for interpreting all material found in the balance report.
- 3.4 The balancing firm shall provide all tools, equipment and instruments required and shall take all readings, and make all necessary adjustments.
- 3.5 After all adjustments are made, prepare a detailed written report and submit for review. Report shall bear the Registered Professional Mechanical Engineer's Stamp of the person supervising the work. Final acceptance of this project will not be made until a satisfactory report is received.
- 3.6 Verify the following conditions before proceeding with work:
 - A. Conduct site observations during construction to determine the location of required balancing devices and confirm that they are properly located and installed. Submit a written report of these observations to the Architect.
 - B. Installation of the designated system is complete and in full operation.

- C. Outside temperature conditions, occupant loads, lighting loads, special equipment requiring extra sensible or ventilation requirements, and solar conditions are within a reasonable range relative to design conditions or provide for acceptable simulation of loads and conditions that will result in a properly balanced system.
- 3.7 All thermal overload protection shall be observed and noted on the data sheets. If the starter equipment is furnished and installed by the Contractor and thermal overload protection is incorrect, such information shall be tabulated, including required size thermal overloads, and included in the report. If thermal overload protection is incorrect, it shall be the responsibility of the Contractor to see that proper overload protection is installed.
- 3.8 Measure and set any special conditions such as minimum outside air quantities; check and adjust outside and return air intakes so that the system will deliver substantially the same volume on either; make tests and record data as required in the "Balancing Report" section. All balancing devices such as dampers and valves shall be clearly marked as to the final balanced position. Plug all test holes, replace access doors and belt guards.
- 3.9 Provide temperature recorders for spaces as necessary to verify acceptable space temperature conditions.
- 3.10 Upon request of the Mechanical Engineer or School District's Representative, a representative of the balancing firm performing the work shall demonstrate fluid flow quantities shown in the report by re-measuring outlets or terminals selected at random by the Mechanical Engineer or School District's Representative to verify accuracy of settings.
- 3.11 Requirements for balancing air systems are as follows:
 - A. Before any adjustments are made; the major items of equipment shall have been checked to assure all bearings have proper lubrication; all belt drives shall have been adjusted for proper alignment and tension; and the systems shall have been checked for such items as dirty filters, duct leakage, filter leakage, damper leakage, equipment vibrations, correct damper operations, etc.
 - B. Adjust fan systems, major duct sections, registers, diffusers, etc., to deliver design air quantities within plus or minus 5%. Individual air outlets, when more than one serves a space, may have a tolerance of 10% from the average. Design CFM is based on filters being approximately 50% loaded. Pressure drop across filters during balancing shall be simulated to that condition. After balancing is completed, verify that motor is not overloaded with the filters clean.
 - C. Check and adjust CFM settings.
 - D. Adjust distribution systems to obtain uniform space temperatures free from objectionable drafts and noise within the capabilities of the system.
 - E. Exchange and pay for sheaves and/or belts as required to adjust the rpm of fans to handle specified air quantity.
- 3.12 Provide four copies of a "Balancing Report" to the Architect. The Mechanical Engineer and School District's Owner' Representative shall review this report. This report shall contain a general information sheet listing instruments used, method of balancing, altitude correction

calculations, manufacturer's grille, register, and diffuser data. Report shall contain the following additional data.

- A. Equipment data sheets listing make, size, serial number, rating, operating data, etc., of all mechanical equipment including fans, motors, starters, and drives. Operating data shall include rotational speed, inlet and outlet pressures, pressure drop across filters, coils and other system components, and measured motor current and voltage.
- B. Balancing data sheets listing the required and actual CFM of all supply, return, and exhaust outlets or inlets, and totals summarized by systems.
- C. A reduced set of contract drawings with outlets marked thereon for easy identification of the designation used in the data sheets.
- D. Listing of any abnormal or notable conditions not covered in the above.
- 3.13 Even though it is the responsibility of the balancing firm to check the physical operation of each operating piece of equipment, the control contractor must assure the balancing firm that all controls are accurately calibrated and must cooperate with him during the balancing work period.
- 3.14 The agency performing the system balance and performance test, shall personally verify that all system control functions and interlocking do in fact provide the desired results as stated. The agency shall provide a written statement within the air balance report verifying this fact.

END OF SECTION

23 07 00 – HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SECTION INCLUDES:

A. Provide labor, equipment and materials, and perform all operations necessary for the installation of insulation as indicated. This section includes thermal and acoustic insulation applied to ductwork and air handling devices.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Acceptable manufacturers for insulation are Manville Corporation, Ownes-Corning and Knauf.
- B. Acceptable manufacturers in addition to insulation manufacturers for adhesives, sealants and coatings are Foster and Childers Product Co.
- C. Duct tape is not an approved sealer tape and shall not be used on this project.

2.2 DUCT WORK INSULATION

- A. Flexible Fiberglass Blanket: Manville Microlite Type 75 meeting ASTM C553 or equal, Type 1, Class B-2; flexible blanket not to exceed 25 flame spread and 50 smoke developed.
 - 1. 'K' ('KSI') Value: 0.27 at 75 degrees F (0.040 at 24 degrees C) installed.
 - 2. Density: .75 LB/CU FT (12 kg/CU M).
 - 3. Vapor Barrier Jacket: FSK, Aluminum foil reinforced with fiberglass yarn and laminated to fire-resistant kraft, secured with UL listed pressure sensitive tape and/or outward clinched expanded staples and vapor barrier mastic as needed. All insulation and jacket material shall be plenum rated.
- B. Duct Liner: Manville Linacoustic Mat Faced or Permacote meeting ASTM C1071 or equal; flexible blanket.
 - 1. 'K' ('KSI') Value: ASTM C518, 0.25 at 75 degrees F (0.036 at 24 degrees C).
 - 2. Noise Reduction Coefficient: .65 or higher based on "Type A mounting". Comply with ASTM C423A Absorption Coefficients, ASTM 84, UL 723 and NFPA 228.
 - 3. Maximum Velocity on Mat or Coated Air Side: 4,000 ft/min.
 - 4. Adhesive: UL listed waterproof type.
 - 5. Fasteners: Duct liner galvanized steel pins, welded or mechanically fastened.

- 6. Absolute roughness of exposed surface not to exceed 0.0013 coated.
- C. Round Duct Liner: Manville Spiracoustic, meeting ASTM C427 or equal; rigid.
 - 1. 'K' ('KSI') Value: ASTM C518, 0.23 at 75 degrees F (.033 at 24 degrees C).
 - 2. Noise Reduction Coefficient of .70 as per ASTM C427 (Type A mounting).
 - 3. Maximum Velocity: 4000 ft/min (20.3 mm/sec).
- D. Duct Liner shall comply with the requirements of NFPA 90A and the "duct liner materials standard" of the Thermal Insulation Manufacturers Association. Duct liner shall be glass fiber insulation with exposed surface coated to prevent fiber erosion at air velocities up to 4000 fpm. Duct sizes for lined duct show the clear dimension inside the lining.
- E. All external insulation shall have foil back jacket.

PART 3 - EXECUTION

- 3.1 EXAMINATION AND PREPARATION
 - A. Verify that ductwork has been pressure tested for leakage in accordance with SMACNA standards before applying insulation materials.
 - B. Verify that all surfaces are clean, dry and free of foreign material. Apply insulation on clean, dry surfaces free of any foreign matter and only after tests and approvals required by the specifications have been completed.
- 3.2 GENERAL INSTALLATION
 - A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.
 - B. Continue insulation vapor barrier through penetrations except where prohibited by code.
 - C. Insulation shall be installed by workmen regularly engaged in this kind of work in accordance with the manufacturer's recommendations.
 - D. All exposed raw edges shall be finished with finishing cement.
 - E. If staples are used, all must be coated with adhesive to maintain vapor barrier integrity. Thickness per ASHRAE Standards Table.

3.3 EXTERNAL DUCT WORK INSULATION INSTALLATION AND SCHEDULE

- A. All insulation shall be applied with edges tightly butted with facing overlapping all joints at least 2". All external insulation shall have foil backed vapor seal. Joints shall be sealed with fire retardant adhesive. The insulation shall be secure to the duct with approximately 4" wide strips at 8" O.C. of fire retardant adhesive. Where the duct width exceeds 30", the underside insulation shall be additionally held in place with mechanical fasteners on about 18" maximum centers.
- B. All breaks and punctures shall be sealed with vapor barrier tape and fire retardant adhesive.
- C. Provide all insulated ductwork conveying air with foil-backed jacket. Seal all jacket seams and penetrations with UL listed tapes or vapor retardant adhesive. Where service access is required, bevel and seal ends of insulation.
- D. Continue insulation through walls, sleeves, hangers, and other duct penetrations except where prohibited by code.
- E. The underside of duct work 24" or greater shall be secured with mechanical fasteners and speed clips spaced approximately 18" on center. The protruding ends of the fasteners should be cut off flush after the speed clips are installed, and then, when required, sealed with the same tape as specified above.
- F. For ductwork exposed to physical abuse in mechanical equipment rooms or in finished spaces, finish with Manville Zeston 2000 PVC jacket or aluminum jacket.
- G. External Insulation Schedule
 - 1. Flexible Fiber Glass
 - a. Supply and Return Ducts @ HVAC units:
 - 1) 1 inch thick Foil Back
- H. The above listed insulation thickness and finish are required. If however, the thickness, density and finish are more restrictive in the current edition of the California Mechanical Code Section 1005 Table No. 10-D and Table 2-53D of the Building Energy Efficiency Standards these values shall be used.
- 3.4 DUCT LINER INSULATION INSTALLATION AND SCHEDULE
 - A. Duct liner shall be used in all weather-exposed locations or outside of building. Duct liner shall be installed in all supply and return plenums for sound reduction and thermal insulation. Supply and return plenums occur at each air-moving piece of equipment. Duct liner shall also be installed where indicated on the drawings.
 - B. Duct linings shall be interrupted at fire dampers and fire doors so as not to interfere with their operation. Duct coverings and linings shall also be interrupted at the immediate area of operation of heat sources in a duct system involving electric resistance or fuel burning heaters.
 - C. All portions of duct designed to receive duct liner shall be completely lined on the interior with acoustical lining as specified herein. Transverse joints shall be neatly butted and there shall be no interruptions or gaps.
 - D. The coated surface of the lining shall face the airstream.
 - E. The lining shall be adhered to the sheet metal with 100% coverage of adhesive, and all exposed leading edges and all transverse joints coated with adhesive.
 - F. The lining shall be additionally secured with mechanical fasteners that shall compress the duct liner sufficiently to hold it firmly in place.
 - G. The lining shall be cut to assure overlapped and compressed longitudinal corner joints.
 - H. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.
 - I. Sizes noted on drawings are clear cross-section area (inside the lining).
 - J. For velocities up to 2,000 fpm, duct liner shall be applied with 100% coverage of fire retardant adhesive. Duct liner shall be cut to assure snug corner joints. The coated or most dense surface of the liner shall face the air stream. The liner shall be additionally secured with mechanical fasteners that shall compress the duct liner sufficiently to hold it firmly in

place. They shall start within 3" of the leading edge of each duct section (and any line transverse joints within the duct section) and shall be spaced no more than 12" O.C. around the perimeter of the duct, except that they need to be no closer than 9" to a corner break. Elsewhere, they shall be a maximum of 18" O.C., except that they shall be placed not more than 6" from a cut edge nor 12" from a corner break. All exposed edges and the leading edge of all cross-joints of the liner shall be coated with the same adhesive used to secure the duct liner to the metal surface. For velocities between 2,000 and 4,000 fpm, installation shall be same except that mechanical fasteners shall be spaced no more than 6" to a corner break. Elsewhere, they shall be a maximum of 10" O.C., except that they shall be placed not more break. Elsewhere, they shall be a maximum of 10" O.C., except that they shall be placed not more break.

- K. Adhesive shall conform to Adhesive and Sealant Council Standards for Adhesives for Duct Liner; ASC-A700K-1972.
- L. Mechanical fasteners shall conform to Mechanical Fastener Standard MF-1-1971, available from SMACNA.
- M. Adhere insulation to sheet metal with full coverage of a UL listed adhesive.
- N. Secure insulation with mechanical liner fasteners as indicated by SMACNA or manufacturer. Pin length should be as recommended by the liner manufacturer.
- O. All exposed edges of the liner must be factory or field coated. For systems operating at 4000 fpm or higher a metal nosing must be installed in all liner leading edges.
- P. Repair liner surface penetrations with UL listed adhesive.
- Q. Duct Liner Insulation Schedule Rigid Fiber Glass
 - 1. Supply and Return Ducts as noted on drawings
 - a. 1 inch thick LINACOUSTIC PERMACOTE or equal
 - 2. Supply and Return Plenums @ HVAC units:
 - a. 1 1/2 inch thick LINACOUSTIC PERMACOTE or equal
- R. The above listed insulation thickness and finish are required. If however, the thickness, density and finish are more restrictive in the current edition of the California Mechanical Code Section 1005 Table No. 10-D and Table 2-53D of the Building Energy Efficiency Standards these values shall be used.

END OF SECTION

23 09 23 – DIRECT-DIGITAL CONTROL SYSTEMS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Temperature Control System (TCS), utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only.
- B. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.
- C. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s).

1.2 SYSTEM DESCRIPTION

- A. The entire Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital controllers communicating via LonMark/LonTalk communication protocols to a Network Area Controller (NAC). Temperature Control System products shall be manufactured by Honeywell. (Sweetwater UHSD Board Approved proprietary system) LonWorks products must be approved in writing by the consulting Engineer and be submitted for approval ten (10) days prior to the date of the bid submittal.
- B. The Temperature Control System (TCS) as provided in this Division shall be based on the Honeywell WEBs System incorporating the Niagara Framework[™]. Systems not developed on the Niagara Framework platform are unacceptable.
- 1.3 SUBMITTAL
 - A. Eight copies of shop drawings of the components and devices for the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions for all controllers, valves, dampers, sensors, routers, etc. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation shall also be included with the submittal package.
 - B. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media and protocol.
 - C. Submittal shall also include a complete point list of all points to be connected to the TCS. Temperature Controls Contractor shall provide necessary point lists, protocol documentation, and factory support information for systems provided.
 - D. Submittal shall also include a copy of each of the graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are to be linked to

one another for system navigation. The graphics are intended to be 80% - 90% complete at this stage with the only remaining changes to be based on review comments from the A/E design team and/or Owner.

- E. Include the following display graphics for each of the sites:
 - 1. Site plan view of entire campus identifying each building include the display of outside air temperature & humidity.
 - 2. Individual buildings, including room layout with display of all space temperatures and occupied mode, outside air temperature & humidity.
 - 3. Mechanical equipment display for each AC unit to include space temperature, heating and cooling setpoints, supply air temperature, fan status, occupied mode, outside temperature & humidity.
 - 4. Boiler and hot water pumps showing all related points.
 - 5. Page showing all room temperatures, room temperature setpoints, occupied mode, AC unit fan status and AC unit mode (heating or cooling).
 - 6. Page showing all other miscellaneous points.
- F. Upon completion of the work, provide a complete set of `as-built' drawings and application software on compact disk. Drawings shall be provided as AutoCAD[™] or Visio[™] compatible files. Eight copies of the `as-built' drawings shall be provided in addition to the documents on compact disk. Temperature Controls Contractor shall provide as-builts for their portions of work.
- 1.4 SPECIFICATION NOMENCLATURE
- A. Acronyms used in this specification are as follows:
 - 1. TCS Temperature Control System
 - 2. NAC Network Area Controller
 - 3. IDC Interoperable Digital Controller
 - 4. IBC Interoperable BACnet Controller
 - 5. GUI Graphical User Interface
 - 6. WBI Web Browser Interface
 - 7. POT Portable Operator's Terminal
 - 8. PMI Power Measurement Interface
 - 9. DDC Direct Digital Controls
 - 10. LAN Local Area Network
 - 11. WANWide Area Network
 - 12. OOT Object Oriented Technology
 - 13. PICSProduct Interoperability Compliance Statement
- 1.5 AGENCY AND CODE APPROVALS

- A. All products of the TCS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
 - 1. UL-916; Energy Management Systems
 - 2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 "signal Equipment"
 - 3. CE
 - 4. FCC, Part 15, Subpart J, Class A Computing Devices

1.6 SOFTWARE LICENSE AGREEMENT

- A. The Owner shall agree to the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.
- B. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the Server(s), and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required IDs and passwords for access to any component or software program shall be provided to the owner. The owner shall determine which organizations to be named in the SI organization ID ("orgid") of all software licenses. Owner shall be free to direct the modification of the "orgid" in any software license, regardless of supplier.

1.7 DELIVERY, STORAGE AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.8 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

PART 2 - PRODUCTS

- 2.1 ACCEPTABLE CONTROL MANUFACTURER/CONTRACTOR
 - A. Honeywell "Authorized Controls Integrator" R & R Controls Inc.

4564 B Alvarado Canyon Road San Diego, CA 92120 Ph: 619-516-1880 Fax: 619 516-1881

2.2 GENERAL

- A. The Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, printers, network devices, valves, dampers, sensors, and other devices as specified herein. All systems and software within TCS shall be Year 2000 compliant and shall be supported by compliance documentation from the manufacturer.
- B. The installed system shall provide secure password access to all features, functions and data contained in the overall TCS.

2.3 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate ANSI/ASHRAE Standard 135-2001 BACnet, LonWorks technology, MODBUS, OPC, and other open and proprietary communication protocols in one open, interoperable system.
- B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE[™] Standard 135-2001, BACnet and LonMark to assure interoperability between all system components is required. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file and a resource file for the device. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet (BACnet Ethernet/IP,) and/or RS-485 (BACnet MSTP) as specified.
- C. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.
- D. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.
- E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.
 - 1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.

2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.4 NETWORKS

- A. The Local Area Network (LAN) shall be a 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.
- B. Local area network minimum physical and media access requirements:
 - 1. Ethernet; IEEE standard 802.3
 - 2. Cable; 100 Base-T, UTP-8 wire, category 5
 - 3. Minimum throughput; 100 Mbps.

2.5 NETWORK ACCESS

A. Remote Access. For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high-speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer's Intranet to a corporate server providing access to an Internet Service Provider (ISP). Customer agrees to pay monthly access charges for connection and ISP.

2.6 NETWORK AREA CONTROLLER (NAC)

- A. The Network Area Controller (NAC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:
 - 1. Calendar functions
 - 2. Scheduling
 - 3. Trending
 - 4. Alarm monitoring and routing
 - 5. Time synchronization
 - 6. Integration of LonWorks controller data and BACnet controller data
 - 7. Network Management functions for all LonWorks based devices
- B. The Network Area Controller must provide the following hardware features as a minimum:
 - 1. One Ethernet Port 10/100 Mbps
 - 2. One RS-232 port
 - 3. One LonWorks Interface Port 78KB FTT-10A
 - 4. One RS-485 ports
 - 5. Battery Backup

- 6. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
- 7. The NAC must be capable of operation over a temperature range of 32 to 122°F
- The NAC must be capable of withstanding storage temperatures of between 0 and 158°F
- 9. The NAC must be capable of operation over a humidity range of 5 to 95% RH, noncondensing
- C. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.
- D. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.
- E. Event Alarm Notification and actions
 - 1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
 - 2. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
 - 3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:
 - a. To alarm
 - b. Return to normal
 - c. To fault
 - d. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: Security, HVAC, Fire, etc.
 - 4. Provide timed (schedule) routing of alarms by class, object, group, or node.
 - 5. Provide alarm generation from binary object "runtime" and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
- F. Control equipment and network failures shall be treated as alarms and annunciated.
- G. Alarms shall be annunciated in any of the following manners as defined by the user:
 - 1. Screen message text
 - 2. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
 - a. Day of week
 - b. Time of day
 - c. Recipient
 - 3. Pagers via paging services that initiate a page on receipt of email message

- 4. Graphic with flashing alarm object(s)
- 5. Printed message, routed directly to a dedicated alarm printer
- H. The following shall be recorded by the NAC for each alarm (at a minimum):
 - 1. Time and date
 - 2. Location (building, floor, zone, office number, etc.)
 - 3. Equipment (air handler #, access way, etc.)
 - 4. Acknowledge time, date, and user who issued acknowledgement.
 - 5. Number of occurrences since last acknowledgement.
- I. Alarm actions may be initiated by user defined programmable objects created for that purpose.
- J. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
- K. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.
- L. Provide a "query" feature to allow review of specific alarms by user-defined parameters.
- M. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
- N. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.
- O. Data Collection and Storage
 - 1. The NAC shall have the ability to collect data for any property of any object and store this data for future use.
 - 2. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:
 - a. Designating the log as interval or deviation.
 - b. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
 - c. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
 - d. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first- out basis.
 - e. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
 - 3. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web browser.
 - 4. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
 - 5. All log data shall be available to the user in the following data formats:

- a. HTML
- b. XML
- c. Plain Text
- d. Comma or tab separated values
- 6. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.
- 7. The NAC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties, at a minimum:
 - a. Archive on time of day
 - b. Archive on user-defined number of data stores in the log (buffer size)
 - c. Archive when log has reached its user-defined capacity of data stores
 - d. Provide ability to clear logs once archived
- 2.7 AUDIT LOG
 - A. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:
 - 1. Time and date
 - 2. User ID
 - 3. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.
- 2.8 DATABASE BACKUP AND STORAGE
 - A. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.
 - B. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.
 - C. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.9 INTEROPERABLE DIGITAL CONTROLLER (IDC)

- A. Controls shall be Honeywell Excel 10 microprocessor based Interoperable LonWorks Controllers (IDC) or approved equal. Where possible, all Interoperable Digital Controllers shall bear the applicable LonMark interoperability logo on each product delivered.
- B. HVAC control shall be accomplished using LonMark[™] based devices where the application has a LonMark profile defined. Where LonMark devices are not available for a particular application, devices based on LonWorks shall be acceptable. For each LonWorks device that

does not have LonMark certification, the device supplier must provide an XIF file for the device. Publicly available specifications for the Applications Programming Interface (API) must be provided for each LonWorks / LonMark controller defining the programming or setup of each device. The Temperature Controls Contractor shall provide all programming, documentation and programming tools necessary to set up and configure the supplied devices per the specified sequences of operation.

- C. The Temperature Controls Contractor shall run the LonWorks network trunk to the nearest Network Area Controller (NAC). Coordinate locations of the NAC to ensure that maximum network wiring distances, as specified by the LonWorks wiring guidelines, are not exceeded. A maximum of 126 devices may occupy any one LonWorks trunk and must be installed using the appropriate trunk termination device. All LonWorks and LonMark devices must be supplied using FTT-10A LonWorks communications transceivers.
- D. The Network Area Controller (NAC) will provide all scheduling, alarming, trending, and network management for the LonMark / LonWorks based devices.
- E. The IDCs shall communicate with the NAC at a baud rate of not less than 78.8K baud. The IDC shall provide LED indication of communication and controller performance to the technician, without cover removal.
- F. All IDCs shall be fully application programmable and shall at all times maintain their LONMARK certification, if so certified. Controllers offering application selection only (non-programmable), require a 10% spare point capacity to be provided for all applications. All control sequences within or programmed into the IDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.
- G. The Temperature Controls Contractor supplying the IDC's shall provide documentation for each device, with the following information at a minimum:
 - 1. Network Variable Inputs (nvi's); name and type
 - 2. Network Variable Outputs (nvo's); name and type
 - 3. Network configuration parameters (nci, nco); name and type
- H. It is the responsibility of the Division 15 contractor to ensure that the proper Network Variable Inputs and Outputs (nvi and nvo) are provided in each IDC, as required by the point charts.
- I. The supplier of any programmable IDC shall provide one copy of the manufacturer's programming tool, with documentation, to the owner.

2.10 GRAPHICAL USER INTERFACE (GUI) SOFTWARE

- A. Operating System: WEBSTATION-AX[™]
 - 1. The GUI shall run on Microsoft Windows XP Professional.
- B. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

- C. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:
 - 1. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.
 - 2. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
 - 3. Graphics shall support layering and each graphic object shall be configurable for assignment to a layer. A minimum of six layers shall be supported.
 - 4. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.
 - a. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
 - b. Holidays shall be set by using a graphical calendar without requiring any keyboard entry from the operator.
 - 5. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
 - 6. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.
- D. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:
 - 1. Create, delete or modify control strategies.
 - 2. Add/delete objects to the system.
 - 3. Tune control loops through the adjustment of control loop parameters.
 - 4. Enable or disable control strategies.
 - 5. Generate hard copy records or control strategies on a printer.
 - 6. Select points to be alarmable and define the alarm state.
 - 7. Select points to be trended over a period of time and initiate the recording of values automatically.
- E. On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.
- F. Security. Each operator shall be required to log on to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators'

access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.

- G. System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
- H. Alarm Console
 - 1. The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.
 - 2. When the Alarm Console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un- acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

2.11 WEB BROWSER CLIENTS

- A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer[™] or Netscape Navigator[™]. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.
- B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.
- C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.
- D. The Web browser client shall support at a minimum, the following functions:
 - 1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
 - 2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
 - 3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.

- 4. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
- 5. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
- 6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
 - a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
 - b. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
 - c. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
 - d. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
 - e. View logs and charts
 - f. View and acknowledge alarms
 - g. Setup and execute SQL queries on log and archive information
- 7. The system shall provide the capability to specify a user's (as determined by the logon user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
- 8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.12 SERVER FUNCTIONS AND HARDWARE

- A. A central server, located at the District's Maintenance Office, shall be provided. The server shall support all Network Area Controllers (NAC) connected to the customer's network whether local or remote.
- B. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1 or dial-up connection.
- C. It shall be possible to provide access to all Network Area Controllers via a single connection to the server. In this configuration, each Network Area Controller can be accessed from a remote Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.
- D. The server shall provide the following functions, at a minimum:
 - 1. Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.

- 2. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
- 3. The server shall include a master clock service for its subsystems and provide time synchronization for all Network Area Controllers (NAC).
- 4. The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.
- 5. The server shall provide scheduling for all Network Area Controllers and their underlying field control devices.
- 6. The server shall provide demand limiting that operates across all Network Area Controllers. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.
- 7. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.
- 8. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
- 9. The server shall provide central alarm management for all Network Area Controllers supported by the server. Alarm management shall include:
 - a. Routing of alarms to display, printer, email and pagers
 - b. View and acknowledge alarms
 - c. Query alarm logs based on user-defined parameters
- 10. The server shall provide central management of log data for all Network Area Controllers supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:
 - a. Viewing and printing log data
 - b. Exporting log data to other software applications
 - c. Query log data based on user-defined parameters
- 11. Server Hardware Requirements: The server hardware platform shall have the following requirements:
 - a. The computer shall be an Intel Pentium IV based computer (minimum processing speed of 3.0 GHz with 2 GB RAM and a 100-gigabyte minimum hard drive). It shall include a DVD-ROM/CD-RW Combination Drive, 2-parallel ports, 2-asynchronous serial ports and 2-USB ports. A minimum 19" flat panel color monitor, 1280 x 1024 optimal preset resolution, 25 ms response time shall also be included.
 - b. The server operating system shall be Microsoft Windows XP Professional. Include Microsoft Internet Explorer 6.0 or later.
 - c. Connection to the TCS network shall be via an Ethernet network interface card, 100 Mbps.

- d. A system printer shall be provided. Printer shall be laser type with a minimum 600 x 600-dpi resolution and rated for 60-PPM print speed minimum.
- e. For dedicated alarm printing, provide a dot matrix printer, either 80 or 132 column width. The printer shall have a parallel port interface.

2.13 SYSTEM PROGRAMMING

- A. The Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.
- B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide "real-time" data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.
- C. Programming Methods
 - 1. Provide the capability to copy objects from the supplied libraries, or from a userdefined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-toone, many-to- one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.
 - Configuration of each object will be done through the object's property sheet using fillin the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.
 - 3. The software shall provide the ability to view the logic in a monitor mode. When online, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
 - 4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.
 - 5. The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

2.14 LONWORKS NETWORK MANAGEMENT

- A. The Graphical User Interface software (GUI) shall provide a complete set of integrated LonWorks network management tools for working with LonWorks networks. These tools shall manage a database for all LonWorks devices by type and revision, and shall provide a software mechanism for identifying each device on the network. These tools shall also be capable of defining network data connections between LonWorks devices, known as "binding". Systems requiring the use of third party LonWorks network management tools shall not be accepted.
- B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.
- C. The network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.
- D. These tools shall provide the ability to "learn" an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management database.
- E. The network management database shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management database at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

2.15 OBJECT LIBRARIES

- A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.
- B. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.
- C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.
- D. All control objects shall conform to the control objects specified in the BACnet specification.
- E. The library shall include applications or objects for the following functions, at a minimum:
 - 1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.
 - 2. Calendar Object. The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical "point-and-click" selection. This object must be "linkable" to any or all scheduling objects for effective event control.
 - 3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals.

- 4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.
- 5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building's "flywheel" effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day's performance.
- Demand Limiting Object. Provide a comprehensive demand-limiting object that is 6. capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of shedable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.
- F. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the BACnet specification.
 - 1. Analog Input Object Minimum requirement is to comply with the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
 - 2. Analog Output Object Minimum requirement is to comply with the BACnet standard for data sharing.
 - 3. Binary Input Object Minimum requirement is to comply with the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an "on" condition. The user must be able to specify either input condition as the "on" condition.
 - 4. Binary Output Object Minimum requirement is to comply with the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the BACnet method of contention resolution shall not be acceptable.

- 5. PID Control Loop Object Minimum requirement is to comply with the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.
- 6. Comparison Object Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.
- 7. Math Object Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.
- 8. Custom Programming Objects Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re- use.
- 9. Interlock Object Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.
- 10. Temperature Override Object Provide an object whose purpose is to provide the capability of overriding a binary output to an "On" state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.
- 11. Composite Object Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the "contained" application that are represented on the graphical shell of this container.
- G. The object library shall include objects to support the integration of devices connected to the Network Area Controller (NAC). At a minimum, provide the following as part of the standard library included with the programming software:
 - 1. LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering. Provide LonMark manufacturer-specific objects to facilitate simple integration of these devices. All network variables defined in the LonMark profile shall be supported. Information (type and function)

regarding network variables not defined in the LonMark profile shall be provided by the device manufacturer.

- 2. For devices not conforming to the LonMark standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file, resource file and documentation for the device to facilitate device integration.
- 3. For BACnet devices, provide the following objects at a minimum:
 - a. Analog In
 - b. Analog Out
 - c. Analog Value
 - d. Binary
 - e. Binary In
 - f. Binary Out
 - g. Binary Value
 - h. Multi-State In
 - i. Multi-State Out
 - j. Multi-State Value
 - k. Schedule Export
 - I. Calendar Export
 - m. Trend Export
 - n. Device
- 4. For each BACnet object, provide the ability to assign the object a BACnet device and object instance number.
 - a. For BACnet devices, provide the following support at a minimum
 - b. Segmentation
 - c. Segmented Request
 - d. Segmented Response
 - e. Application Services
 - f. Read Property
 - g. Read Property Multiple
 - h. Write Property
 - i. Write Property Multiple
 - j. Confirmed Event Notification
 - k. Unconfirmed Event Notification
 - I. Acknowledge Alarm
 - m. Get Alarm Summary

- n. Who-has
- o. I-have
- p. Who-is
- q. I-am
- r. Subscribe COV
- s. Confirmed COV notification
- t. Unconfirmed COV notification
- u. Media Types
- v. Ethernet
- w. BACnet IP Annex J
- x. MSTP
- y. BACnet Broadcast Management Device (BBMD) function
- z. Routing

2.16 MODBUS SYSTEM INTEGRATION

- A. The Network Area Controller shall support the integration of device data from Modbus RTU, ASCII, or TCP control system devices. The connection to the Modbus system shall be via an RS-232, RS485, or Ethernet IP as required by the device.
- B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the Modbus system data into the FPMS. Objects provided shall include at a minimum:
 - 1. Read/Write Modbus AI Registers
 - 2. Read/Write Modbus AO Registers
 - 3. Read/Write Modbus BI Registers
 - 4. Read/Write Modbus BO Registers
- C. The Network Area Controller shall perform all scheduling, alarming, logging and global supervisory control functions, of the Modbus system devices.
- D. The Temperature Controls Contractor shall provide a Modbus system communications driver. The equipment system vendor that provided the equipment utilizing Modbus shall provide documentation of the system's Modbus interface and shall provide factory support at no charge during system commissioning
- 2.17 OTHER CONTROL SYSTEM HARDWARE
- A. Space Temperature Wall Module. Wall Module shall be Honeywell or equivalent.
 - 1. Wall module shall have a 20K Ohm NTC thermistor temperature sensor with operating range of 45 to 99 F under a locking cover/enclosure with UL 916 listing designed for mounting on a standard electrical switch box.
 - 2. Space temperature sensors shall be accurate to plus or minus one F degree.

- 3. Where specified, space temperature sensors shall have a setpoint knob calibrated for warmer-cooler adjustments
- 4. Where specified, wall module shall also have an after-hours override pushbutton and LED override indicator.
- 5. Insulating foam shall be installed on the back of all space temperature wall modules to prevent air infiltration from wall opening.
- B. Duct Mount and Outside Air Temperature Sensors: Temperature sensors with an accuracy of +0.3° F. Temperature sensors shall be Honeywell or equivalent.
 - 1. Outside air sensors shall include an integral sun shield.
 - 2. Duct sensors shall have sensor approximately in center of the duct, and shall have selectable lengths of 6, 12, and 18 inches.
 - 3. Multipoint averaging element sensors shall be provided where specified and shall have a minimum of one foot of sensor length for each square foot of duct area (provide multiple sensors if necessary).
 - 4. Pipe mount sensors shall have copper, or stainless steel separable wells.
- C. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point shall be provided where specified. Current switches shall include an integral LED for indication of trip condition and a current level below trip set point.
- D. Humidity Sensors. Humidity sensors shall be Honeywell or equivalent.
 - 1. Duct and room sensors shall have a sensing range of 5% to 95%.
 - 2. Duct sensors shall be provided with a sampling chamber.
 - 3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall have a compensated ambient temperature range of -40°F to 170° F.
- E. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. Control panels shall meet all requirements of Title 24, California Administrative Code. All external wiring shall be connected to terminal strips mounted within the panel. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

2.18 SEQUENCE OF OPERATION

- A. Constant Volume Air Handling Unit, 1-Stage Cooling, 1-Stage Heating, with Economizer Enabled from Outside Air Dry Bulb Temperature. Constant Volume HVAC Unit Controller Software. The constant volume unit controller shall be configurable for air handlers with staged or analog heating and cooling, minimum or modulating economizer outside or mixing damper dampers, and enthalpy or dry bulb economizer changeover. Controller shall comply with LonMark HVAC profile #8030.
 - 1. Fan Off. Anytime the fan is off, all system heating and cooling shall be off, and the mixing dampers shall be positioned closed to the outside air.
 - 2. Fan and Mode Control. System fan and heating/cooling temperature setpoints shall normally be placed in the occupied, standby, or unoccupied mode of operation and control via a system scheduler unique seven-day schedule. Prior to scheduled occupied periods, the unoccupied temperature setpoint shall be ramped up to the occupied

setpoint over a time period proportional to the temperature difference between the room temperature and the occupied temperature setpoint such that at occupancy time the occupied temperature is reached. During unoccupied and standby periods the outside air damper shall be closed and the fan shall remain off until heating or cooling is demanded to satisfy the unoccupied and standby temperature setpoints. The standby mode of operation is for periods of temporary vacancy such as the lunch hour, and shall use owner determined temperature setpoints a degree or two away from the occupied comfort settings. System shall automatically revert to the proper mode of operation of power after a power failure. Units shall restart at a random staggered time interval after power restoration.

- 3. Occupant Schedule Override Control. When any room HVAC system is operating in a mode other than OCCUPIED, each room temperature sensor wall module schedule override button shall provide the room occupant with ability to place the system in the occupied mode of operation for 60 (180 default, user programmable) minutes by pressing the module override button. Via the button, the occupant shall also have the ability to cancel the override command, or to place the system in the unoccupied mode when operating in the occupied mode. Via the module LED, the occupant shall have the ability to note the status of the system overrides as being in the override mode, override unoccupied mode, continuously occupied mode via a network command, or in the normal mode of operation (LED off).
- 4. Fan Fail Alarm. Any time the fan is commanded on and the fan differential pressure switch piped across the fan, or a fan current sensor, does not prove air flow or fan operation, a fan-failed alarm shall be presented to the operator station. This alarm check shall be delayed upon fan start for 10 seconds (adjustable) to give the system time to prove flow prior to creating a false alarm.
- 5. Temperature Control, Occupied Periods. Heating control shall operate with 6 cycles per hour, and cooling control shall operate with 4 cycles per hour unless the equipment manufacturer dictates other parameters. If the scheduler commands the fan to stop during periods of electric duct heating, the heater shall be de-energized and the fan shall continue to run for 60 seconds to dissipate the residual heater heat prior to stopping airflow. A staging PID algorithm with heating and cooling anticipation features shall be employed for all staging control. Upon a drop in space temperature below the heating setpoint, the lead duct heater shall be energized, the on time proportional to the heating load. After the lead heater stage becomes full on, a further increase in the heating load shall cause the lag heating stage to be cycled, the on time proportional to the increasing load. The reverse of this shall happen on a decrease in heating load. Upon a rise in space temperature above the cooling setpoint, the lead compressor/coil shall be energized, the on time proportional to the cooling load. After the lead cooling stage becomes full on, a further increase in the cooling load shall cause the lag compressor/coil stage to be cycled, the on time proportional to the increasing load. The reverse of this shall happen on a decrease in cooling load.
- 6. If the space temperature drops or rises to either the heating or cooling unoccupied temperature setpoint during unoccupied periods, the system shall start and operate in the heating or cooling mode until the unoccupied temperature setpoints have been satisfied. The same operation shall occur for the standby mode of operation where specified.
- 7. Discharge Low Limit. If at any time the discharge airdrops below the user defined discharge air temperature low limit, an alarm shall be issued and the mixing dampers

shall be driven closed to the outside air. As the temperature rises, the dampers shall modulate open to the minimum ventilation position and the alarm shall clear.

- 8. Wall Sensor Module. Wall temperature sensor module shall be located where shown on the plans, and shall include the temperature sensor, the occupied/unoccupied override selection push button with override status LED (where specified), a warmer-cooler setpoint adjustment knob (where specified), and a jack for connecting to the LonTalk communication network. The system owner determines the normal heating and cooling room temperature setpoints for all wall module sensors (such as 73F & 77F). The warmer-cooler adjustment knob on the wall module shall give room occupants the ability to vary these values by an owner determined increment, such as two degrees, by rotating the setpoint knob. The setpoint knob shall not affect Setpoints in use when the room is unoccupied.
- 9. Master Override Button. Provide a Master Override Button for each of the school sites at the District's WEBSTATION-AX central server to lockout all of the classroom AC unit compressors when commanded.

2.19 POINT LISTS

- A. The points in the following table shall be accessible from the Graphical User Interface (GUI) and/or the Web browser interface (WBI). The supplier of the IDC and IBC devices shall ensure that the points listed in this table are accessible on their respective networks, by the Network Area Controller (NAC).
- B. The following abbreviations apply to the point table to indicate what level of functionality must be provided:
 - D = Display only
 - M = Modify value
 - A = Alarm
 - L = Log
 - S = Schedule
 - GC = Global supervisory control routine such as demand limiting

System Points						
Typical for all AC, HP & FC units	D	М	А	L	S	GC
AC Unit S/S		Х			Х	Х
AC Unit Status	Х		Х	Х		
AC Unit Supply Air Temperature	Х		Х	Х		
Space Temperature	Х		Х	Х		
Space Cooling Setpoint		Х		Х		Х
Space Heating Setpoint		Х		Х		Х
Cooling Stage	Х			Х		
Heating Stage	Х			Х		

Smoke Detector	Х		Х					
Door Switches	Х		Х					
Other misc. points								
Misc. Room Temperatures (see mech	Х			Х				
MDF Room Temperatures (1 per site)	Х		Х	Х				
Walk-in Freezer Temperature (1 per site)	Х		Х	Х				
Walk-in Freezer Hot Gas BP Status (1 per	Х		Х	Х				
Walk-in Refrigerator Temperature (1 per	Х		Х	Х				
Walk-in Refrige Hot Gas BP Status (1 per	Х		Х	Х				
Hot Water Pump Start/Stop		Х		Х	Х	Х		
Hot Water Pump Status	Х		Х	Х				
Boiler Supply Water Temperature	Х		Х	Х				
Boiler Return Water Temperature	Х		Х	Х				
Outside air temperature (1 per site)	Х		Х	Х				
Outside air humidity (1 per site)	Х		Х					
Power Meter (1 per site)	Х		Х	Х				
*Door switches are to be provided under Alternate #1								
**Power Meter is to be provided under Alternate #2								

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All work described in this section shall be performed by a Honeywell "Authorized Controls Integrator" that has a successful history in the design and installation of integrated control systems using Niagara Framework. The installing contractor shall have a local office located within 20 miles from Sweetwater Union High School District and a minimum of ten years of integration experience installing Honeywell DDC control systems and shall provide documentation in the submittal package verifying the company's experience.
- B. The Temperature Controls Contractor shall have employees at the local branch that are fully trained and certified for the Honeywell WEBs Systems incorporating Niagara Framework. Copies of the employees Niagara Training Certificates shall be included in the submittals.
- C. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
- D. Drawings of the TCS network are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of the Owner shall be furnished and installed without additional cost.

- E. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by this contractor in accordance with these specifications.
- F. Temperature Controls Contractors shall have a C-10 License in good standing in the state of California.

3.2 WIRING

- A. All electrical control wiring and power wiring to the control panels, NAC, computers and network components shall be installed in conduit and be the responsibility of the Temperature Controls Contractor.
- B. All wiring shall be in accordance with the National Electrical Code and any applicable local codes. All TCS wiring shall be installed in the conduit types allowed by the National Electrical Code or applicable local codes. Where TCS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.
- C. Echelon Compliant Direct Burial Cable shall be used for all underground communication bus wiring between buildings to prevent damage from moisture. The existing underground conduit systems are not watertight.

3.3 WARRANTY

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of two years from the time of system acceptance.
- B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by this contractor at no expense to the Owner.

3.4 WARRANTY ACCESS

- A. The Owner shall grant to this contractor, reasonable access to the TCS during the warranty period.
- B. The owner shall allow the contractor to access the TCS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.5 SOFTWARE LICENSE

- A. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). The owner, or his appointed agent, shall determine which organizations to be named in the "orgid" of all Niagara Framework software licenses.
- B. The owner, or his appointed agent, shall be free to direct the modification of the "orgid" in any Niagara Framework software license, regardless of supplier.
- C. The owner, or his appointed agent, shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and /or configured for use within Niagara Framework (Niagara) based controllers and/or servers and any related

LAN / WAN / Intranet and Internet connected routers and devices. Any and all required Ids and passwords for access to any component or software program shall be provided to the owner.

3.6 ACCEPTANCE TESTING

- A. Upon completion of the installation, this contractor shall load all system software and startup the system. This contractor shall perform all necessary calibration, testing and debugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. This contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by- point log to validate 100% of the input and output points of the DDC system operation.
- C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.
- D. System Acceptance: Satisfactory completion is when this contractor have performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.7 OPERATOR INSTRUCTION, TRAINING

- A. During system commissioning and at such time acceptable performance of the TCS hardware and software has been established this contractor shall provide both off-site and on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by factory-trained personal that are familiar with the system hardware, software and accessories.
- B. This contractor shall provide 40 hours of instruction to the owner's designated personnel on the operation of the TCS and describe its intended use with respect to the programmed functions specified. Operator orientation of the systems shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation. Contractor to provide local training facility that will accommodate up to 12 school district employees.
- C. The training shall be in three 8-Hour sessions as follows:
 - 1. First Training Session: 8 Hours of classroom training after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the owners' personnel can start to familiarize themselves with the system before classroom instruction begins.
 - 2. Second Training Session: 8 Hours of classroom training approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.
 - 3. Third Training Session: 8 Hours of classroom training to be scheduled at the request of the owner during the first six-month period. These sessions shall cover topics as

requested by the owner such as: how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.

END OF SECTION

23 20 00 – HVAC PIPING

PART 1 - GENERAL

- 1.1 Section Includes
 - A. Refrigeration System Piping
 - B. Piping Supports

PART 2 - PRODUCTS

- 2.1 Piping: Type ACR L Hard Copper. Joints: Solder for copper using 95% tin 5% antimony. Provide wrought copper fittings.
- 2.2 Fittings: Provide wrought copper fittings.
- 2.3 Refrigeration Specialties: Provide in line filter dyers at all condensing units in suction piping. Provide shut off valves at each condensing unit. Provide suction line accumulators.
- 2.4 Hangers:
 - A. Copper pipe: horizontal insulated and uninsulated: Adjustable steel clevis of sufficient size to fit outside of insulation.
 - B. Copper pipe: vertical insulated and uninsulated: Tubing riser clamp carbon steel with copper finish; or figure with plastic coating on formed portion.
 - C. Hanger Spacing:
 - D. Copper pipe: 1/2" to 2" pipe every 6'- 0" or less.
 - E. Copper pipe: 2" and larger pipe every 8'- 0" or less.
 - F. Pipe Supports on Roof: Roof pipe supports shall be Dura-Block[™] by Eaton's B-Line Business 509 West Monroe Street, Highland, IL 62249, in size and quantity to meet manufactures specifications for rated loads.
 - G. Provide seismic motion restraints as required by California Mechanical 1997 and California Building Codes 1998.

PART 3 - EXECUTION

- 3.1 Supports shall secure pipes in place, shall prevent pipe vibration and maintain required grading of proper adjustment, and shall provide for expansion and contraction.
- 3.2 Hangers and roof supports shall be located near or at changes in piping direction and at concentrated loads and shall provide vertical adjustment to maintain pitch required. All piping mechanically attached to metal studs or bracing shall be attached with approved

isolator devices. These isolation devices are for the avoidance of excessive noise or vibration in the building due to the operation of equipment, and/or due to interconnected piping, ductwork or conduit.

3.3 Hangers and roof supports shall be of strength and rigidity to suit loading and service and in a manner which will not unduly stress the building construction. Hangers and roof supports shall be of adequate size to fit outside the insulation.

3.4 REFRIGERATION PIPING INSTALLATION

- A. All piping shall be concealed in walls, furred spaces, pipe spaces, or above suspended ceilings. Piping shall be grouped wherever practical and shall be installed uniformly in straight parallel lines in either vertical or horizontal positions and at right angles with beams, walls, ceilings or other building lines. Install all exposed piping as close as practical to walls, columns or overhead construction to provide maximum headroom and minimum interference with usable building space. Where interference develops in the field, piping shall be offset or routed as required.
- B. Pipe shall be installed to eliminate sagging.
- C. All pipe, fittings and valves shall bear manufacturer's name and trademark, and valves shall have service and pressure rating cast in bodies.
- D. Copper piping passing through poured concrete floors shall be sleeved and wrapped with plastic foam or fire stop material as appropriate with 50% overlap.
- 3.5 PIPE TESTING
 - A. All piping system shall be tested and proven tight prior to concealment.
 - B. Insure that the test pressure which might damage equipment does not reach such units by valving them off or otherwise isolating them during the test.
 - C. All air tests shall be held for a minimum of four hours without loss of pressure.

END OF SECTION

23 31 00 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

- 1.1 Section Includes
 - A. Metal Ducts
 - B. Nonmetal Ducts
 - C. HVAC Casings
- 1.2 Quality Assurance
 - A. Installation Standards
 - 1. NFPA 90A.
 - 2. NFPA 90B.
 - 3. SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
 - 4. California Mechanical Code.

PART 2 - PRODUCTS

- 2.1 SHEET METAL
 - A. Unless otherwise specified, sheet metal used for duct and plenum construction shall be G60 coated galvanized steel of lock forming grade conforming to ASTM standards A-525 and A-527. All duct work and supports shall be galvanized. All sheet metal round duct shall be round spiral lock-seam construction. "Knock down" (KD) duct is not acceptable.
 - B. The gauge of the duct and its construction shall be based on low pressure or medium pressure or low or medium velocity. The velocities can be obtained by the duct size and CFM values listed on the drawings. The static pressure for various systems is listed on the mechanical equipment schedule. Refer to the SMACNA standards for the correct duct construction based on the velocities and static pressures involved.
 - C. Sealing of Duct Work: All supply and return duct work from mechanical units, all exhaust duct work and all outside air duct work shall have a high pressure Class A seal per SMACNA.
 - D. Alumiflex type duct will not be permitted. All ducts are to be rigid galvanized sheet metal.
 - E. Exposed round ductwork shall be equal to United McGill Round Uni-Light spiral duct, manufactured from G 60 galvanized sheet steel meeting ASTM A-527-71 (lock forming quality). The duct and fittings shall be assembled with United Uni-Ramp joints, using sheet metal screws.
 - F. All ductwork exposed on roofs must be dog house design to prevent ponding.
 - G. Ductwork fittings, transitions, and hangers exposed to view shall be painted. Provide primer and final coat on all exposed to view ductwork. The color of the final coat of paint shall be selected by the Architect.

- H. All fittings shall be standard design fittings of the same manufacturer as the duct. Branch takeoffs shall be set at 45 degrees to the trunk duct in the direction of the air flow, with factory made fittings. All reductions in duct size shall be made in factory fabricated reducing fittings. Elbows with heel taps are not acceptable.
- I. All factory fabricated fittings and joints must be joined using sheet metal screws and duct sealing compound. Ducts made up with sealer shall have a minimum of 2" overlap and sealed with duct sealing compound applied to both parts for the full length of the overlap.
- J. Concealed and exposed to view fume exhaust ducts shall be 16-gauge 316 stainless steel duct and fittings. All seams and connections shall be welded. All exposed to view fume exhaust ductwork, fittings, transitions, and hangers shall be painted. Provide primer and final coat of paint on all ductwork, fittings, transitions, and hangers. The color of the final coat of paint shall be selected by the Architect or Owner's District's Representative.
- K. Clothes dryer exhaust ducts to be constructed of galvanized steel duct. Clothes dryer exhaust ducts shall not have fasteners or other projections into the air stream.

2.2 FLEXIBLE DUCT

- A. Flexible duct shall only be permitted in concealed tee bar ceilings and at the end of duct runouts to diffusers or grills. No flex duct shall be exposed to view. The maximum flex length shall be 7 feet.
- B. Provide flexible connections at inlet and discharge connections of fans and air handling equipment to prevent mechanical noises from being transmitted to connecting ductwork.
- C. Acceptable manufacturers are Vent fabrics, Inc and Duro Dyne MFG. UL listed, fire-retardant, Flexible Duct Connector, Metal Fab® 3x3x3 Grip Loc MBX333 (#10159) or equal, to NFPA 90A and crimped into metal edging strip.
 - 1. Ventglas shall be used for flexible duct connections when not exposed to the weather.
 - 2. Ventlon shall be used for flexible duct connections exposed to the weather.
- D. Flexible ducts shall be installed in as straight a manner as possible. Avoid bends with inside radius of less than one duct diameter. Cut ducts to length required, rather than using bends to take up slack.
- E. Flexible duct shall comply with the Class I requirements of the NFPA Bulletin No. 90-A with a flame spread rating 25 or less and smoke developed rating not higher than 50.
- F. All flexible ducts shall be insulated unless otherwise specified. Insulation shall be 1" thick (min.) fiberglass with "R" value at 75 degrees F.
- G. Acoustical Flexible Ductwork Flexible duct in sound sensitive spaces shall be UL 181 Class 1 acoustical flexible duct or equal of Casco Silentflex II or AP (R or F) by JP Lamborn Co. Duct shall be factory made and consist of an interior liner that is sound transparent. Interior liner material to be spun nylon or similar spun-bonded, nonwoven fabric. Interior liner shall not be air or watertight. Acoustic insertion loss shall not be less than 3 dB per foot of straight duct at 500 hertz based on 6-inch duct at 2,500 feet per minute.

2.3 ROUND DUCT TAKE-OFF FITTINGS

A. Take-off fittings for all rigid round ducts shall be at 45-degree angles to the main duct or use bellmouth fitting. Provide quadrant damper at duct take-off fitting unless otherwise specified.

2.4 DUCT SEALANT

- A. Acceptable manufacturer is Chicago Mastic Corp. and Sealing System by Hardcast, Inc.
- B. Duct sealer shall be a mineral impregnated fiberglass or metal-to-metal air pressure sealant that is flexible and self-curing.
- C. Sealant shall be fire resistive when dry.

PART 3 - EXECUTION

- 3.1 GENERAL
 - A. Ductwork construction and installation including sheet metal gauges, reinforcement, joint sealing, air leakage and details not specifically shown on the drawings shall be in accordance with SMACNA Publication "HVAC Duct Construction Standards Meal and Flexible" Second Edition and SMACNA Publication "Seismic Restraint Manual: Guidelines for mechanical systems 2nd Edition, 1998".
 - B. Use Ductmate Duct Connection System for all transverse joints in ducts.
 - C. Seal seams, joints, duct connections, elbow gores with Hardcast high pressure Class A SMACNA sealant.
 - D. Radius elbows shall have a centerline radius equal to 1¹/₂ times the duct width. Square throats will not be permitted on radius elbows. Square elbows shall have double thick turning vanes. Job fabricated turning vanes will not be accepted without prior acceptance.
 - E. Provide all necessary dampers as required for proper adjustment and control of air distribution. All dampers shall have rigid bearings and locking quadrants that allow no rattling. All damper rods shall be marked to indicate the relative position of the damper blade with respect to the rod. Install fire dampers in accordance with their UL listing and the manufacturers recommendations.
 - F. All grilles, registers, and diffusers shall be set flush and true to the wall or ceilings to prevent air leakage around the edges. Provide plaster frames for all outlets in plaster or gypsum board.
 - G. Provide 1" angle collars for all exposed ducts passing through roofs, ceilings, floors and walls. Anchor collars in position after installation is complete.
 - H. At all places where inside of duct will be visible through return air grilles, louvers, etc., paint normally visible inside portion of duct with flat black paint.
 - I. Install hinged doors on ductwork and housing to provide access to all parts of every automatic damper, fire damper and all other items requiring maintenance or inspection.
 - J. Transitions in ductwork, in changing shapes and sizes, shall be made with angles not exceeding 15 degrees wherever possible. Maximum divergence upstream of equipment shall be 30 degrees and maximum convergence downstream shall be 45 degrees.
 - K. Where horizontal ducts pass through walls and vertical ducts pass through roof or floors, supporting angles shall be rigidly attached to ducts and to the wall, roof or floor. Angles shall be galvanized and of approved sizes to properly support the ductwork. The supporting angles shall be placed on at least two sides of the duct.

- L. Where horizontal ducts pass through walls and vertical ducts pass through roof or floors, the openings shall be tightly sealed off so as to provide an air and sound tight seal between duct and opening.
- M. Contractor shall not provide holes in the duct systems for the installation of hangers, conduits, etc. Coordinate work of all other trades so this will not be necessary.
- N. Ensure that interior of ducting is kept clean during building construction. Install plastic film over exposed duct openings as soon as ducts are installed.
- O. Locate duct with sufficient space around equipment to allow normal operating and maintenance activities.
- P. All supply air, return air, outside air and exhaust air ductwork joints and seams to be sealed through their entirety with high pressure Class A SMACNA duct sealant.
- Q. Complete metal ducts within themselves with no single partition between ducts. Where width of duct exceeds 18 inches, cross break for rigidity. Open corners are not acceptable.
- R. Lap metal ducts in direction of air flow. Hammer down edges and slips to leave smooth duct interior.
- S. Construct tees, bends and elbows with radius of not less than 1½ times width of duct on centerline. Where not possible and where rectangular elbows are used, provide approved type airfoil turning vanes.
- T. Clothes dryer exhaust ducts shall be fabricated with no screws or other penetrations into the air stream.

3.2 FLEXIBLE DUCTWORK

A. Connect flexible ducts to metal ducts with metal draw bands plus sheet metal screws. Use crimp joints with bead for joining round duct sizes with crimp in direction of airflow.

3.3 FLEXIBLE CONNECTIONS

A. Provide flexible connections at inlet and discharge connections of fans and air handling equipment to prevent mechanical noises from being transmitted to connecting ductwork. Align sheet metal duct with fan or fan casing opening in all three dimensions prior to installation of flexible connection, so that duct opening nearly coincides and are almost equally spaced from one another all around. Do not install flexible connection until above requirements are met. Fans or fan casings and ducts shall be able to move 1" in any direction relative to each other without short-circuiting metal to metal or stretching taut the flexible connection.

END OF SECTION

23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

- 1.1 Section Includes
 - A. Backdraft and pressure relief dampers.
 - B. Barometric relief dampers.
 - C. Manual volume dampers.
 - D. Control dampers.
 - E. Fire dampers.
 - F. Ceiling radiation dampers.
 - G. Smoke dampers.
 - H. Combination fire and smoke dampers.
 - I. Flange connectors.
 - J. Duct silencers.
 - K. Turning vanes.
 - L. Remote damper operators.
 - M. Duct-mounted access doors.
 - N. Flexible connectors.
 - O. Flexible ducts.
 - P. Duct accessory hardware.
- 1.2 Submittals
 - A. Product Data: For each type of product indicated.
 - 1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.
 - B. Shop Drawings.
- 1.3 Quality Assurance
 - A. Installation Standards
 - 1. NFPA 90A.
 - 2. NFPA 90B.
 - 3. SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
 - 4. California Mechanical Code.

PART 2 - PRODUCTS

- 2.1 Provide airfoil blade dampers for applications over 1500 fpm.
- 2.2 Backdraft and Pressure Relief Dampers: Multiple blade, parallel action, gravity balanced with return springs.
- 2.3 Gravity backdraft dampers shall be fabricated multi blade, parallel action, gravity balanced backdraft dampers of galvanized steel or extruded aluminum, with center pivoted blades linked together; with sealed edges, steel ball bearings, and plated steel pivot pin.
- 2.4 Barometric Relief Dampers: Horizontal or vertical mounting; multiple blade, parallel action, gravity balanced with return springs.
- 2.5 Manual Volume Dampers: Multiple and single blade, parallel- and opposed-blade design, with linkage outside airstream.
 - A. Standard, steel, manual volume dampers.
 - B. Standard, aluminum, manual volume dampers.
 - C. Low-leak, steel, manual volume dampers.
 - D. Low-leak, aluminum, manual volume dampers.
 - E. Acceptable manufacturer are Penn Ventilator Co., Metal Form Manufacturing Co. and Durodyne MFG.
 - F. Provide tight close-off dampers at locations indicated on drawings or as needed for control of the air distribution system.
 - G. Dampers shall have air loss (leakage), when closed, less than 1% of the full flow rate (based on approach velocity of 2,000 fpm) with a pressure differential across damper 4" static pressure or less.
 - H. Construction shall be of No. 22 gauge galvanized blades.
- 2.6 All control rods for volume dampers shall be continuous throughout blade and duct work. Provide locking quadrants and bronze bushings.
- 2.7 Control Dampers: Parallel or Opposed-blade design; galvanized-steel, stainless-steel, or aluminum frame and blades.
- 2.8 Fire Dampers: Static and dynamic, replaceable electric heat-responsive device.
- 2.9 Ceiling Radiation Dampers: Replaceable heat-responsive device.
- 2.10 Smoke Dampers
 - A. Multiple-blade type Curtain type with blades outside airstream except when located behind grille, where blades may be inside airstream.
- B. Leakage: Class II.
- 2.11 Combination Fire and Smoke Dampers: Static and dynamic, replaceable electric heatresponsive device.
 - A. Acceptable manufacturers are Pottorff, Ruskin, Air Balance Inc. or Greenheck.
 - B. Provide combination fire/smoke dampers where shown on the drawings.
 - C. WALL AND CONCRETE FLOOR INSTALLATIONS
 - 1. TYPE 1: SMOKE CLOSURE "MOTOR", FIRE CLOSURE "FUSIBLE LINK"
 - a. Combination fire/smoke dampers will be louver bladed type. Dampers must be tested and listed under both UL 555 and UL 555S. Units must be factory-supplied assemblies that consist of damper, sleeve and 1-cycle/year actuator. Dampers must have a minimum class II leakage and dynamic closure rating under UL 555S. Provide units as power-open unless otherwise noted. Actuators to have a min. operating temperature of 350° F. Seals should be metal-to-metal without the use of synthetic gasket. Fusible links shall be rated for 212° F, unless otherwise noted. Install in accordance with manufacture's installation instructions provided with units. Provide suitable access for inspection and servicing of each damper. Provide integrated CSFM listed duct smoke detector model 2151 or DH-100 AC/DC.
 - Motor actuators must be by ISO 9000 recognized control manufacturer and certified by ETL laboratories for 1-year continuous power applications such as Invensys, Siemens and Honeywell. Inexpensive stall motors will not be accepted.
 - Provide units with dual position indicator switches for remote annunciation. Pottorff model FSD 142, CSFM No. 3225-0368:110 & 3230-368: 111.
 - 2. TYPE 2: FIRE/SMOKE CLOSURE "MOTOR W/ BIMETAL LINKS"
 - a. Combination fire/smoke dampers will be louver bladed type. Dampers must be tested and listed under both UL 555 and UL 555S. Units must be factory-supplied assemblies that consist of damper, sleeve and 1 cycle/year actuator. Dampers must have a minimum class II leakage and dynamic closure rating under UL 555S. Provide units as power-open unless otherwise noted. Actuators to have a minimum operating temperature of 350° F. Seals should be metal to metal without the use of synthetic gasket. Dual temperature thermal switches (DRS-30) rated for 212° F & 350° F, unless otherwise noted. Install in accordance with manufacture's installation instructions provided with units. Provide suitable access for inspection and servicing of each damper. Provide integrated CSFM listed duct smoke detector model 2151 or DH-100 AC/DC.
 - b. Motor actuators must be by ISO 9000 recognized control manufacturer and certified by ETL laboratories for 1-year continuous power applications such as Invensys, Siemens and Honeywell. Inexpensive stall motors will not be accepted. Dual temperature thermal switches shall be equipped with auxiliary contacts for remote annunciation. Pottorff model FSD 142, CSFM No. 3225-0368:110 & 3230-368: 111.
 - D. FOR CORRIDOR CEILING APPLICATIONS

- 1. Dampers shall be of similar construction to those above except, in tunnel corridor construction where the ceiling construction is similar to that of the wall provide dampers that have been specifically tested and listed for horizontal mounting as corridor dampers under UL 555 and 5555. Pottorff model FSD 172, CSFM No. 3225-0368:110 & 3230-0368:111.
- 2. Dampers that are installed in corridor ceilings where the construction is (floor/ceiling or roof/ceiling assemblies) that require radiation protection will be radiation dampers that have been tested and listed under both UL 555 and UL 555S. The dampers will have a minimum class II leakage rating. The dampers will be activated by a bimetal, electric link that responds to a signal from a smoke detector, and shall require manual reset. Pottorff model 5680/5660FG, CSFM No. 3225-0368:006 & 3230-0368:106.
 - a. Each combination fire/smoke damper shall meet all requirements specified for fire dampers and additionally shall include an operating shaft which, when rotated 90 degrees, causes damper to operate between closed and open. Operating shaft and damper combination shall be suitable for linking to an operation by any standard low voltage electric damper operator having sufficient torque characteristics.
 - b. Install a duct smoke detector and provide control wiring and conduit for each combination fire/smoke damper per California Building Code requirements.
- 2.12 Duct Silencers: Factory fabricated and tested, round or rectangular.
- A. Acceptable Manufacturer: Vibro-Acoustics as Basis of Design or equal by Industrial Acoustics Co. (IAC).
- B. Materials and Construction
 - 1. Outer Casing Construction: Outer casings of rectangular duct silencers shall be made of 22 gauge galvanized steel in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge. Casings shall be lock-formed and sealed to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the job site.
 - 2. Interior Construction: Interior construction for rectangular duct silencers shall be made of not less than 26-gauge galvanized perforated steel. All perforated steel shall be adequately stiffened to insure flatness and form. All spot welds shall be painted.
 - 3. Sound Absorbing Fill Material: Fill material shall be of inorganic glass fiber of a density sufficient to obtain the specified acoustic performance. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly. Media shall be bacteria and fungus resistant. It shall be resilient such that it will not crumble or break. It shall conform to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel.
 - 4. Combustion Rating: Filler shall not be less than the following when tested in accordance with ASTM-E-84, NFPA Standard 255 or UL No.723. Flamespread Classification 15. Smoke Development Rating 50.
- 2.13 Turning Vanes: Double-blade, galvanized sheet steel.

- A. Acceptable manufacturers are Tuttle & Bailey, Barber-Colman and Aero/Dyne.
- B. Turning vanes shall be double-walled and formed to assure that any point on one blade is equidistant from the same point on an adjacent blade.
- 2.14 Duct-Mounted Access Doors: Double wall, rectangular, galvanized sheet steel with insulation.
 - A. Acceptable manufacturers are Vent fabrics, Inc., C. E. Sparrow Co. and Elmdor MFG.
 - B. Access panels in sheet metal work shall consist of three one-piece stampings: the doorframe, the door itself and the pan. Space between door and pan shall be filled with 1" thick insulation. The door shall be hung with loose pin hinges.
 - C. Access panel sizes shall be as follows unless otherwise specified on drawings:

Size of Duct to be		Metal Gauges of:		
Accessed	Panel Size	Frame	Door	Pan
6" - 8"	6" x 8"	24	26	28
10" - 12"	10" x 12"	22	24	28
12" - 16"	12" x 16"	20	24	28
18" and over	16" x 24"	20	22	28

D. Access doors shall be fabricated in accordance with the details in the SMACNA Duct Construction Standards. Latches and hinges shall be equal to Ventlok of appropriate type and size.

PART 3 - EXECUTION

3.1 Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

3.2 ACCESS DOORS

- A. Provide access doors as specified for inspection and cleaning before and after coils, at fire dampers, at smoke dampers, at volume dampers, and elsewhere as indicated or as required. Review locations prior to fabrication.
- B. Locate access doors for easy access. Doors should be located above accessible ceilings, whenever possible. Where access is required above gypsum board ceilings, coordinate location of access panel with Contractor. Coordinate location of access doors with other trades such that conduit and pipe does not prevent or interfere with access to ductwork.

3.3 FIRE DAMPERS

- A. Provide fire dampers at locations shown, where ducts and outlets pass through fire rated components where ducts enter and leave all duct shafts serving more than one floor, and where required by authorities having jurisdiction.
- B. Fire dampers shall be complete with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings, and hinges.
- C. Install fire dampers in accordance with California Mechanical Code 1997 and California form Building Code 1998 requirements, manufacturer's recommendations and State Fire Marshal recommendations.

3.4 FIRE/SMOKE DAMPERS

- A. Install fire/smoke dampers in accordance with California Mechanical Code 1997 and California Building Code 1998 requirements, manufacturer's recommendations and State Fire Marshal recommendations.
- B. Provide a smoke detector up stream of the fire/smoke dampers that will upon detection of smoke close the fire/smoke damper.
- C. Provide control wiring and conduit from smoke detector to fire/smoke damper.

3.5 DUCT SILENCERS

- A. Install where shown on Drawings in accordance with the manufacturer's recommendations to obtain the published acoustical and air flow performance.
- B. Duct silencer acoustical and aerodynamic performance shall be determined in accordance with the latest edition of ASTM Standard E477 Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers. All tests shall be conducted by a laboratory that is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) to conduct the test. Where test data is obtained in the manufacturer's laboratory, the facility shall be available for inspection and witnessed testing by the architect, mechanical engineer and acoustical consultant in order to verify compliance with the latest revision of ASTM Standard E477. The architect or project acoustical consultant shall be the final arbiter in determining compliance.
- C. The manufacturer shall supply certified test data for each scheduled silencer. The data shall include dynamic insertion loss, generated noise and pressure drop for forward or reverse flow, matching the project's air distribution system requirement. All ratings shall be conducted in the same facility and shall utilize the same silencer.
- D. Test facilities and test reports shall be open to inspection upon request from the Engineer. Silencer performance must have been substantiated by laboratory testing according to ASTM E477-96 and so certified when submitted for approval. The aero-acoustic laboratory must be NVLAP accredited for the ASTM E477-96 test standard. A copy of the accreditation certificate must be included with the submittals. Data from non-NVLAP accredited test facilities will not be accepted.
- E. Acoustical and Aerodynamic Performance:
 - 1. All silencer ratings shall be determined in a duct-to-reverberant room test facility that provides for airflow in both directions through the test silencer in accordance with the ASTM E-477-96 test standard. The test set-up, procedure and facility shall eliminate all

effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption.

- 2. Silencer pressure drops shall not exceed those listed in the silencer schedule. Silencer pressure drop measurements shall be made in accordance with the ASTM E-477-96 test standard. Tests shall be conducted and reported on the identical units for which acoustical data is presented.
- F. Sound trap baffles should be oriented so as to be parallel to the plane of the turn if the sound trap is located in a position less than 3 duct diameters in distance from the elbow. The duct diameter shall be based upon the maximum duct cross sectional dimension of the sound trap.
- G. If the sound trap is located greater than 3 duct diameters away from an elbow, the orientation is not critical.
- H. With the exception of elbow silencers, locate no rectangular sound attenuators within one duct diameter from elbows, fan suction or discharge openings, takeoffs, etc. unless indicated on the drawings.

23 37 00 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

- 1.1 Section Includes
 - A. Diffusers, registers and grilles.

PART 2 - PRODUCTS

- 2.1 Acceptable manufacturers are Krueger, Titus or Carnes.
- 2.2 All units must be factory finished. Provide white color finish. Unit ratings shall be approved by ADC.
- 2.3 Supply Air Distribution Provide the sizes listed below unless otherwise noted on the drawings.
 - A. Supply Diffuser 24" X 24" Lay in Tee-Bar and Modular Core Type. Exposed blades with 4 modular cores that can be removed and repositioned to provide one-way to four-way blow pattern. Square neck type. Krueger Model Number 1240 Series with frame style 23. Cores shall be put in four-way blow pattern unless otherwise noted. Include square to round transition for duct connection. Standard white color.

CFM	FACE SIZE	NECK SIZE
0 - 100	24" X 24"	6″ x 6"
101 - 175	24" X 24"	8" X 8"
176 - 250	24" X 24"	10" X 10"
251 - 400	24" X 24"	12" X 12"
401 - 500	24" X 24"	14" X 14"
501 - 700	24" X 24"	16" X 16"
701 - 850	24" X 24"	18" X 18"

B. Supply Diffuser - 24" X 24" Surface Mounted and Modular Core Type. Exposed blades with 4 modular cores that can be removed and repositioned to provide one-way to four-way blow pattern. Square neck type. Krueger Model Number 1240 Series with frame style 22. Cores shall be put in four-way blow pattern unless otherwise noted. Include square to round transition for duct connection. Standard white color.

CFM	FACE SIZE	NECK SIZE
0 - 100	11" X 11"	6″ x 6"
101 - 175	13" X 13"	8" X 8"
176 - 250	15" X 15"	10" X 10"
251 - 400	17" X 17"	12" X 12"
401 - 500	19" X 19"	14" X 14"
501 - 700	21" X 21"	16" X 16"
701 - 850	23" X 23"	18" X 18"

Supply Grill - Surface Mounted Sidewall Type Diffuser, Krueger Model Number 5880H.
Extruded aluminum with double deflection. Include transition from duct size to diffuser size.
2 way blow. Standard white color.

CFM	FACE SIZE	NECK SIZE
0 - 75	11 3/4" X 5 3/4"	10" X 4"
76 - 150	11 3/4" X 7 3/4"	10" X 6"
151 - 175	13 3/4" X 7 3/4"	12" X 6"
176 - 225	15 3/4" X 7 3/4"	14" X 6"
226 - 350	19 3/4" X 9 3/4"	18" X 8"
351 - 600	21 3/4" x 11 3/4"	20" X 10"

- 2.4 Return Air Distribution Provide the sizes listed below unless otherwise noted on the drawings.
 - A. Return Grill 24" X 24" Perforated lay in Tee-Bar type, Krueger Model Number 6290 with frame style 23. Concealed hinges. Include square to round transition for duct connection. Standard white color.

<u>CFM</u>	FACE SIZE	NECK SIZE
0 - 100	24" X 24"	6″ x 6"
101 - 175	24" X 24"	8" X 8"
176 - 250	24" X 24"	12" X 12"
401 - 500	24" X 24"	14" X 14"
501 - 700	24" X 24"	16" X 16"
701 - 850	24" X 24"	18" X 18"

B. Return Grill - Surface mounted type, Krueger Model Number 6290 with frame style 22. Concealed hinges. Include square to round transition for duct connection. Standard white color.

<u>CFM</u>	FACE SIZE	NECK SIZE
0 - 100	13" X 13"	6 x 6"
101 - 180	15" X 15"	8" X 8"
181 - 225	16" X 16"	9" X 9"
226 - 280	17" X 17"	10" X 10"
281 - 400	19" X 19"	12" X 12"
401 - 600	22" X 22"	15" X 15"
601 - 800	25" X 25"	18" X 18"

C. Return Grill - Surface Mounted Sidewall Type Return Grill, Krueger Model Number S580H. Extruded aluminum with 3/4" centers. Include transition from duct size to grill size. 35-degree angle blades. Standard white color.

CFM	FACE SIZE	NECK SIZE
0 - 100	11 3/4" X 7 3/4"	10" X 6"
101 - 150	13 3/4" X 7 3/4"	12" X 6"
151 - 200	19 3/4" X 7 3/4"	18" X 6"
201 - 350	19 3/4" X 11 3/4"	18" X 10"
351 - 450	19 3/4" X 13 3/4"	18" X 12"
451 - 600	25 3/4" x 13 3/4"	24" X 12"

D. Exhaust Grills shall be the same model and size as return grills.

PART 3 - EXECUTION

- 3.1 Air flow tests and sound level measurement shall be made in accordance with applicable ADC equipment test codes and ASHRAE standards. Manufacturer shall certify catalogued performances and ensure correct application of air outlet types.
- 3.2 Positions indicated are approximate only. Check location of supply, return and exhaust grilles and make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement. See architectural reflected ceiling plans and interior elevations for additional information.

23 40 00 - HVAC AIR CLEANING DEVICES

PART 1 - GENERAL

- 1.1 Section Includes
 - A. Air Filters

PART 2 - PRODUCTS

- 2.1 Acceptable manufacturers are Farr Co. or American Air Filter.
- 2.2 Air filters for rooftop HVAC and HV units, fan coils or furnace units shall be equal to Farr 30/30 2" medium efficiency pleated, disposable type filters.
- 2.3 Each filter shall consist of a non-woven cotton fabric media support grid and enclosing frame. Provide Farr Holding Frames factory fabricated of 16 gauge galvanized steel and be equipped with gaskets and four heavy-duty positive sealing fasteners. Each fastener shall be capable of withstanding 25 lbs. pressure without deflection. They shall be capable of being attached or removed without the use of tools. Filters shall be capable of being installed or removed without any movement of equipment or duct work.
- 2.4 Filters shall have a composite fire hazard rating as tested by ASTM E-84, NFPA 255, or UL 723 not to exceed 25 flame spread and 50 smoke developed. Materials labeled accordingly.
- 2.5 Air Filters shall be a California State Fire Marshal approved and listed type. Preformed filters having combustible framing shall be tested as a complete assembly. Air filters in all occupancies shall be Class 2 or better (as shown in the State Fire Marshal Listing). Air filters shall be accessible for cleaning or replacement.
- 2.6 Filters shall conform to ASHRAE 90A-1980 and NFPA 90.

PART 3 - EXECUTION

- 3.1 Provide two sets of air filters for each HVAC, HV and fan coil unit.
 - A. The first set of air filters shall be installed during construction and used during the air balance portion of the project.
 - B. The second set of air filters shall be installed after the air balance portion of the project is finished and prior to the mechanical final punch list site visit.

23 80 00 - DECENTRALIZED HVAC EQUIPMENT

PART 1 - GENERAL

- 1.1 Section Includes
 - A. Rooftop package units
 - B. Fan coil units
 - C. Condensing units
 - D. Exhaust Fans
- 1.2 Related sections:
 - All units that provide heat and/or air conditioning shall be equipped for and shall interface with DDC (Direct Digital Controls) controls systems. See 23 09 23 – DIRECT-DIGITAL CONTROL SYSTEMS FOR HVAC.

PART 2 - PRODUCTS

- 2.1 ROOFTOP PACKAGE UNITS
 - A. Acceptable manufacturers for HVAC units are Carrier or Trane.
 - B. Acceptable manufacturers for heat and ventilation units are Renzor or Sterling.
 - C. Provide full perimeter spring vibration isolation rails or neoprene pads for rooftop package HVAC and Heat and Vent equipment as called for on the mechanical schedule. Provide seismic motion restraints as required by California Mechanical and Building Codes.
 - D. Provide a minimum of 16-gauge custom pitched roof curb for each rooftop unit. The roof curb shall be a single type pitched curb with the slope of the roof curb field measured. The roof curb shall be supported by roof structural support members. Align the roof curb with these support members. The roof curb shall provide a level surface for the installation of the rooftop unit.
 - E. The casing shall be constructed of coated steel meeting SMACNA or ASHRAE Standards. Internal insulation shall meet the requirements of NFPA Bulletin 90-A and UL 181.

2.2 FAN COIL UNITS

- A. Acceptable manufacturers are Carrier or Trane.
- B. Provide factory assembled and tested fan coil unit of draw-through blow-through design with insulated casing, blower, motor, coils, drain pan and accessories indicated. Drain pan shall extend below valves and fittings at coil connections.
- C. Casing shall be 16-gauge galvanized steel with 1" insulation, supply and return collars, and access panels as indicated.
- D. Coils shall be copper tubing mechanically expanded in aluminum fins, manual air vent and insulated condensate drain pan under coil and headers. ARI rated capacities.

- E. Blower shall be belt drive.
- F. Motor shall be permanent split capacitor, resilient mounts, with oilers and internal thermal protection. Provide adjustable motor sheave on belt drive units to permit a minimum of 10% field adjustment or fan speed.
- G. Units shall be suspended and provided with neoprene rubber-in-shear vibration isolators and hanger units. Provide seismic motion restraints as required by California Mechanical and Building Codes. This isolation equipment is for the avoidance of excessive noise or vibration in the building due to the operation of equipment, and due to interconnected piping, ductwork and conduit.
- H. Hanger assembly shall accommodate 3/8" maximum diameter threaded hanger rod for units up to 450 lbs. operating weight and 1/2" diameter threaded hanger for the units 450 to 1000 lbs. The required hanger rods shall be furnished by the installer. Hanger brackets shall be mechanically secured to the fan coil unit. All hanger rods shall have double nuts.

2.3 CONDENSING UNITS

- A. Acceptable manufacturer is Carrier or Trane.
- B. Provide 1" thick neoprene pads for the isolation of mechanical equipment. This isolation equipment is for the avoidance of excessive noise or vibration in the building due to the operation of equipment.
- C. Provide seismic motion restraints as required by California Mechanical and Building Codes.

2.4 EXHAUST FANS

- A. Acceptable manufacturers are Greenheck, Cook or Penn. Exhaust fans shall meet AMCA standards.
- B. Provide a custom pitched roof curb for all roof mounted exhaust fans. The roof curb shall be a single type pitched curb with the slope of the roof curb field measured. The roof curb shall be supported by roof structural support members. Align the roof curb with these support members. The roof curb shall provide a level surface for the installation of the roof mounted exhaust fans. Roof mounted exhaust fans and motors shall be designed for outdoor duty.
- C. Provide neoprene rubber-in-shear vibration isolators for all ceiling hung and attic suspended units. Provide seismic motion restraints as required by California Mechanical and Building Codes. This isolation equipment is for the avoidance of excessive noise or vibration in the building due to the operation of equipment, and due to interconnected ductwork and conduit.
- D. Provide and flex connections on exhaust inlet and outlet for the isolation of exhaust fans. These flex connections are for the avoidance of excessive noise or vibration in the building due to the operation of equipment.
- E. The casing shall be constructed of coated steel meeting SMACNA and ASHRAE Standards.

PART 3 - EXECUTION

3.1 HVAC UNITS, HEAT AND VENT UNITS AND EXHAUST FANS

- A. Install equipment in accordance with manufacturer's recommendations, good industry standards and SMACNA Installation Standards for Heating, Air Conditioning and Solar systems.
- B. Provide high-pressure air seal around ducts and units.
- C. Coordinate with other work, including ductwork, floor construction, and electrical work as necessary to interface installation of air handling equipment with other work.
- D. Ensure equipment is wired properly, with rotation in direction indicated and intended for proper performance. If there is no rotation arrow supplied by the manufacturer, install a correct rotation arrow.
- E. Inlet and outlet connections to all equipment shall be made with neoprene coated glass fabric flexible connection not less than four inches full length with one-inch slack. Weather exposed connections shall be same as above except to be hypalon coated in lieu of neoprene.

3.2 ROOFTOP PACKAGE UNITS

- A. The unit manufacturer shall furnish, when requested, certified sound power levels for both discharge sound and casing radiated sound, tested in accordance with ASHRAE Standard 36-72.
- B. Arrangement and configuration as indicated on drawings and as described on the equipment schedule. Condensing section shall be designed for outdoor duty. Performance shall be certified in accordance with Air Conditioning and Refrigeration institute (ARI) Standard for rooftop HVAC units. Fans to be rated by AMCA.
- C. Provide and flex connections on supply and return duct plenums for the isolation of mechanical equipment. These flex connections are for the avoidance of excessive noise or vibration in the building due to the operation of equipment.

3.3 FAN COIL UNITS

A. Provide and flex connections on supply and return duct plenums for the isolation of mechanical equipment. These flex connections are for the avoidance of excessive noise or vibration in the building due to the operation of equipment.

3.4 CONDENSING UNITS

A. Arrangement and configuration as indicated on drawings and as described on the equipment schedule. Condensing units shall be weatherized for outdoor duty. Condensing unit performance shall be certified in accordance with Air Conditioning and Refrigeration institute (ARI) Standards.

3.5 EXHAUST FANS

- A. The exhaust fan's manufacturer shall furnish, when requested, certified sound power levels for both discharge sound and casing radiated sound, tested in accordance with ASHRAE Standard 36-72.
- B. Arrangement and configuration as indicated on drawings and as described on the equipment schedule. Performance shall be certified in accordance with Air Conditioning and Refrigeration Institute (ARI) Standard for rooftop HVAC units. Fans to be rated by AMCA.

DIVISION 26 - ELECTRICAL

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements

26 05 00 – GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This specification shall apply to all phases of Work hereinafter specified, shown on Drawings, or as required to provide a complete installation of electrical systems for this Project. Work required under this specification, is not limited to just the Electrical Drawings refer to Architectural, Structural, Landscape, and Mechanical / Plumbing Drawings, as well as all other drawings applicable to this project, which designate the scope of work to be accomplished. The intent of the Drawings and Specifications is to provide a complete and operable electrical system that includes all documents that are a part of the Contract.
 - 1. Work Included. Furnish labor, material, services and skilled supervision necessary for the construction, erection, installation, connections, testing, and adjustment of all circuits and electrical equipment specified herein, or shown or noted on Drawings, and its delivery to the Owner complete in all respects ready for use.
 - 2. The electrical Work includes installation or connection of certain materials and equipment furnished by others. Verify installation details, installation and rough-in locations from the actual equipment or from the equipment shop drawings.
- B. Electrical Drawings. Electrical Drawings are diagrammatic, and are intended to convey the scope of work, indicating intended general arrangement of equipment, conduit and outlets. Follow Drawings in laying out Work and verify spaces for installation of materials and equipment based on actual dimensions of equipment furnished.

PART 2 - PRODUCTS

- 2.1 General
 - A. Materials and Equipment: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety.
- 2.2 Switchboards / Distribution Boards:
 - A. Provide switchboard with rating, components and features as indicated on the Drawings. All sections shall be constructed of code gauge sheet metal. See drawings for more information. Switchboard and switchboard components shall be as manufactured by Square D or approved equal Cutler Hammer or Siemens.
 - B. Busbars shall be rectangular cross-section with silver-plated joints, full-height in each vertical section with horizontal cross busbars between sections. Bus bracing shall not be less than short-circuit indicated on the Drawings or utility requirements. Provide all lugs suitable for copper conductors. Neutral busbar shall be 100% rated unless otherwise noted on drawings and shall have terminals for all active, spare, or inactive circuits. Ground busbar shall be full length with provisions for future length extension.

2.3 Panelboards - Branch Circuit:

- A. Branch circuit panelboards shall be of the dead front safety type equipped with thermalmagnetic bolt-on type 40 deg C. circuit breakers. Panels shall be minimum 20" wide and 5-3/4" deep unless otherwise noted on plan. All branch circuit panelboards shall be 42 circuit bus provided with main circuit breaker and branch circuit breakers of the rating indicated on the panel schedule. See panel schedules and panel schedule notes on drawings for additional requirements.
- B. Trims shall have doors equipped with flush type combination lock and catch, two milled type keys supplied with each panel. All locks shall be keyed alike and each door shall have a plastic covered directory frame with a typed identification card of all circuit and panel numbers for branch circuit panelboards.
- C. Neutral and Ground bus bars shall be full size, and rectangular in cross section.
- 2.4 Transformers:
 - See drawings for transformer schedule and additional specifications. Transformers shall be Α. self-cooled type with Class H insulation and a temperature rise of 115°C in 40°C ambient under continuous full load conditions, kilovolt ampere ratings shall be as shown on the Drawings. Design, construction, and operational characteristics shall be in accordance with ASA, AIEE, and NEMA standards. All insulating materials shall be in accordance with NEMA ST20-1972 Standards for a 220°C, UL component recognized insulation system. Windings shall be of the fire-resistant type, designed for natural convection cooling through air circulation. Coils with exposed wire shall not be accepted. Core mounting frame and enclosures shall be of the welded and bolted construction, seismic rated, with sufficient mechanical rigidity and strengths to withstand shipping, erection and short circuit stresses. Enclosure shall be suitable for outdoor installation and shall have suitable ventilating openings with rodent-proof screens. Transformers shall be furnished complete with mounting channel and mounting bolts. Enclosures shall be provided with lifting lugs and jacking plates as required. Noise level shall be guaranteed by the manufacturer not to exceed 45 decibels for transformers up to and including 50 KVA, 50 decibels up to and including 112-1/2KVA, 55 decibels up to and including 300KVA as measured by NEMA Standards.
 - B. Each Transformer Must Receive the Following Commercial Tests: Ratio, Polarity, Exciting Current, No-Load Loss, Resistance, Copper Loss, Impedance, Induced and Applied Potential Test. Approval shall be granted unless certified test reports covering commercial tests are made available for each unit with shop drawing submittal.
 - C. Each transformer shall be furnished with a manufacturer's nameplate located on the front of the unit. The nameplate shall be anodized aluminum with the following information etched or stenciled on the face: Voltage, KVA Rating; Phase; dB Rating; tap adjustments and wiring diagrams.
 - 2.5 Lighting Fixtures: See Section 26 51 00 Lighting Fixtures.
- 2.6 Wiring Devices:
 - A. Provide wiring devices indicated per plan. Devices shall be specification grade. Acceptable manufactures are Leviton, Pass & Seymour and Hubbell. Provide all similar devices of same manufacturer, unless indicated otherwise. Final color selection subject to change by architect during submittal review process.

Wiring Devices (Decora)

1.	Convenience Receptacle	#16252- WHITE
2.	Dedicated Receptacle	#16352- WHITE
3.	Isolated Ground Receptacle	#16262-IG- WHITE
4.	G.F.C.I. Receptacle	#6599- WHITE
5.	Single Pole Switch	#5691-2- WHITE
6.	Double Pole Switch	#5692-2- WHITE
7.	Three Way Switch	#5623-2- WHITE
8.	Four Way Switch	#5624-2- WHITE
9.	Pilot Light Switch "On"	#5628-2- WHITE
10.	Pilot Light Switch "Off"	#5631-2- WHITE
11.	Projection Screen Switch	#5657-2- WHITE
12.	Keyed Switch	#1221-2KL-STAINLESS

- B. Receptacles on generator and/or UPS power shall be red.
- C. I.G. receptacle bodies shall be of a basic color specified above with an orange triangle to symbolize isolated ground.
- D. Receptacles located in wood finished areas shall generally be black unless otherwise indicated by the architect. The contractor shall obtain written approval of the architect regarding final receptacle color selection prior to ordering receptacles.
- E. Plate colors shall match device.
- F. The following device plates shall be engraved: key operated switches, switches with Pilot Lights and Switches for the control of motors, heaters and ventilators.
- G. Weatherproof Outlet Covers/Assemblies. All Receptacles identified as weatherproof on the drawings shall be GFCI type and equipped as follows:
 - 1. Subscript WP-A: Recessed wall box, 6" x 6"x 3 ½" deep, with a hinged, lockable, cast aluminum, self-closing, gasket-equipped door. C.W. Cole TL-310 Series with an interior metal plate suitable for a GFCI receptacle in one compartment separated from a second compartment with a metal separation barrier. The second compartment shall have a blank metal plate suitable for field installation of power, AV or communications devices. This compartment shall have a minimum ¾" C.O. with pull string routed from the box to the facility telephone backboard unless otherwise note on the drawings. Provide 1 key minimum per device to the Owner's project manager upon completion of project.
 - 2. Subscript WP-B: Raintight while "in use", one gang GFCI receptacle, key and lockable cover. Taymac 20310 series. Unit shall comply with NEC/CEC article 410-57(b).
 - 3. Subscript WP-C: Weatherproof cover for use with portable tools or equipment, complying with CEC article 410-57(b). Leviton 6196-V or equal by Hubbell.
 - 4. Subscript WP- D: BK Lighting Square Star Style "path Star" with hinged weatherproof cover housing a G.F.C.I. receptacle. Color by Architect. Mount housing to BK Lighting "power pipe" underground junction box. See drawings for additional details.

- 2.7 Motor Controllers / Starters: See drawings for specifications.
- 2.8 Circuit Breakers:
 - A. Provide molded plastic case, air circuit breakers conforming to UL 489. Provide breakers with thermal magnetic trip units, and a common trip bar for two- or three-pole breakers, connected internally to each pole so tripping of one pole will automatically trip all poles of each breaker. Provide breakers of trip-free and trip-indicating bolt-on type, with quick-make, quick-break contacts. Provide single two- or three-pole breaker interchangeability. Provide padlocking device for circuit breakers as shown on the Drawings.
 - B. Ground Fault Interrupting Breakers. Provide where shown molded plastic case, air circuit breakers, similar to above with ground fault circuit interrupt capability, conforming to UL Class A, Group 1.
 - C. Tandem or half-sized circuit breakers are not permitted.
 - D. Series Rated Breakers. UL listed series rated combinations of breakers can be used to obtain panelboard interrupting ratings listed below or shown on Drawings. If series rated breakers are used, panelboards shall be appropriately labeled to indicate the use of series rated breakers. Shop drawing submittal shall include chart of U.L. listed devices which coordinate to provide series rating.
 - E. Circuit breakers shall be standard interrupting construction. Panelboard shall accept standard circuit breakers up to 225 amperes. Provide HACR ratings for all circuit breakers serving motor loads.
 - F. Circuit breaker handle accessories shall provide provisions for locking handle in the on or off position.
 - G. Breakers 100 AMP through 400 AMP frame shall be thermal-magnetic trip with inverse time current characteristics and ground fault protection as indicated on the Drawings. Breakers 225 AMP through 400 AMP shall have continuously adjustable magnetic pick-ups of approximately 5 to 10 times trip rating.
 - H. Breakers 400 AMP frame and above shall be 100% rated and have solid-state trip unit with minimum seven function complete with built-in current transformers. Breakers shall have easily changed trip rating plugs with trip ratings as indicated on the Drawings. Rating plugs shall be interlocked so they are not interchangeable between frames and interlocked such that breaker cannot be latched with rating plug removed. Breaker shall have built-in test points for testing long delay and instantaneous, and ground fault (where shown) functions of the breaker by means of a 120-volt operated test kit. Provide one test kit capable of testing all breakers 400 AMP and above. Solid-state trip shall be with long time rating, long and short time delay, independently adjustable long and short time pick-up, and adjustable instantaneous pick-up.
 - I. Where indicated circuit breakers shall be current limiting and consist of a thermal magnetic circuit breaker and an independently operating limiter section within a molded case. Coordinate current limiting circuit breakers (CLCB) ratings as required to protect electrical system components on the load side of the CLCB to include, but not limited to, protecting automatic transfer switches, panel boards and lighting control panels.
- 2.9 Disconnect Switches:

- A. Non-fusible or fusible, externally operated horsepower-rated, 600V A.C. Provide NEMA 3R, lockable enclosures for all switches located on roof tops, in wet or damp areas and in any area exposed to the elements.
- B. Fusible switches shall be Class "R".
- C. Amperage, Horsepower, Voltage and number of pole per drawings. All of which shall be clearly marked on the switch nameplate.
- D. Provide the Owner's project manager with one spare set of fuses and two sets of fuse clips/fuse for every set of fuses on the project.

2.10 Fuses:

- A. Provide fuses at all locations shown on the Drawings and as required for supplemental protection.
 - 1. Fuses manufactured by Bussman Manufacturing Division, McGraw-Edison Company are specified herein to establish minimum general requirements.
 - 2. All fuses shall be the product of a single manufacturer.
- B. Main and Feeder Protection.
 - 1. Where rating of protective device is greater than 600A, provide Bussman Hi-Cap fuses, Class L, current limiting, having an interrupting rating of 200,000A RMS.
 - 2. Where rating of protective device is 600A or less, provide Bussman Class R fuses, Class RKI current limiting fuses, having an interrupting rating of 200,000A RMS.
- C. Motor Protection.
 - 1. Class RKI Dual-element, current limiting fuses having an interrupting rating of 200,000A RMS.
 - 2. Where rating of protective device is 600A or less, provide Bussman Fusetron Dual-Element fuses, Class RK5, having an interrupting rating of 200,000A RMS.
 - 3. Where fuses feeding motors are indicated but not sized, it shall be the responsibility of the Contractor to coordinate the fuse size with the motor to provide proper motor running protection.
 - 4. When rejection type fuses are specified (Class RK1 or RK5) the fuse holder of all switches (specified in other Sections) shall be suitable for the fuses provided.
- 2.11 Cable Tray: See drawings for specifications.
- 2.12 Power Distribution Units (PDU): See drawings for specifications.
- 2.13 Generator Systems: See drawings for specifications.
- 2.14 Transfer Switches: See drawings for specifications.
- 2.15 Lighting Control Systems: See drawings for specifications.

- 2.16 Dimming Systems: See drawings for specifications.
- 2.17 Fire Alarm System: See drawings for specifications.
- 2.18 Conduit:
 - A. Galvanized Rigid Conduit (GRC) shall be full weight threaded type steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metallizing, or sherardizing process.
 - B. Intermediate Metal Conduit (IMC), shall be hot-dipped galvanized in accordance with UL 1242 and meeting Federal Specification WWC-581 (latest revision).
 - C. Electrical Metallic Tubing (EMT) shall be zinc-coated steel with baked enamel or plastic finish on inside surfaces. EMT shall be dipped in a chromic acid bath to chemically form a corrosion-resistant protective coating of zinc chromate over galvanized surface.
 - D. Flexible metal conduit shall be constructed of aluminum or hot-dipped galvanized steel strips wound spirally with interlocking edges to provide greatest flexibility with maximum strength. Interior surfaces shall be smooth and offer minimum drag to pulling in conductors. Used only as directed by the Engineer.
 - E. Liquid-tight conduit (Seal-Tite) shall be galvanized steel flexible conduit as above except with moisture and oil-proof jacket, pre-cut lengths and factory-installed fittings. For outdoor installations and motor connection.
 - F. Metal Clad (MC) Cable shall be used.
 - G. Nonmetallic Flexible Tubing (ENT) shall not be used.
 - H. Non-Metallic Conduit:
 - 1. Polyvinyl chloride (PVC) rigid conduit, Schedule 40, Type II for underground installation only with solvent welded joints, conforming to Underwriters Laboratories, Inc. (U.L.) requirements, listed for exposed and direct burial application.
 - 2. Conduit and fittings shall be produced by the same manufacturer.
- 2.19 Fittings:
 - A. Condulet type fittings shall be smooth inside and out, taper threaded with integral insulating bushing and of the shapes, sizes and types required to facilitate installation or removal of wires and cables from the conduit and tubing system. These fitting shall be of metal, smooth inside and out, thoroughly galvanized, and sherardized cadmium plated.
 - B. Metallic condulet covers shall have the same finish as the fitting and shall be provided for the opening of each fitting where conductors do not pass through the cover.
 - C. Connector, coupling, locknut, bushings and caps used with rigid conduit shall be steel, threaded and thoroughly galvanized. Bushings shall be insulated.
 - D. EMT fittings, connectors and couplings, shall be steel, zinc or cadmium plated, raintight, threadless, compression or tap-on multiple point, steel locking ring type with insulated throat.
 - E. Flexible steel conduit connectors shall be or malleable iron clamp or squeeze type or steel twist-in type with insulated throat. The finish shall be zinc or cadmium plating.

- F. Die cast, set screw or indenter type fittings are not acceptable.
- G. Conduit unions shall be "Erickson" couplings, or approved equal. The use of running threads will not be permitted.
- 2.20 600 Volt Conductors Wire and Cable:
 - A. All conductors shall be copper.
 - B. Type THHN/THWN thermoplastic, 600 volt, UL approved, dry and wet locations, for conductor sizes up to and including #4 AWG.
 - C. Type XHHW cross-linked synthetic polymer, 600 volt, UL approved, for dry and wet locations, for conductor sizes #2 AWG and above.
 - D. Cross-linked synthetic polymer, XHHW, 600 volts, UL approved, for installation underground, in concrete or masonry.
 - E. Wire and cable shall be new, manufactured not more than six (6) months prior to installation, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on outer covering at regular intervals.
 - F. Wire and cable shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. Each system shall be color-coded and it shall be maintained throughout.
 - G. Systems Conductor Color Coding:
 - 1. Power 208/120V, 3PH, 4W:
 - a. Phase A = Black
 - b. Phase B = Red
 - c. Phase C = Blue
 - d. Neutral = White
 - 2. Power 480/277V, 3PH, 4W:
 - a. Phase A = Brown
 - b. Phase B = Orange
 - c. Phase C = Yellow
 - d. Neutral = White
 - 3. Grounding Conductors: Green
 - 4. Fire Alarm System: As recommended by the manufacturer.
 - H. All color-coding for #8 conductors and above shall be as identified above, utilizing phase tape at each termination.
 - I. No conductors carrying 120 volt or more shall be smaller than #12 AWG.
 - J. Aluminum conductor shall not be used.
 - K. Wire-pulling compounds used as lubricants in installing conductors in raceways shall only be "Polywater J". No oil, grease, graphite, or similar substances may be used. Pulling of No.

1/0 or larger conductors shall be done with an approved cable pull machine. Other methods; e.g. using vehicles, and block and tackle to install conductors are not acceptable.

- 2.21 Junction and Pullboxes:
 - A. For interior dry locations, boxes shall be galvanized one-piece drawn steel, knockout type, with removable, machine screw secured covers.
 - B. For outside, damp or surface locations, boxes shall be heave cast aluminum or cast iron with removable, gasketed, non-ferrous machine screw secured covers.
 - C. All boxes shall be sized for the number and sizes of conductors and conduits entering the box and equipped with plaster rings where required. Each conductor shall be terminated at an insulated, barriered terminal connector and completely identified with an engraved fiber identification marker, Electrovert or Underwriter's Safety Device Company.
- 2.22 Outlet Boxes:
 - A. For fixtures, boxes shall be galvanized, one-piece drawn steel, knockout type equipped with 3/8" fixture studs and plaster rings where required.
 - B. For convenience outlets, wall switches, or other devices, outlet boxes shall be galvanized one-piece drawn steel, knockout type 4" x 4"x 1-1/2" minimum size with plaster rings as required.
 - C. For locations where standard boxes are not suitable due to number and size of conduit to be terminated, special boxes shall be designed to fit space or meet other requirements and submitted for approval.
 - D. For exposure to weather, damp locations, or surface mounting, outlet boxes shall be heavy cast aluminum or cast iron with threaded hubs; covers shall be watertight with gaskets and non-ferrous screws.
 - E. See drawings for floor box installation notes and specifications on drawings.
- 2.23 Plywood Backboards:
 - A. Where indicated for telephone or communications system terminals or other equipment assemblies, provide backboards of size indicated. Use Douglas Fir Plywood, fire rated, exterior grade, finished one side and prime coat painted on all surfaces with finish coat of gray enamel leaving 1 fire-rating stamp/sheet exposed for inspection. Unless otherwise indicated, use 3/4" thick plywood.
- 2.24 Terminal Cabinets:
 - A. Terminal cabinets shall be fabricated of hot dipped galvanized code gauge sheet metal for flush or surface mounting, complete with barriered sections, a door for each vertically barriered section and sizes as indicated on plan. Doors shall be hinged and lockable. Locks shall be keyed to match the branch circuit panelboards. Terminal cabinet trims shall match the branch circuit panels.
 - B. Provide each terminal cabinet with a full size plywood backboard and terminal blocks (minimum 25% or 12 spare terminal blocks). All wires terminating on the terminal blocks shall be identified with an engraved fiber tag.

- C. Terminal cabinets shall be installed complete with full-length skirts of the same construction and finish as the terminal cabinet.
- D. Where mounted outdoors, terminal cabinets shall be NEMA 3R, weatherproof complete with gaskets and required sealant to prevent moisture from entering the terminal cabinet.
- 2.25 Painting:
 - A. Terminal cabinets, panels, junction boxes, pull boxes, etc., and conduit installed outdoors and in public view shall be painted with colors selected by the Architect to match the subject exterior surface. Refer to painting section of the specifications for additional requirements.
- 2.26 Seismic Design and Anchoring of Electrical Equipment:
 - A. Seismic Protection Criteria: All Electrical and Mechanical machinery installations provided, as part of this contract located in any Seismic Risk Zone of the Uniform Building Code Seismic Risk Map shall be protected from earthquakes in accordance with the Uniform Building Code and, as applicable, the state and local building codes and regulations. Protection criteria for these zones shall be a Horizontal Force Factor as prescribed by the CBC multiplied by the machinery weight considered passing through the machinery center of gravity in any horizontal direction. Unless vibration isolation is required to protect machinery against unacceptable structure transmitted noise and/or vibration, machinery shall be protected from earthquakes by rigid structurally sound attachment to the load supporting structure. The force factor and anchorage shall be determined by calculations performed and submitted to the Architect by a registered California professional engineer (civil or structural) hired by the contractor. The Contractor shall be responsible for the design of seismic restraint systems for all pieces of equipment weighing over 100 pounds including but not limited to the following:
 - 1. Switchgear
 - 2. Conduits/Conduit support trapezes
 - 3. Transformers
 - 4. Panels
 - 5. Light Fixtures
 - 6. UPS, PDU and Generator Equipment
 - 7. Cable Tray and Bus Duct
- B. Seismic protection, labor, materials and design shall be included in the Contract sum.
- 2.27 Trenching and Backfilling: Contractor shall be responsible for trenching and backfilling. Refer to Trenching and Backfilling section of the specifications for complete requirements.
- 2.28 Portable Assistive Listening System: A complete Williams PPA-VPE with 014 microphone shall be furnished to meet the ADA requirements for hard-of-hearing at Drama Classroom 252. Furnish R7 receivers in numbers equal to 4% of the seating or a minimum or four. The system shall be integrated into the any existing sound reinforcement system. The transmitter shall be portable with built-in antenna that can be adjusted as required for total coverage of seating area.

PART 3 - EXECUTION

- 3.1 Installation of Conduit and Outlet Boxes:
 - A. All conduit except as hereinafter specified, installed in concrete or masonry, or damp or hazardous location, or subject to mechanical injury shall be heavy wall, threaded, galvanized rigid steel conduit (GRC).
 - B. Exposed conduit not subject to abuse or damage and conduit installed in concrete and masonry shall be galvanized rigid steel conduit (GRC), or intermediate metal conduit (IMC).
 - C. Rigid conduit or PVC conduit may be installed under floor slabs, under concrete sidewalls and as noted on the Drawings. Rigid conduit installed under slabs shall be 1" trade size minimum and shall be wrapped with 20 mil. polyvinyl chloride plastic tape. PVC conduit shall be minimum 1" diameter.
 - D. Flexible steel conduit shall only be permitted to be used at light fixture outlets and connections to vibrating electrical equipment. All flexible steel conduit runs shall be less than 6'-0". All outdoor installation shall be made using liquid-tight flex with approved fittings. Include a separate insulated green ground conductor sized per NEC in each conduit. Other uses of flexible conduit shall be as approved by the Engineer.
 - E. Flexible liquidtight conduit shall be installed in lieu of the flexible steel; where required by the, NEC, in damp and wet location, where exposed to weather, in refrigerated area (65°F or less), and/or between seismic joints. All rotating electrical equipment shall be supplied with flexible, liquid-tight conduit with appropriate slack and shall not exceed thirty-six (36) inches. Include a separate insulated green ground conductor sized per NEC in each conduit. Other uses of liquidtight flexible conduit shall be as approved by the Engineer.
 - F. Intermediate metal conduit (IMC), is approved for use in all locations as approved for GRC or EMT and in accordance with Article 345 of NEC and UL Information card #DYBY.
 - G. All conduit installed in the dry walls or ceilings of the building shall be steel tube (EMT), Galvanized Rigid Steel (GRC), or Intermediate Metal Conduit (IMC). Flexible conduit shall not be used in lieu of EMT, IMC or rigid conduit except as noted herein.
 - H. Conduit shall be run so as not to interfere with other piping fixtures or equipment.
 - I. The ends of all conduit shall be cut square, carefully reamed out to full size and shall be shouldered in fitting.
 - J. No running threads will be permitted in locations exposed to the weather, in concrete or underground. Special union fittings shall be used in these locations.
 - K. Underground conduit shall be, unless otherwise indicated, Schedule 40 PVC (polyvinyl chloride) complete with a minimum three (3") inch, (2,000 LB) concrete envelope, (2") inch minimum separation between conduits, installed at depth of not less than 24" below grade. Conduit separation shall be maintained using plastic spacers located at 10'-0" intervals. Where power and communication/signal conduits are run in a common trench a (12") inch minimum separation shall be maintained between power and communication/signal conduits. Where underground conduit passes under a building slab, concrete encasement may not be required, contact the Engineer for direction. Include a separate insulated green ground conductor sized per NEC in each conduit.
 - L. All underground or imbedded conduits shall be 3/4" minimum trade size for steel and for PVC.

- M. Where underground conduit runs stub-up, conduit shall transition to GRC underground. The contractor shall use GRC elbows and GRC risers wrapped in 20 mil. PVC tape for stub-ups.
- N. PVC conduit shall not be run in walls.
- O. Where underground conduit runs penetrate floor slab, conduit shall terminate flush with the floor slab using a flush coupling. Exception: communications conduits stubbed through the slab shall be terminated 4" above the finished floor and be equipped with a removable conduit plug and pull rope. Tie off pull rope to conduit plug. Plug by Jackmoon or Equal.
- P. Where conductors enter a raceway in a cabinet, pull box, junction box, or auxiliary gutter, the conductors shall be protected by a plastic bushing type fitting providing a smoothly rounded insulating surface.
- Q. Where conduit extends through roof to equipment on roof area, this Contractor shall provide 24 gauge galvanized sheet metal flashing cones with 4" flanges on roof surface. This flashing shall be delivered to the roofing contractor for installation. The actual location of all such roof penetrations and outlet shall be verified by the Contractor.
- R. All conduit underground, in masonry and concrete and where concealed under floor slabs shall have joints painted with thread compound prior to makeup.
- S. All conduit shall be supported at intervals not less than 6'-0" and within 12" from any outlet and at each side of bends and elbows. Conduit supports shall be galvanized, heavy stamped, two-hole conduit clamp properly secured.
- T. Where conduit racks are used the rack shall consist of two piece conduit clamps attached to galvanized steel slotted channels, properly secured via threaded rods attached directly to the building structure.
- U. Nail-in conduit supports will not be allowed. One-piece setscrew type conduit clamps or perforated iron for supporting conduit will not be permitted.
- V. Seismic Conduit Support:
 - 1. All conduit shall be supported in such a manner that it is securely attached to the structure of the building. Attachment is to be capable of supporting the tributary weight of conduit and contents in any direction. Maximum spacing of support and braces are to be as follows:

CONDUIT SIZE	MAXIMUM SPACING	
1/2" to 3"	6'-0"	
3-1/2" to 4"	8'-0"	

- W. All conduit runs shall be installed parallel or perpendicular to walls, structural members, or intersection of vertical planes and ceilings. Field made bends and offset shall be avoided where possible. Crushed or deformed raceway shall not be installed.
- X. Open knockouts in outlet boxes only where required for inserting conduit.
- Y. Locate wall outlet of the same type at same level in all rooms, except where otherwise noted.
- Z. Outlet boxes on metal studs shall be attached to metal hangers, or bolted to studs; on wood studs attachment shall be with wood screws, nails not acceptable.

- AA. Recess boxes shall not be mounted back-to-back in any wall; minimum offset shall be 24 inches.
- BB. Junction Boxes that do not contain any device(s) shall be located in storage rooms, electrical closets, or above accessible ceilings, not in hard lid ceilings or other forms of inaccessible ceilings. Place boxes which must be exposed to public view in a location approved by the Owner's Project Manager. Provide covers or plates to match adjacent surfaces as approved by the Owner's Project manager.
- CC. Surface mounted panels secured to stud walls shall be secured to wall using 1/2" x 3" screws into steel backing plate as detailed by the Architect.
- DD. Sleeves shall be installed where conduit passes through masonry or concrete walls and shall be 24 gauge galvanized steel no more that 1/2" greater in diameter than the outside diameter of the conduit. When located in non-rated structures, caulk conduit sleeve with stone wool and waterproof below grade. When located in fire rated structures, provide U.L. listed fire stopping system as required.
- EE. All boxes shall be covered with outlet box protector, Appleton SB-CK. Keep dirt from entering box or panels. If dirt does get in, it shall be removed prior to pulling wires.
- FF. All boxes installed outdoors shall be suitable for outdoor installations, gasketed, screw cover and painted as directed by the Architect with weatherproof paint to match building.
- GG. All conduit entries to outdoor mounted panels, cabinets, boxes, etc., shall be made using Myers "SCRU-TITE" hubs Series ST.
- HH. All spare conduits shall have a 200 LB test polypropylene pull line left in place for future use in all runs tagged with a plastic tag at terminating end indicating the location of the opposite end of the conduit.
- II. Where conduit is underground, under slabs or grade, exposed to the weather, or in wet locations, make joints liquid tight and gas tight.
- JJ. All multiple conduit runs within suspended ceilings shall be suspended from building structure by means of unistrut hangers/raccks, Conduit shall not be allowed to lay on ceiling or be supported from ceiling suspension wires or other suspension system. Support conduit to structure above suspended ceilings 8" minimum above ceiling to allow removal of ceiling tile. Maintain two inch clearance above recessed light fixtures
- KK. All exposed conduits shall be painted to match the finish of the wall or ceiling to which it is supported.
- LL. Where conduits or wireways cross expansion joint, provide approved expansion or deflection fittings, or combinations of fittings, which allow deflection in all directions. For seismic joints provide liquidtight flex.
- MM. Seal all conduits where termination is subject to moisture or where conduit penetrates exterior wall, floor or roof, in refrigerated areas, classified (hazardous areas) and as indicated on the drawings.
- NN. Except as otherwise indicated on the Drawings, bends in conduit 2 inches or larger for underground conduit shall have a radius or curvature of the inner edge, equal to not less than ten (10) times the internal diameter of the conduit. For the serving utilities, make large radius bends to meet their requirements.

- OO. Provide nylon or a 1/8-inch O.D. polyethylene rope, rated at 250 pounds tensile strength, in all conduits more than 5 feet in length left empty for future use. Not less than 5 feet of rope shall be left at each end of the conduit.
- PP. Tag all empty conduits at each accessible end with a permanent tag identifying the purpose of the conduit and the location of the other end. In wet, corrosive outdoor or underground locations, use brass, bronze, or copper 16 gauge tags or lead tags secured to conduit ends with #16 or larger galvanized wire. Inscribe on the tags, with steel punch dies, clear and complete identifying information.
- QQ. Underground conduits, which terminate inside building(s) below grade, or which slope so that water might flow into building(s), shall be sealed at termination after installation of conductors. Install plugs or caps in spare (empty) conduits. Provide 4% slope to outside the building where possible to drain the water away from the building.
- 3.2 Installation of 600-Volt Conductors:
 - A. All electrical wire, including signal circuits, shall be installed in conduit.
 - B. All circuits and feeder wires for all systems shall be continuous from switch to terminal or farthest outlet. No joints shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.
 - 1. Utilize preinsulated connectors, 3M Company "Scotchlok," or Ideal Industries, Inc. "Super Nut," for splices and taps in conductors No. 10 AWG and smaller.
 - 2. Tape all splices and joints, exclusive of preinsulated connectors, with vinyl plastic tape manufactured by 3M Company, St. Paul, Minnesota. Use sufficient tape to secure insulation strength equal to that of conductors joined.
 - C. All underground splices must be encapsulated and resin filled and rated submessible.
 - D. Thoroughly clean all conduit and wire-ways and see that all parts are perfectly dry before pulling any wires. No joint shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.
 - E. Install UL approved fixture wire from all lighting fixture lamp sockets into fixture outlet or junction box.
 - F. For 20 ampere branch circuit wiring, increase No. 12 conductors to No. 10 for 120 volt circuits longer than 100 feet and for 277 volt circuits longer than 150 feet.
 - G. Conductor Support. Provide conductor supports as required by codes and recommended by cable manufacturer. Where required, provide cable supports in vertical conduits and provide lower end of conduit with a ventilator.
- 3.3 Joints in 600-Volt Conductors:
 - A. Joints in 600-volt conductors smaller than No. 4 AWG shall be made with Scotchlok spring type connectors. Wires No 4 AWG and larger shall be joined together with approved type of pressure connector and taped with #33 3M tape, three (3) layers minimum to provide insulation not less than that of conductor. Connections to switch or busbar shall be made with one-piece copper lugs. Splicing of all 600 volt or less in-line connections #2 AWG through 350 Kcmil shall be made with 3M brand PST connector.
- 3.4 Grounding:

- A. Provide grounding for entire electric installation as shown on plans, as listed herein and as required by applicable codes. Included as requiring grounding are:
 - 1. Conduit, Raceways and Cable Trays.
 - 2. Neutral or identified conductors of interior wiring system.
 - 3. Panelboards and Switchboards.
 - 4. Non-current carrying metal parts of fixed equipment.
 - 5. Telephone distribution equipment.
 - 6. UPS, PDU, ATS and Generator Systems
 - 7. Raised Flooring
 - 8. Antennas
- B. Furnish and install required number of 3/4" x 10' copper clad ground rods to meet specified resistance, all required grounding wires, conduit and clamps. The size of the grounding conductors shall be not less than that set forth in the latest edition of the California Code of Regulations, Title 24, State of California and NEC, unless otherwise indicated. Rods shall be installed such that at least 10 feet of length is in contact with the soil. Where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from vertical or shall be buried in a trench that is at least 2.5 feet deep. The upper end of the electrode shall be flush with or below ground level unless the aboveground end and the grounding electrode conductor attachments are protected against physical damage. Unless otherwise noted, connection to the grounding electrode conductor may be by compression type or exothermic process connector. Mechanical connectors shall not be used.
- C. Grounding System Connection:
 - 1. Compression connectors shall be unplated copper, manufactured by Burndy, or approved equal, designed specifically for the intended connection.
 - 2. Exothermic weld-type connectors shall be 'Cadweld' manufactured by Erico Products, or approved equal, designed specifically for the intended connection.
 - 3. Mechanical connectors shall not be used.
- D. Isolated Ground Receptacles shall have an insulated ground wire connected between the receptacle and the panelboard isolated ground bus. Unless otherwise noted, this ground wire shall not be grounded at any other point, and shall be distinguished from other ground wires by a continuous yellow stripe.
- E. Provide separate green equipment ground conductor in all electrical raceways, to effectively ground all fixtures, panels, controls, motors, disconnect switches, exterior lighting standards, and noncurrent carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, busses, etc., for this purpose. Connect the equipment ground to the building system ground. Use the same size equipment ground conductors as phase conductors, up through No. 10 AWG. Use CEC Table 250-95 for conductor size with phase conductors No. 8 and larger, if not shown on the Drawings.
- F. Clean the contact surfaces of all ground connections prior to making connections.
- G. Ductwork. Provide a flexible ground strap, No. 6 AWG equivalent, at each flexible duct connection at each air handler, exhaust fan, and supply fan, and install to preclude vibration.

- H. Motors. Connect the ground conductor to the conduit with an approved grounding bushing, and to the metal frame with a bolted solderless lug. Bolts, screws and washers shall be bronze or cadmium plated steel.
- I. Building grounding system resistance to ground shall not exceed 25 ohm.
- 3.5 Power Supplies to all Mechanical Equipment Including Plumbing, Heating and Air Conditioning Units;
 - A. An electric power supply, including conduit, any necessary junction and/or outlet boxes and conductors and connection shall be furnished and installed by this Contractor for each item or mechanical equipment.
 - B. Power supplies to individual items of equipment shall be terminated in a suitable outlet or junction box adjacent to the respective item of equipment, or a junction box provided by the manufacturer or the equipment and directed by the Mechanical Contractor. Allow sufficient lengths of conductor at each location to permit connection to the individual equipment without breaking the wire run.
 - C. The location of all conduit terminations to the equipment is approximate. The exact location of these conduit terminations shall be located and installed as directed by the Mechanical Contractor.
 - D. Provide power supplies to all mechanical equipment, including but not limited to, equipment furnished and installed by Owner or Contractor such as heating and air conditioning equipment. The installation shall produce a complete operable system.
 - E. Unless otherwise noted, this Contractor shall furnish and install all conduit, boxes, wires, etc., for line voltage wiring and low voltage wiring.
 - F. It is the Contractor's responsibility to verify with the Drawings of other trades regarding the extent of his responsibility for mechanical equipment. The bid must include a sum sufficient to cover the cost of the installation.
 - G. Power supplies shall be terminated in a suitable outlet or junction box adjacent to the respective item of equipment.
 - H. The location of all power supply connection and/or terminations to the mechanical equipment is approximate. The exact locations of these terminations shall be verified with other trades during construction.
- 3.6 Prefabricated Equipment: Installation of all prefabricated items and equipment shall conform to the requirements of the manufacturer's specifications and installation instruction pamphlets. Where code requirements affect installation of materials and equipment, the more stringent requirements, code or manufacturer's instructions and/or specifications, shall govern the work.

26 05 05 – SELECTIVE DEMOLITION FOR ELECTRICAL

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 SECTION INCLUDES

- A. Electrical Demolition: Selective removal and disposal of [interior] [and] [exterior] components of existing electrical systems not to remain for completed Project, as indicated on Drawings and specified herein.
 - 1. Demolition Work shall include complete demolition of components and shall include all buried and concealed items, their supports, coverings and adjoining finishes.
 - 2. Demolition shall include terminating and labeling of conductors and removal of circuit overload protection devices and relabeling of panel board circuit diagrams and other such informational aids.
 - 3. Extent of demolition is only indicated generally on Drawings and shall not be considered as the complete scope of demolition necessary. Conditions indicated are based on limited surveys of existing conditions. Deviations and conditions which could not be reasonably anticipated shall be governed by provisions in the Conditions of the Contract pertaining to unforeseen conditions.
- B. Electrical Components to be Demolished:
 - 1. Lighting fixtures: ceiling-mounted, as indicated on Drawings.
 - 2. Power outlets and related conductors, including devices, outlet boxes and as indicated on Drawings.
 - 3. Fire, signaling devices, and related conductors, as indicated on Drawings.
- C. Electrical Demolition due to Reconfiguration of Electrical Systems: Removal, disposal and reconfiguration of electrical components in order to keep existing systems operable, due to the following.
 - 1. Removal of partitions, walls, floors, ceilings and roofs.
 - 2. Penetrations through partitions, walls, floors, ceilings and roofs.
- D. Electrical Demolition to Eliminate Interferences: Removal disposal and reconfiguration of electrical components in order to eliminate conflicts of existing components to remain, due to the following.
 - 1. Interference with new electrical components provided under this Project.
 - 2. Interference with new, added partitions, walls, floors and ceilings.
 - 3. Interference with access for Work under this Contract, including structural, architectural, plumbing, HVAC and fire protection Work, whether or not indicated on Drawings, as necessary.

- 4. Interference with required clearances between and around components remaining and new components.
- E. Maintenance of Service: Maintain electrical power and signal services in full operation and protect systems against damage and disruption. Provide temporary services around Project area as necessary.
- F. Patching and Refinishing: Restore surfaces damaged due to electrical demolition, if not otherwise indicated or accomplished by Work described elsewhere in the Drawings and Specifications.

PART 2 - PRODUCTS

- 2.1 SALVAGEABLE MATERIALS
 - A. Salvageable Item Removed by Owner: Prior to start of electrical demolition Work, Owner will make reasonable efforts to remove furnishings and equipment not fixed to the building or to utility services.
 - B. Salvageable Items: Ownership of salvageable items shall remain with Owner, unless otherwise indicated.
- 2.2 NON-SALVAGEABLE MATERIALS
 - A. Non-Salvageable Materials: All other materials, equipment, fixtures and debris become the property of the Contractor and shall be removed from the Site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Review of Existing Systems: Review documents and verify against existing conditions immediately prior to starting electrical demolition Work.
 - 1. Confirm locations of disconnects, conductors and outlets. Mark locations of concealed elements on surfaces.
 - 2. Confirm whether circuits are active. Temporarily deactivate circuits as necessary.
- B. Utility Service Disconnection: Disconnect, remove, and cap designated utility services within demolition areas. Mark location of disconnected utilities. Identify and indicate capping locations on project record drawings.

3.2 PROTECTION

- A. Protection: Conduct demolition Work and removal of debris to ensure minimum interference with exit ways, roads, streets, walks, and facilities remaining operational.
- B. Temporary Barriers: Protect existing items which are not indicated to be altered. Erect and maintain weatherproof closures for exterior openings. Erect and maintain temporary partitions or barriers to prevent spread of dust, fumes, noise, and smoke to provide for continued occupancy of facility by Owner.

- C. Dust Control: Use water sprinkling, temporary enclosures, and other approved methods to minimize amount of dust and debris rising and scattering in the air. Comply with governing regulations pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions such as [ice,] staining, flooding, pollution and electrical shock.
- D. Disposal Methods: Use methods which minimize spread of dust and debris. See additional requirements specified in Section 01 73 29 Cutting and Patching.
 - 1. Do not throw materials from windows. Use enclosed chutes which dump directly into disposal containers.
 - 2. Do not transport materials and debris through spaces to remain occupied, unless approved by Owner. When necessary to cross through occupied spaces, provide temporary covers and dust barriers. Provide plywood covers where necessary for wheeled traffic to cross existing flooring.
- E. Protection of Existing Construction: In removal of materials, take care not to damage construction remaining in place, salvageable materials and equipment. Repair or replace existing construction, materials and equipment damaged during demolition, to Owner's satisfaction, at no change in Contract Time and Cost.
- F. Remove all electrical materials completely and neatly, leaving surfaces smooth and ready for new Work. Sawcut where cutting is necessary. See additional requirements specified in Section 01 73 29 Cutting and Patching.
- 3.3 DEMOLITION
 - A. Demolition Equipment: Locate demolition equipment so as not to impose excessive loads to supporting walls, floors, roof or framing.
 - B. Demolition: Proceed with demolition in an orderly and careful manner. Protect existing foundation supporting structural members and finish material to remain. Coordinate activities with Work specified in other Sections.
 - C. Removal: Remove materials to be re-installed or retained in manner to prevent damage. Store and protect materials. Carefully remove, store, and protect for re-installation electrical materials and equipment identified on Drawings.

3.4 DISPOSAL AND CLEAINING

- A. Disposal: Promptly remove from the Site all debris, rubbish, and other materials resulting from demolition operations. Dispose of debris legally. On-site burning or burying of debris will not be permitted.
- B. Salvage: Items of salvageable value shall be delivered to Owner at location at Project site as directed.
- C. Cleaning and Restoration: Clean adjacent finishes, equipment, improvements and other features of dust, dirt, and debris caused by demolition operations. Restore adjacent areas to condition existing prior to start of the Work, unless otherwise indicated.

26 51 00 – LIGHTING FIXTURES

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.
- B. Section 26 05 00 General Electrical Requirements.

1.2 SUMMARY

- A. Provide U.L. listed and labeled lighting fixtures complete with light engines at light outlets indicated on the drawings. Each fixture shall bear the U.L. Label, and shall comply with Code Requirements.
- B. Fixtures are listed and described in the Lighting Fixture Schedule and in the following paragraphs. Fixture catalog numbers are to be used as a guide only and shall be understood to be followed by the words "except as modified by the total fixture description". Provide all accessories, features and adaptations necessary to meet the requirements of the description.
- 1.3 DEFINITIONS
- A. CEC: Latest adopted version of California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.
- 1.4 QUALITY ASSURANCE
 - A. Products shall be UL listed and labeled.
 - B. Comply with CEC.
- 1.5 SUBMITTALS
 - A. Product Data
 - 1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed.
 - 2. Catalog cuts for each fixture including complete photometric data in IES format.
 - 3. Weight and dimensions.
 - 4. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
 - B. Samples: when requested by Architect.
 - C. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:

- 1. Operational procedures for the overall lighting systems including the "Sequence of Operation".
- 2. Test procedures and test results.
- 3. Instruction for the proper operation and maintenance of the lighting system.
- 4. Factory issued technical, installation, and maintenance manuals.
- 5. A replacement parts list complete with part numbers and name, address, and phone number of suppliers used by the Contractor. A spare parts list recommended for purchase by the District shall be included.
- 6. All portions of the material list and shop drawings which are not included in the foregoing.
- 1.6 LAMP REPLACEMENT
 - A. Replace lamps and light engines which burn out after Owner's use or acceptance of the project (or of an area in the case of beneficial occupancy).
 - B. Lamps and light engines which burn out within 120 days.
- 1.7 FIELD REPLACEMENT LIGHT ENGINE
 - A. Integrate LEDs, driver, power supply, thermal management components, and optical mixing components.
- PART 2 PRODUCTS
- 2.1 MANUFACTURERS
 - A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings.
- 2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS
 - A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
 - B. Metal Parts: Free of burrs and sharp corners and edges.
 - C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- 2.3 EXIT SIGNS
 - A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
 - B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger and a self-contained power pack.

- 3. Battery: Sealed, maintenance-free, nickel-cadmium type.
- 4. Charger: Fully automatic, solid-state type with sealed transfer relay.
- 5. Operation: Relay automatically energizes light engine from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects light engine from battery, and battery is automatically recharged and floated on charger.
- 6. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
- 7. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
- 8. Integral Self-Test: Factory-installed electronic device automatically initiates coderequired test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.4 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- B. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes each with single canopy designed to mount a single fixture. Finish same as fixture.
- C. Support Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gauge (2.68 mm).
- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

- 3.1 ACCEPTANCE TESTING
 - A. Complete the testing and documentation requirements of Title 24 Energy Code Acceptance Testing procedures. Complete and sign the Acceptance Testing Forms and submit to District and DSA Inspector (IOR).

3.2 UTILITY DESIGN INCENTIVE PROGRAM

- A. Furnish the Utility Company representative with the itemized, paid proof of purchase/invoice for the purchase and installation of energy efficient equipment.
- B. Assist the Utility in the verification by Utility representative of both the purchase and installation of the energy efficient equipment, including providing the representative access to the Construction Project, at reasonable times, for verification of installation of the equipment.
- C. Provide the Utility with a written request for payment of the Incentives calculated, when the Construction Project is completed and occupied.

3.3 INSTALLATION

A. Lighting fixtures:

- 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
- 2. Install lamps in each luminaire.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, and reinstall.
- C. Remote Mounting of Drivers: Distance between the driver and fixture shall not exceed that recommended by driver manufacturer. Verify, with driver manufacturers, maximum distance between driver and luminaire.
- D. Lay-in Ceiling Lighting Fixtures Supports: Do not use grid as a support element.
 - 1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
 - 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
 - 4. Install at least one independent support rod or wire from structure to a tab on each lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- E. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
 - 4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

3.4 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes.

3.5 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 ADJUSTING
- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
 - 1. Adjust aimable luminaires in the presence of Architect.

26 55 61 – THEATRICAL LIGHTING AND STAGE DIMMING SYSTEM

PART 1 - GENERAL

- 1.1 Related Sections
- A. 26 05 00: General Electrical Requirements.

1.2 Warranty

- A. Note to Design Professional: Require manufacturer's warranties.
- 1.3 Commissioning
 - A. Note to Design Professional: Coordinate and specify commissioning requirements that applies to the specific project if Construction Commissioning is determined as necessary by designated District Representative.

PART 2 - PRODUCTS

- A. Manufactures
 - 1. Electronic Theatre Control (ETC) http://www.etcconnect.com
 - 2. Leviton http://www.leviton.com
 - 3. Or Approved Equal
- B. Dimmer Racks
 - 1. Freestanding dead-front switchboards. Exterior surfaces shall be finished in black powder coat.
 - 2. Racks shall be designed to allow for adjacent or back-to-back mounting. Rear sections of racks behind dimmer modules shall be utilized wireways. Removable conduit panels shall be provided on both top and bottom of racks.
 - 3. Racks shall be designed to operate at 208/120 volts and either single-phase or 3phase power. Removable panels shall be provided on the sides of the rack to allow simple rack- to-rack busing.
 - 4. Racks shall be factory-tested and control modules shall be burned-in at elevated temperatures for a minimum of 24 hours. Racks shall be UL listed and shall have a minimum interrupting capacity of 10,000 amps.
 - 5. Dimmers within racks shall allow for selectable panic operation through external dry contact closures.
- C. Dimmers
 - 1. Plug-in modules shall consist of die-cast aluminum chassis containing one or 2 circuit breakers, solid-state power devices, high-speed processors and 2 filter chokes.

- 2. Dimmer modules shall include toroidal filter chokes to limit objectionable harmonics, radiated radio frequencies, electromagnetic interference on conductors and acoustical noise in load lamp filament. Current rise time shall be measured at 90 degrees conductive angle from 10 percent to 90 percent of output waveform. Rise time of dimmer shall not vary by over 10 percent operating at 25 percent to 100 percent of rated load. Rise time of stage dimmers shall be no less than 350 microseconds. Rise time of house dimmers shall be not less than 800 microseconds.
- 3. Power efficiency of dimming channels shall be at least 95 percent, or 97 percent at full load, depending on rise time of modules.
- 4. Dual dimmer modules shall be Strand 2.4 KW, CD80SV, 72314.
- D. Control modules
 - 1. Control modules shall be plug-in assembly consisting of formed steel chassis, one glass epoxy printed circuit board, and 2 levers for easy tool-free insertion and removal. Control modules shall contain LEDs providing user feedback. Control modules shall be Strand CD 80 SV Series.
 - 2. 2. Provide 48-module racks requiring one control module per rack. Slots shall be provided in racks for fully redundant, on-line backup control modules.
 - 3. 3. Control modules shall accept 2 input control signals of either industry standard DMX512 or Strand AMX protocols. Network interfaces for dimmers and feedback data shall be provided. Control module front panels shall provide RS232 serial ports and hand-held terminal ports.
- E. Control Consoles: Control consoles shall be microprocessor-based lighting control systems. Control consoles shall provide for control of up to 512 dimmers on a maximum of 125 control channels with at least 200 cues. Output shall be user-selectable between digital (CMX) and USITT standard (DMX512) and Strand (AMX).
- F. Entrance Stations: Entrance stations shall be Strand No. 63021 having full on/off functions with LED to indicate on status. Stations shall be wired with 6-conductor, 20AWG, stranded, unshielded cables.
- G. Border lights: Optical train shall consist of medium screw base PAR38 or R40 reflector lamps. Unit may also be provided with general service A-Lamps with Alzak reflectors. Compartments shall accommodate combination filter holders for color gels or 55/8-inch diameter glass roundels.
- H. Plug-In Boxes:
 - 1. Plug-in boxes shall be Strand 9600 Series.
 - 2. Plug-in boxes shall be formed of 18 gauge painted steel with a removable cover plate.
 - 3. Plug-in box shall contain TLG receptacles on 18-inch S-cable pigtails with strain relief fittings.

PART 3 - EXECUTION

3.1 Deliver the operating and servicing manual for stage lighting and dimmer system to the District.

3.2 Training

- A. Instruct the District in the correct operation of system.
- B. Manufacturer of dimming system shall provide an engineering representative on-site, after installation has been completed to instruct District's personnel in the operation and maintenance of system. Instruction time shall not be less than 2 days.

DIVISION 28 - LIFE SAFETY

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements

28 46 00 – FIRE DETECTION AND ALARM

PART 1 - GENERAL

- 1.1 General Conditions
 - A. The Contractor shall furnish all equipment, devices, materials, tools, labor, drawings, permits and all associated documentation necessary for a complete distributed networked fire alarm system, ready for operational turn-over in accordance with the requirements of the NFPA-72, The National Fire Alarm Code, and the Authority Having Jurisdiction. The Contractor shall provide all devices and equipment required by the drawings and specifications. The Contractor may not delete any equipment or devices without submission and approval of a request for information detailing all deletions.

1.2 QUALITY

A. To ensure reliability and complete compatibility, all items of the Fire Alarm System, including control panels, power supplies, as well as all initiating devices and notification appliances, shall be listed by Underwriters Laboratories inc. (UL) and shall bear the "UL" label. The fire alarm control panel equipment shall be U.L. Listed under the UL 864 Standard Control Units and Accessories for Fire Alarm Systems, 9th edition.

1.3 ACCEPTABLE MANUFACTURERS AND DISTRIBUTORS

- A. All references to manufacturer's model numbers and other pertinent information herein is intended to establish the District standard of FCI equipment, performance, function and quality. The system shall be installed by a Platinum Level Distributor. The contractor shall have been in business for a minimum of twenty years. The contractor shall have an office within 30 miles of the project site.
- B. The fire alarm contractor shall supply and install FCI equipment. The fire alarm contractor shall not outsource any equipment, and/or labor.
- C. The equipment, programming and installation shall be provided by an approved Platinum Level engineered systems distributor of FCI, located within San Diego County.
- D. The contractor shall provide a certificate from the manufacturer, for 3 year parts warrantee.
- E. The installing contractor shall provide a 24/7 service department and house spare products in their inventory, for all products used in this specification.
- F. The contractor shall be a UL Certified Installer, FCI factory trained technicians, and shall have a Nicet level 3 technician on site.

1.4 SCOPE

- A. A new intelligent reporting, networked, fully peer-to-peer, microprocessor controlled fire detection system shall be installed in accordance with the specifications and drawings. The existing FCI panel in the admin building shall be replaced with an E3 system including an ILI-MB-E3, an ILI-S-E3, a PM-9, a RPT-E3-UTP, a LCD-E3 and a DACT-E3 in a C size cabinet.
- B. Basic Performance:

- 1. The Network Communications Circuit (NetSOLO) serving the network nodes shall be wired using a single twisted non-shielded two conductor cable or connected using an approved fiber optic cable between nodes in a Class B.
- 2. Signaling Line Circuits (SLC) serving the addressable devices shall be wired Class B.
- 3. Initiation Device Circuits (IDC) serving the non-addressable devices connected to addressable monitor modules shall be wired Class B.
- 4. Notification Appliance Circuits (NAC) serving strobes and speakers shall be wired Class B.
- 5. Transponders shall operate in a peer-to-peer fashion with other panels and transponders in the system.
- 6. All network node communications shall be communicated between panels and transponders on a single pair of copper wires or fiber optic cables.
- 7. All signaling line circuits (SLC) shall reside in the remote Transponders. The SLC modules shall operate in a peer-to-peer fashion with all other panels and transponders in the system. Systems that provide a "Degraded" mode of operation upon loss of the INCC Command Center or a short in the riser shall not be acceptable.

1.5 BASIC SYSTEM FUNCTIONAL OPERATION

- A. When a fire alarm condition is detected and reported by one of the system alarm initiating devices, the following functions shall immediately occur:
 - 1. The System Alarm LED'S shall flash.
 - 2. A local piezo-electric signal in the control panel shall sound at a pulse rate.
 - 3. The 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.
 - 4. The historical log shall record the information associated with the fire alarm control panel condition, along with the time and date of occurrence.
 - 5. 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 STANDARDS

- A. The system shall conform to the latest editions of the following codes and standards:
 - 1. NFPA 72 National Fire Alarm Code 1999
 - 2. NFPA 70 National Electrical Code
 - 3. Americans with Disabilities Act (ADA)
 - 4. NFPA 90A, Installation of Air Conditioning and Ventilating Systems
 - 5. NFPA 101 Life Safety Code
- 1.7 WARRANTY

A. The system shall be installed by a Platinum level distributor. The installing contractor shall warranty the entire installation for 1 year. The manufacturer shall guarantee all system equipment for a period of three (3) years from the date of final acceptance. This does not include existing field devices or wiring.

1.8 INTERFACING WITH RELATED SYSTEMS

A. Coordinate with the appropriate contractors for interfacing to other building systems as required including but not limited to the sprinkler systems and the HVAC systems.

1.9 SUBMITTALS

- A. General
 - 1. Six copies of all submittals and shop drawings shall be submitted to the Architect/Engineer for review.
- B. Equipment Submittals shall contain:
 - 1. A bill of Material that indicates the quantity, model number and description of each of the components of the system.
 - 2. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
- C. Shop Drawings:
 - 1. A cover page indicating the project name and address, the engineered systems distributor's name and other contact information, the installing contractor's name and other contact information and the date of the equipment submittals. Any revised submittals shall reflect the original submittal's date and the revised submittal's date.
 - 2. A separate floor plan for each floor must be provided. If a floor plan must be split using match lines in order to be able to fit on the page, match lines and match line references shall be provided that refer to the sheet number that shows the area on the opposite side of the match line.
 - 3. A title block shall be provided on each sheet and shall include, at a minimum, the project name, the project address, the sheet name, the sheet number, the scale of the drawing, the date of the drawing and any revision dates if applicable.
 - 4. Floor plans shall be prepared in AutoCAD.
 - 5. The floor plans must be prepared to scale (1/8" = 1'0" unless otherwise required by the Architect, Engineer of AHJ). All equipment and device locations shall be shown on the floor plans. The floor plans shall show all wiring information in a point-to-point format. If required by the AHJ, all conduit routing shall be shown.
 - 6. A sheet that details the exterior view and interior view of the annunciator panel(s) and that clearly shows the associated wiring information shall be provided.
 - 7. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
- D. Operation and Maintenance Manuals and As-built Drawings:
 - 1. Within 21 calendar days after the acceptance test, submit two copies of the complete Operating and Maintenance Manuals and As-built Drawings.

- 2. The Operating and Maintenance Manuals shall be similar to the Equipment Submittals but revised to reflect any changes made during the project. In addition, the Operating and Maintenance Manuals shall contain the factory's standard Installation and Operating Instructions.
- 3. The As-built Drawings shall be similar to the Shop Drawings but revised to reflect any changes made during the project.
- E. Software Modifications
 - 1. Provide the services of a Platinum Level FCI factory trained and authorized technician to perform all system software modifications, upgrades or changes.
 - 2. Provide the use of all hardware, software, programming tools and documentation necessary to modify the fire alarm system software 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 modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.
- 1.10 FIRE ALARM SYSTEM FUNCTIONALITY
 - A. Provide a complete, electrically supervised distributed, networked analog/addressable fire alarm and control system, with analog initiating devices.
 - B. Each ILI-MB-E3 node shall incorporate two (2) Signaling Line Circuits (SLC), with the capacity to support up to 99 analog addressable detectors and 98 addressable modules per SLC.
 - C. All Voice, Data, and Fire Fighters phone Riser shall transmit over a single pair of wires or fiber optic cable.
 - D. Each Network Node shall incorporate Boolean control-by event programming including as a minimum AND, OR, NOT, and Timer functions.
 - E. The control panels shall have the capability to accept firmware upgrades via connection with a laptop computer, without the requirement of replacing microchips.
 - F. The network shall be based on a peer to peer token ring technology operating at 625 K baud.
 - G. The network shall include the capability of utilizing twisted pair wiring, a pair of fiber optic cable strands up to 200 microns, or both, to maximize flexibility in system configuration.
 - H. Each network node shall have the capability of being programmed off-line using Windows based software supplied by FCI (Fire Control Instruments). Each node shall also have the capability of being downloaded by connecting the laptop computer into any other node in the system. Systems that require system software to be downloaded to each transponder at each transponder location shall not be acceptable.
 - I. Each network node shall have the capability of being grouped with any number of additional nodes to produce a "Region", allowing that group of nodes to act as one, while retaining the peer-to-peer functionality. Systems utilizing "Master/Slave" configurations shall not be acceptable.

- J. Each network node shall have the capability of annunciating all events within its "Region" or annunciating all events from the entire network, on both the front panel LCD without any additional equipment.
- K. Each SLC network node shall have the capability of having an integral DACT (digital alarm communicator transmitter) that can report events in either its region, or the entire network to a single central station monitoring account.
- L. Each ILI-MB-E3 panel shall have the capability of storing its entire program, and allow the installer to activate only the devices that are installed during construction, without further downloading of the system.
- Each system shall be provided with four (4) levels of password protection with up to sixteen (16) passwords.

PART 2 - PRODUCTS

- 2.1 Intelligent Network INCC Command Center HARWARE
 - A. The Intelligent Network INCC Command Center (INCC) shall supply the user interface including an LCD or Touch screen ¼ VGA display, and Intelligent Loop Interface Modules (ILI-MB-E3). The INCC shall consist of the following units, and components, each of which is described in detail in this section:
 - 1. System Cabinet (B, C or D Size Cabinet) with the associated inner door
 - 2. Power Supply Module (PM-9) with batteries
 - 3. 80 Character LCD Display (LCD-E3)
 - 4. Intelligent Loop Main Board Interface (ILI-MB-E3)
 - 5. Intelligent Loop Supplemental Interface (ILI-S-E3)
 - 6. DACT (DACT-E3)
 - 7. RS-485 Repeater (RPT-E3)
 - 8. (2) Auxiliary Switch Modules (ASM-16)
 - B. System Cabinet
 - 1. The system cabinet shall be either surface or semi-flush mounted with a texture finish and shall consist of a back box, an inner door and a door. The Cabinet shall be available in at least three (3) sizes to best fit the project configuration. The system cabinet houses one or more PM-9 Power Supply Module, a INI-VG Intelligent Network Interface Voice Gateway, one or more ILI-MB-E3 assemblies, and other optional modules listed above. The cabinet shall be of dead-front steel construction with an inner door to conceal any internal circuitry and wiring. A minimum of a 1-inch wiring gutter space shall be provided behind the mounting plate. Wiring shall be terminated on removable terminal blocks to allow field servicing of all modules without disrupting system wiring.
 - C. Power Supply Module (PM-9)
 - 1. The PM-9 power supply shall use the latest technologies to provide power to the INCC and shall incorporate the following features:

- a. Power saving switching technology using no step-down transformers
- b. 9 Amp continuous rated output to supply up to all power necessary under normal and emergency conditions for INCC Command Center Modules
- c. Integral Battery Charger with capacity to charge up to 55 amp-hour batteries while under full load.
- D. Batteries
 - 1. Batteries shall be of sufficient capacity to provide power for the entire system upon loss of normal AC power for a period of twenty-four (24) hours with fifteen (15) minutes of alarm signaling at the end of this twenty four hour period as required by NFPA 72, Local Systems.
- E. LCD Display Module (LCD-E3)
 - 1. The LCD display shall be an 80 character RS-485 based textual annunciator with the capability of being mounted locally or remotely. It provides audible and visual annunciation of all alarms and trouble signals. Dedicated LED's shall be provided for:
 - a. AC Power On (green)
 - b. Alarm (red)
 - c. Supervisory (yellow)
 - d. System Trouble (yellow)
 - e. Power Fault (yellow)
 - f. Ground Fault (yellow)
 - g. System Silenced (yellow)
 - 2. The 80-character alphanumeric display shall provide status of all analog/addressable sensors, monitor and control modules. The display shall be of the liquid crystal type (LCD), clearly visible in the dark and under all light conditions.
 - 3. The panel shall contain four (4) functional keys:
 - a. Alarm Acknowledge
 - b. Trouble Acknowledge
 - c. Signal Silence
 - d. System Reset/Lamp Test
 - 4. The panel shall contain three (3) configuration buttons:
 - a. Menu/Back
 - b. Back Space/Edit
 - c. OK/Enter
 - 5. It shall also have a 12-key telephone style keypad which shall permit selection of functions.
- F. Intelligent Loop Interface (ILI-MB-E3)
 - 1. The system shall be of multiprocessor design to allow maximum flexibility of capabilities and operation. The Intelligent Loop Interface shall be capable of mounting

in a standalone enclosure or integrated with the Intelligent Network INCC Command Center (INCC) described above.

- 2. Field Programmable
 - a. The system shall be capable of being programmed by means of a Field Configuration Program (FCP) allowing programming to be downloaded via portable computer from any node on the network.
- 3. RS-232C Serial Output
 - a. A supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals, accept a downloaded program from a portable computer, or provide 80 column readout of all alarms, troubles, location descriptions, time, date, etc. The communication shall be standard ASCII code operating from 1200 to 115,200 baud rate.
- 4. RS-485 Serial Output
 - a. Each ILI-MB-E3 shall incorporate an RS-485 bus via a ribbon harness for connection of modules inside the same cabinet, and via a four wire quick connector for connection of modules up to 3000 feet from the cabinet. This RS-485 bus shall support up to sixteen (16) ASM-16 auxiliary switch modules, six (6) LCD-E3 main Annunciators and five (5) LCD-7100 annunciators.
- 5. Peer-to-Peer panel configuration.
 - a. All Loop Interface Modules shall incorporate it's own programming, log functions, Central Processor Unit, and control by event (CBE) programming. In the event that any loop becomes disabled, each remaining loop driver shall continue to communicate with the remainder of the network and maintain normal operation. "Degrade" configurations under these conditions are not acceptable.
- 6. Control-by-Event (CBE) Program
 - a. The ILI-MB-E3 shall be capable of programming using Boolean logic including AND, OR, NOT, and TIMING functions to provide complete programming flexibility.
- 7. Alarm Verification
 - a. Smoke detector alarm verification shall be a standard option while allowing other devices (i.e.: manual stations, sprinkler flow, etc.) to create an immediate alarm. This feature shall be selectable for smoke sensors that are installed in environments prone to nuisance or unwanted alarms.
- 8. Alarm Signals
 - a. All alarm signals shall be automatically latched or "locked in" at the control panel until the operated device is returned to normal and the control panel is manually reset. When used for sprinkler flow, the "SIGNAL SILENCE" switch may be bypassed, if required by the AHJ.
- 9. Electrically Supervised
 - a. Each SLC and NAC circuit shall be capable shall be electrically supervised for opens, shorts and ground faults. The occurrence of any fault shall activate the system trouble circuitry but shall not interfere with the proper operation of any other circuit.

- b. A yellow "SYSTEM TROUBLE" LED'S shall light and the system audible sounder shall steadily sound when any trouble is detected in the system. Failure of power, open or short circuits on the SLC or NAC circuits, disarrangement in system wiring, failure of the microprocessor or any identification module, or system ground faults shall activate this trouble circuit. A trouble signal may be acknowledged by operating the "TROUBLE ACKNOWLED'SGE" switch. This shall silence the sounder. If subsequent trouble conditions occur, the trouble circuitry will resound. During an alarm, all trouble signals shall be suppressed with the exception of lighting the yellow "SYSTEM TROUBLE" LED'S.
- 10. Drift Compensation Analog Smoke Sensors
 - a. System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to the effects of component aging or environment (i.e.: dust). Each sensor shall maintain its actual sensitivity under adverse conditions to respond to alarm conditions while ignoring the factors which generally contribute to nuisance alarms. The system trouble circuitry shall activate, display "DIRTY DETECTOR" and "VERY DIRTY DETECTOR" indications and identify the individual unit that requires maintenance.
- 11. Analog Smoke Sensor Test
 - a. System software shall automatically test each analog smoke sensor a minimum of three times daily. The test shall be a recognized functional test of each photocell (analog photoelectric sensors) and ionization chamber (analog ionization sensors) as required annually by NFPA 72. Failure of a sensor shall activate the system trouble circuitry, display a "Test Failed" indication, and identify the individual device that failed.
- 12. Central Station Option
 - a. The fire alarm control panel shall provide an integral Digital Alarm Communicator Transmitter (DACT) for signaling to a Central Station. The DACT shall contain a "Dialer-Runaway" feature preventing unnecessary transmissions as the result of intermittent faults in the system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers. The fire department shall be consulted as to the authorized central station companies serving the municipality. The fire alarm system shall transmit both alarm and trouble signals with the alarm having priority over the trouble signal. The contractor shall be responsible for all installation charges, while the customer shall be responsible for the line lease charges.
- 13. Network Annunciator Option
 - a. Each ILI-MB-E3 and associated display shall provide the option of being configured as a network annunciator. The options for annunciation shall default as a regional annunciator with the capability of selecting global annunciation to provide system wide protection as well as Acknowledge, Silence, and Reset capabilities.
- 14. Redundant History Log
 - a. Each ILI-MB-E3 shall contain a full 4100 event history log supporting local and network functions. In the event that a main processor or network node is lost the entire log shall be accessible at any other Loop Interface board. This shall be demonstrated by removing power from the INCC Command Center followed by

the extraction of the history log from any loop driver location including the INCC Command Center or Transponder.

- 15. LED'S Indicator and Outputs
 - a. Each ILI-MB-E3 Loop Interface shall incorporate as a minimum the following Diagnostic LED'S indicators:
 - b. Power (green)
 - c. Alarm (red)
 - d. Supervisory (yellow)
 - e. General Trouble (yellow)
 - f. Ground Fault (yellow)
 - g. Transmit (green)
 - h. Receive (green)
- 16. Auxiliary Power Outputs
 - a. Each ILI-MB-E3 Loop Interface shall provide the following supply outputs as follows:
 - b. 24 VDC Non-resettable, 1 amp. max., power limited.
 - c. 24 VDC Resettable, 1 amp. max., power limited.
- 17. Microprocessor
 - a. The Loop interface shall incorporate a 32 bit RISC processor. An isolated "watchdog" circuit shall monitor the microprocessor and upon failure shall activate the system trouble circuits on the display. The microprocessor shall access the system program, for all control-by-event (CBE) functions. The system program shall not be lost upon failure of both primary and secondary power. Programming shall supporting Boolean logic including AND, OR, NOT, TIME DELAY functions for maximum flexibility.
- 18. Auto Programming
 - a. The system shall provide means for all SLC devices on any SLC loop to be preprogrammed into the system. Upon activation of auto programming, only the devices that are present will activate. This allows for a system to be commissioned in phases without the need of additional downloads.
- 19. Environmental Drift Compensation
 - a. The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.
- 20. NON-FIRE Alarm Module Reporting
 - a. A non- reporting type ID shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LDC. Activation of a NON-

FIRE point shall activate control by event logic but shall not cause any indication on the control panel.

- 21. One-Man Walk Test
 - a. The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.
 - b. This test feature is simply intended to provide for certain random spot testing of the system and is not intended to comply with the requirements of testing fire alarm systems in accordance with NFPA 72, as it is impossible to test all of the functions and verify things such as annunciation with only one person.
- 22. Signaling Line Circuits
 - a. Each ILI-MB-E3 module shall provide communication with all analog/addressable (initiation/control) devices via two (2) signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. The circuits shall be capable of operating in an NFPA Style 7 configuration when equipped with isolator modules between each module type device and isolator sensor bases. Each circuit shall communicate with a maximum of ninety-nine (99) analog sensors and ninety-eight (99) addressable monitor/control devices. A unique 40 character identifier shall be available for each device. The devices shall be of the Velocity series with the capability to poll 10 devices at a time with a maximum polling time of 2 seconds when both SLC's are fully loaded.
- 23. Notification Appliance Circuits
 - a. Two (2) independent NAC circuits shall be provided on the ILI-MB, polarized and rated at 2 amperes DC per circuit, individually over current protected and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class B, Style Y, or Class A, Style Z.
- 24. Alarm Dry Contacts
 - a. Alarm dry contacts (Form C) shall be provided and shall be rated 2 amps @ 30 VDC (resistive) and shall transfer whenever a system alarm occurs.
- 25. Supervisory Dry Contacts
 - a. Supervisory dry contacts (Form C) shall be provided and shall be rated 2 amps @ 30 VDC (resistive) and shall transfer whenever a system Supervisory condition occurs.
- 26. Trouble Dry Contacts
 - a. Trouble dry contacts (Form C) shall be provided and shall be rated at 2 amps @ 30 VDC (resistive) and shall transfer whenever a system trouble occurs.
- G. Auxiliary Switch Module (ASM-16)

- 1. Each ASM-16 has sixteen (16) programmable push-button switches.
- 2. Each push-button switch has three (3) associated status LED's (red, yellow, green), configurable to indicate any combination of functions.
- 3. Flexible switch configurations to allow flexible set-up of phone, speaker and auxiliary function circuits.
- 4. An insertable label to identify the function of each switch and LED'S combination.
- 5. Specialty modules that only perform one task such as Speaker, Phone, or Auxiliary are not acceptable.
- 6. RPT-E3
 - a. The RPT-E3 provides the capability to communicate with up to 16 ASM-16 modules locally up to 3000 feet from the INCC Command Center.
- H. Network Repeater Module
 - 1. The Intelligent Network Interface shall provide interconnection and protection of remote INCC Command Centers and Transponders. The repeater shall regenerate and condition the token passing, 625 k-baud signal between units. The Repeater shall be available in wire, fiber, or wire/fiber configurations as determined by field conditions.
 - 2. Fiber configurations shall utilize "ST" type connectors and be able to operate with up to 200-micron multi-mode fiber, but optimize for 62.5/125. The interface shall have a jumper to allow selection of ground detection of wiring when used in the wire mode. The interface shall have integral LED's to display current status of the board.
- I. Supplemental Notification Appliance Circuit (SNAC)
 - 1. The SNAC shall be available in two models (SNAC-6 and SNAC-9) offering either up to 6.0 amps (4.0 amps continuous) or 9.0 amps (6.0 amps continuous) of regulated 24-volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60-hour standby.
 - 2. The SNAC shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay.
 - 3. The SNAC shall include an attractive surface mount back box.
 - 4. The SNAC shall include the ability to delay the AC fail delay per 2002 NFPA requirements.
 - 5. The SNAC include power limited circuitry, per UL standards.

2.2 SYSTEM PERIPHERALS

- A. 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 0 to 9) type address switches by using a standard screwdriver to rotate two dials on the device to set the address. Devices which use a binary address set via dipswitch

packages, a handheld device programmer or other special tools for setting the device address are not acceptable.

- 3. Detectors shall be analog and addressable, and shall connect to the fire alarm control panel's Signaling Line Circuits.
- 4. Addressable thermal and smoke detectors shall provide dual (2)status LED's. Both LED's shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LED's 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 LED's can be programmed off via the fire control panel program.
- 5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity can be automatically adjusted by the panel on a time-of-day basis.
- 6. Using software in the INCC Command Center, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 2.
- 7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature.
- 8. The following bases and auxiliary functions shall be available:
 - a. Standard base with remote LED output
 - b. Sounder base rated at 85 DBA minimum.
 - c. Form-C Relay base rated 30VDC, 2.0A
 - d. Isolator base
- 9. 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.
- 10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
- B. Addressable Manual Station (MS-7AF)
 - 1. Manual fire alarm stations shall be non-code, non-break glass type, equipped with key lock so that they may be tested without operating the handle.
 - 2. An operated station shall be visually apparent, as operated, at a minimum distance of 100 feet (30.5 m) from the front or side.
 - 3. Stations must be designed such that after an actual activation, they cannot be restored to normal except by key reset.
 - 4. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

- 5. Manual stations shall be constructed of high impact Lexan, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters one half inch (12.7 mm) in size or larger.
- 6. Addressable manual stations 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.
- C. Intelligent Thermal Detectors
 - 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.
- D. Intelligent Multi Criteria Acclimating Detector (ACS-ACCLIMATE) NOT USED
- E. Intelligent Duct Smoke Detector (ADPF)
 - 1. The in-duct smoke detector housing shall utilize an on-board intelligent photoelectric detector, which provides continuous analog monitoring and alarm verification from the panel.
 - 2. When sufficient smoke is sensed, an alarm signal is initiated, and appropriate action taken to shut down or 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.
 - 3. Duct smoke detectors which are mounted above a ceiling or otherwise obstructed from normal view shall be provided with a remote alarm indicator.
 - 4. Each detector shall be installed in either the supply side or return side duct in accordance with the requirements of the Local applicable mechanical code. Duct detector shall be provided under this section, and installed by the mechanical contractor.
- F. Addressable Dry Contact Monitor Module (AMM-2F)
 - 1. Addressable monitor module 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's.
 - 2. The monitor module shall mount in any standard deep electrical box.
 - 3. The IDC zone shall be suitable for Style B operation.
- G. Addressable Dry Contact Monitor Module (AMM-4F) NOT USED
- H. Addressable Dry Contact Monitor Module (AMM-2IF) NOT USED
- I. Addressable Dry Contact Monitor Module (MMI-10F) NOT USED
- J. Two Wire Detector Monitor Module (AMM-4SF) NOT USED
- K. Two Wire Detector Monitor Module (MMI-6SF) NOT USED
- L. Addressable Control Module (AOM-2SF)
 - 1. Addressable control modules shall be provided to supervise and control the operation of one conventional NAC of compatible, 24 VDC powered, polarized audio/visual

notification appliances or UL Listed polarized relays for fan shutdown and other auxiliary control functions.

- 2. The control module shall mount in a standard 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box, or to a surface mounted back box.
- 3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NAC's may be energized at the same time on the same pair of wires.
- M. Addressable Control Module (MMO-6SF) NOT USED
- N. Addressable Relay Module (AOM-2RF)
 - 1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall have two (2) form C sets of contacts that operate in tandem and are rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NAC's may be energized at the same time on the same pair of wires.
 - 2. The relay module shall mount in a standard 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box, or to a surface mounted back box.
- O. Addressable Relay Module (MMO-6RF) NOT USED
- P. Isolator Module (M500X) NOT USED
- Q. Sprinkler Waterflow Switches (provided and installed by the sprinkler contractor)
 - 1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.
 - 2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.
 - 3. All waterflow switches shall come from a single manufacturer and series.
 - 4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.
 - 5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.
- R. Sprinkler and Standpipe Valve Supervisory Switches (provided and installed by the sprinkler contractor):
 - 1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
 - 2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.
 - 3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the

valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

- 4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4 inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.
- 5. The switch housing shall be finished in red baked enamel.
- 6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
- 7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.
- S. Graphic or Matrix Annunciator (uses ANU-48 serial driver board) NOT USED
- T. LCD Display Annunciator Requirements
 - 1. Furnish and install where shown on the plans a remote serial annunciator, model LCD-7100. The annunciator shall provide an 80-character display, which shall duplicate all information on the basic system display including any network nodes its host panel is annunciating, with the exception of menus. It shall also contain the following function keys: Alarm Acknowledge, Trouble Acknowledge, Signal Silence, System Reset/Lamp Test and System Drill Test.
 - 2. The annunciator shall contain a key lock, which will enable the switches only when placed in the "ON" position, with the exception of the Trouble Acknowledge, which is used to silence the local trouble audible sounder. The annunciator shall also contain the following LED's: Alarm, Supervisory, System Trouble, Power Fault, System Silenced.
 - 3. The annunciator shall mount on a standard three-gang surface or flush electrical box.
 - 4. Each ILI-MB-E3 shall accommodate up to five (5) remote LCD-7100 annunciators which can be located up to 3,000 feet from the control panel.
- U. Audible Evacuation Horns
 - 1. The horn appliances shall be Wheelock Series AS horn and the horn strobe appliances shall be Wheelock Series AS horn Strobes or approved equals. The horn shall be UL Listed under Standard 464 for Audible Signal Appliances and horns equipped with strobes shall be listed under UL Standard 1971 for Emergency Devices for the Hearing-Impaired. In addition, the strobes shall be certified to meet the requirements of FCC Part 15, Class B and shall incorporate low temperature compensation to ensure the lowest possible current consumption.
 - 2. All horns shall use solid-state components and shall provide field selectable operation with volume control and tone control. All models shall have a peak anechoic sound output of 83 dB at 10 feet and an adjustable frequency range of 800 to 1200 Hz. All inputs shall employ terminals that accept #12 to #18 AWG wire sizes.
 - 3. The strobe portion of the appliance shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens. The strobe shall be of low current design. Where Multi- Candela Chime Strobes are specified, the strobe intensity shall have a minimum of four (4) field selectable settings and shall be rated per UL Standard 1971 at: 15/30/75/110cd or 135/185cd for wall mount and 15/30/75/95cd or 115/177cd for

ceiling mount. The selector switch for selecting the candela shall be tamper resistant and not accessible from the front of the appliance. The 1575 candela strobe shall be specified when 15 candela UL Standard 1971 listing with 75 candela on-axis is required (e.g. ADA compliance).

- 4. When synchronization is required, the strobe portion of the appliance shall be compatible with Wheelock's SM, DSM sync modules or FCI's Snac9 Power Supply with built-in Patented Sync Protocol. The strobes shall not drift out of synchronization at any time during operation. If the sync module or Power Supply fails to operate, (i.e., contacts remain closed), the strobe shall revert to a non-synchronized flash rate.
- V. Strobe Devices
 - 1. Strobes shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:
 - a. The maximum pulse duration shall be 2/10 of one second.
 - b. Strobe intensity shall meet the requirements of UL 1971.
 - c. The flash rate shall meet the requirements of UL 1971.
 - d. Strobe candela rating shall be determined by positioning the selector switch on the back of the device.

PART 3 - EXECUTION

- 3.1 INSTALLATION:
 - A. Installation shall be in accordance with the NFPA 72, NEC, local and state codes, as shown on the drawings, and as recommended by Gamewell-FCI.
 - B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
 - C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
 - D. Manual stations shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor measured to the operating handle.
- 3.2 TESTING:
 - A. Provide the service of a competent, factory-trained technician authorized by Gamewell-FCI to technically supervise and participate during the pre-testing and acceptance testing of the system.
 - B. Before energizing the cables and wires, conduct a complete visual inspection of all control panel connections and test wiring for short circuits, ground faults, continuity, and insulation.

- C. Close each sprinkler system control valve and verify proper supervisory alarm at the INCC Command Center.
- D. Verify activation of all flow switches.
- E. Open initiating device circuits and verify that the trouble signal actuates.
- F. Open signaling line circuits and verify that the trouble signal actuates.
- G. Open and short notification appliance circuits and verify that trouble signal actuates.
- H. Ground initiating device circuits and verify response of trouble signals.
- I. Ground signaling line circuits and verify response of trouble signals.
- J. Ground notification appliance circuits and verify response of trouble signals.
- K. Check installation, supervision, and operation of all intelligent smoke detectors.
- L. 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 INCC COMMAND CENTER and the correct activation of the control points.
- M. 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.

3.3 ACCEPTANCE TESTING:

- A. Provide the service of a competent, factory-trained technician authorized by Gamewell-FCI to technically supervise and participate during the pre-testing and acceptance testing of the system.
- B. Before the installation shall be considered completed and acceptable by the AHJ, a complete test using as a minimum, the following scenarios shall be performed and witnessed by a representative approved by the specifying engineer. The monitoring company and/or the fire department must be notified prior to the final test in accordance with local requirements.
- C. The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, and the fire department shall operate every installed device to verify proper operation and correct annunciation at the control panel.
- D. The signaling line circuits and notification appliance circuits shall be opened in at least two
 (2) locations to verify the presence of supervision.
- E. When the testing has been completed to the satisfaction of both the contractors 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.
- F. 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 by the awarding authority.

3.4 INSTRUCTION:

A. Provide instruction for operating the system. Provide (4) two-hour training periods, to be scheduled at the owner's discretion, any time during the three year warranty period. "Hands-on" demonstrations of the operation of all system components and the entire system functions shall be provided.

DIVISION 32 - EXTERIOR IMPROVEMENTS

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements.

32 12 16 – ASPHALT PAVING

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.
 - B. Section 10 14 00 Signage
 - C. Section 32 17 23 Pavement Markings.

1.2 SECTION INCLUDES

- A. Asphaltic concrete paving for vehicular traffic and curbs.
- B. Asphaltic concrete paving for playgrounds and play courts.
- C. Patching and repair of existing asphaltic paving for underground utility Work and where damaged by new construction.
- D. Slurry seal over asphaltic concrete surfaces after completion of construction, to restore and seal surfaces.

1.3 REFERENCES

A. Standard Specifications: Standard Specifications for Public Works Construction ("Green Book"), 1997 Edition, by Joint Cooperative Committee of the Southern California Chapter of the American Public Works Association and the Southern California Districts of the Associated General Contractors of California. Standard Specifications shall be as amended and adopted by the authorities having jurisdiction, including San Diego Regional Supplementary Amendments to the Standard Specifications for Public Works Construction.

1.4 SUBMITTALS

A. Submit mix design(s) for review.

PART 2 - PRODUCTS

- Materials, General: Unless otherwise indicated on the Drawings or specified herein, subbase, aggregate base and asphaltic concrete paving materials shall comply with Section 200
 Rock Materials and Section 203 - Bituminous Materials, in the Standard Specifications.
- 2.2 Sub-Base Material: Existing or imported materials, Select Subbase in accordance with Standard Specifications, Subsection 200-2.6.
- 2.3 Aggregate Base: Crushed Aggregate Base in accordance with Standard Specifications, Subsection 200-2.2.2.

- 2.4 Asphalt Concrete Materials: Standard Specifications, Subsection 203-6.
- 2.5 Slurry Seal Coat: Emulsion-aggregate slurry, Standard Specifications, Subsection 203-5.
- 2.6 Headers and Stakes: 2x6 nominal preservative treated douglas fir, except at curves provide laminated 1x6 nominal preservative treated douglas fir. Use hot dipped galvanized nails only.

PART 3 - EXECUTION

- 3.1 ASPHALT PAVING MIXES
- A. Asphalt Paving Mixes: As referenced in Standard Specifications ("Green Book").
 - 1. Base or underlying courses: Standard Specifications, A-AR-4000 or B-AR-4000.
 - 2. Finish course, vehicle traffic areas: Standard Specifications, C2-AR-4000 (Dense Medium).
 - 3. Finish course, playground areas: Standard Specifications, E-AR-4000 (Extra Fine).
- 3.2 ASPHALTIC CONCRETE PAVING, PATCHING AND REPAIR.
- A. Replace Asphaltic Concrete Paving: Remove existing asphaltic concrete surfacing and underlying base material and replacing removed surfacing and base material with new asphaltic concrete as shown on the Drawings and as specified herein.
 - 1. Exact limits of asphaltic concrete surfacing to be removed and replaced shall be as directed by the Architect.
 - 2. Cut on neat lines with a power-driven saw to minimum depth of 46 mm before removing existing asphaltic concrete paving.
 - 3. Remove surfacing and base without damage to surfacing that is to remain in place. Damage to pavement which is to remain in place shall be repaired to a condition satisfactory to the Architect or damaged pavement shall be removed and replaced with new asphalt concrete if ordered by the Architect. Repairing or removing and replacing pavement damaged outside the indicated limits of pavement shall be at no change in Contract Time and Contract Sum.
 - 4. Removed materials shall be legally disposed of offsite.
 - 5. Material remaining in place, after removing surfacing and base to required depth, shall be graded to plane, watered, and compacted. Finished surface of the remaining material shall not extend above grade indicated on the Drawings.
 - 6. Areas of base material which are low as a result of over excavation shall be filled asphaltic concrete, at no change in Contract Time and Contract Sum.
 - 7. Install new aggregate base and compact new and existing aggregate base as necessary.
 - 8. Place and compact new asphaltic concrete paving as specified elsewhere herein.

- B. Small Area Asphaltic Concrete Placement: Spreading and compacting shall be performed by methods that will produce an asphalt concrete surfacing of uniform smoothness, texture, and density. Use methods and equipment suitable for location, size and configuration of asphaltic concrete paving area.
- C. Crack Repair: Cracks in existing asphalt concrete surfacing shall be prepared and filled with crack sealant and covered with sand.
 - 1. Cracks 6 mm wide and wider in existing asphalt concrete surfacing and shoulders shall be prepared and sealed.
 - 2. Cracks to be filled and adjacent asphalt concrete surfacing shall be cleaned and shall be free of dirt, vegetation, debris and loose sealant. Cleaning shall be done by air blasting. Old sealant which protrudes above the asphalt concrete surfacing shall be completely removed. Routing will not be required.
 - 3. Crack sealant shall be readily handled at ambient temperature, shall be capable of being stored for periods of up to 6 months, shall withstand freeze-thaw cycles and shall contain no volatile organic compounds which may contribute to air pollution. Base material shall remain ductile with aging and provide resiliency under extreme climatic conditions.
 - 4. Immediately following the application of crack sealant material, apply sand on crack sealant material. Sand shall be free from clay or organic material, and 90 percent to 100 percent shall pass a 4.75-mm sieve and not more than 5 percent shall pass a 75-μm sieve. Spread sand uniformly with full coverage of joint sealer.
 - 5. Lightly broom clean completed joint repair to remove loose excessive sand.
 - 6. Within 2 days after application of sealant, sealed cracks that reopen or in which sealant material sags below the surrounding asphalt concrete surfacing shall be resealed.

32 13 13 – CONCRETE PAVING

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS
 - A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
 - B. Section 10 14 00 Signage
 - C. Section 32 17 23 Pavement Markings.

1.2 SECTION INCLUDES

- A. Concrete paving for pedestrian and vehicular traffic.
- B. Portland cement concrete curbs and gutters.
- C. Portland cement concrete sidewalks integral with curbs and gutters.
- D. Repair of portland cement concrete paving.

1.3 REFERENCES

- A. Standard Specifications: Standard Specifications for Public Works Construction ("Green Book"), 1997 Edition, by Joint Cooperative Committee of the Southern California Chapter of the American Public Works Association and the Southern California Districts of the Associated General Contractors of California. Standard Specifications shall be as amended and adopted by the authorities having jurisdiction, including San Diego Regional Supplementary Amendments to the Standard Specifications for Public Works Construction.
- 1.4 SUBMITTALS
 - A. Submit mix design(s) for review.

PART 2 - PRODUCTS

2.1 BASE MATERIALS

- A. Base Material: As specified in Section 02300 Earthwork.
- B. Aggregate Base: Where indicated on the Drawings or, if not indicated, Crushed Aggregate Base in accordance with Standard Specifications, Subsection 200-2.2.

2.2 FORM MATERIALS

- A. Forms Materials: Steel or wood, at Contractor's option.
 - 1. Lumber shall be S4S No. 2 or better Douglas fir. At straight forms, use 2x lumber. At curved forms, provide laminated 1x lumber or plywood.
 - 2. Soil forms are not permitted to form paving work.

- 3. Form materials shall be new. Reuse of forms will not be acceptable.
- B. Formwork: Construct formwork to result in concrete formed the lines, profiles and grades shown on Drawings. Provide adequate bracing in conformance with the general material requirements of Section 03100 Concrete Formwork.

2.3 REINFORCEMENT

- A. Reinforcement, General: As indicated on Drawings and specified following. Off-site Work shall comply with Standard Specifications and Standard Details.
- B. Steel Reinforcing Bars, On-Site Work: ASTM A615, Grade 40 or 60, unless otherwise indicated, deformed billet steel bars, clean and free from rust, scale and coatings that would reduce bond. Unless otherwise indicated on the Drawings, provide minimum No. 3 reinforcing bars.
- C. Dowels: Smooth or deformed steel reinforcing bars, as indicated on the Drawings and to work with dowel sleeves specified below.
- D. Dowel Sleeves: Speed Dowel slip-dowel system, as manufactured by Aztec Concrete Accessories, Inc., Fontana, CA (909/829-2765 or 800/531-3355), or equivalent in accordance with the "or equal" provision specified in Section 01600 Product Requirements.
 - 1. Sleeves shall be two-piece design, with sleeve to slip over smooth or deformed reinforcing bar and base plate to secure sleeve in form.
 - 2. Sleeve materials shall be polypropylene plastic.
- E. Supports for Reinforcement: Wire-bar-type chairs, bolsters, bar supports and spacing devices, complying with CRSI Manual of Standard Practice, for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Provide size and shape as required for strength and support of reinforcement during reinforcement installation and concrete placement.
- F. Tie Wires: 18 gage minimum, black annealed steel.
- G. Reinforcement Fabrication: To required shapes and dimensions, in accordance with requirements specified in Section 03200 Reinforcing Steel, for on-site Work, and in accordance Standard Specifications 201-2 and 303-1.7.3, for off-site Work in public rights-of-way.

2.4 NATURAL COLOR CONCRETE MATERIALS

- A. Concrete Materials, General:
 - 1. Comply with Standard Specifications for site paving.
 - 2. For exterior slabs on grade, such as trash enclosure slab, comply with requirements specified in Division 3 Concrete.
- B. Portland Cement: ASTM C150, Type II, unless sulfate resistant Type is determined to be necessary by sulfate content tests performed by Testing Laboratory after grading Work is completed.
- C. Fine and Coarse Aggregates: ASTM C33.
- D. Select Exposed Aggregate: ASTM C33, proprietary mixture as indicated on the Drawings, from single source and selected from within range offered by supplying quarry.

- E. Curing Compounds for Natural Color Concrete: Non-staining, dissipating resin, conforming to ASTM C 309, Type 1, Class B, translucent, complying with applicable air quality (VOC) regulations.
 - 1. W.R. Meadows Sealtight 1100.
 - 2. L&M Cure R, manufactured by L&M Construction Chemicals, or equal.
- F. Top Surface Set Retarder: For exposed aggregate concrete, provide one of the following or equivalent product of another manufacturer in accordance with the "or equal" provision specified in Section 01600 Product Requirements:
 - 1. True Etch Surface Retarder, manufactured by Burke Group, LLC (The).
 - 2. Concrete Surface Retarders, manufactured by Euclid Chemical Co.
 - 3. Lithotex, manufactured by L. M. Scofield Co.
 - 4. Rugasol-S, manufactured by Sika Corporation.
- G. Water: Clean and not detrimental to concrete.
- 2.5 ACCESSORY MATERIALS
 - A. Form Release Compound: Debond Form Coating, manufactured by L&M Construction Chemicals, or equal.
 - B. Bonding Agent: One of the following, or equal.
 - 1. Everbond, manufactured by L&M Construction Chemicals.
 - 2. Weldcrete, manufactured by Larsen Products Corporation.
 - C. Fast-Setting Grout: Formulated for minimum initial set time of 15 minutes and minimum final set time of 25 minutes at 21 deg C.
 - 1. Commercially prepared and pre-packaged, one of the following, at Contractor's option:
 - a. Magnesium phosphate grout, single-component, water-activated or twocomponent with prepackaged liquid activator.
 - b. Modified high-alumina based grout.
 - c. Hydraulic cement-based grout.
 - 2. Clean, uniformly rounded aggregate filler may be used to extend prepackaged grout. Moisture content of aggregate filler shall no exceed 0.5 percent. Amount of aggregate filler shall not exceed instructions and recommendations of grout manufacturer.
 - D. Expansion Joint Filler, Paving: Deck-O-Foam Expansion Joint Filler manufactured by W.R. Meadows, Inc., or equal, conforming to AASHTO-M-153-84, Type 1 and Type 2, 1/2-inch thick, compatible with joint sealing products.
 - E. Expansion Joint Sealant, Paving: Three-component urethane joint sealant, as specified in Section 07 90 00 Joint Protection, color to match adjacent concrete color.
 - F. Concrete Sealer: HLQ-125 as manufactured by SINAK Corp., San Diego, CA (619/231-1771), or equal, penetrating sealer that interacts with mineral compounds and siliceous materials in portland cement concrete to produce more dense, non-dusting surface.
 - G. curb Drain Penetration Forms: Thru The Curb Drain standard model (no stamping), or equal, size as recommended by manufacturer for drain pipe required.

PART 3 - EXECUTION

3.1 CONCRETE MIXES

- A. Concrete Mix and Delivery Requirements, General: Comply with requirements specified in Section 03300 Cast in Place Concrete.
- B. Concrete Mix for Pedestrian (Sidewalk) Pavements, Natural Color: Standard Specification for Public Works Construction, Section 201-1.1.2 - Class 520-B-2500, with minimum slump of 4-inches, except concrete paving in public rights of way shall be as required authorities having jurisdiction.
- C. Concrete Mix for Trash Enclosure and other Exterior Slabs on Grade, Natural Color: ASTM C94 Ready-Mixed Concrete, Alternative No. 2, minimum 28 day compressive strength as indicated on Drawings or, if not indicated, 3000 psi. Special inspection is not required.

3.2 PORTLAND CEMENT CONCRETE PAVING CONCRETE REPAIR

- A. Cracked Portland Cement Concrete Repair: Where indicated or directed, remove cracked concrete segments completely and dispose of materials legally off-site.
 - 1. Cut out defective concrete using diamond-bladed saw. Cuts shall be at crack control joints or expansion control joints. Cuts shall be neat and regular.
 - 2. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
 - 3. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
 - 4. Install new portland cement concrete matching existing finish, including crack control (score) lines.
- B. Portland Cement Concrete Paving Spall Repair: Cut out and patch spalled concrete.
 - 1. Comply with fast-setting grout manufacturer's instructions and recommendations.
 - 2. Match shape and finish of existing concrete to minimize difference in appearance between patched and existing concrete.
- C. Portland Cement Concrete Grinding:
 - 1. Where indicated or directed, and where offsets are greater than 3/8-inch, grind joints between concrete segments level using diamond-bladed grinders specifically produced for concrete grinding.
 - 2. Grind in longitudinal direction of traveled way, for full width of offsetting concrete.
 - 3. Grinding shall begin and end at lines perpendicular to pavement edges and score lines, as applicable. Comply with Architect's directions for orientation.

32 17 23 – PAVEMENT MARKINGS

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.
 - B. Section 32 12 16 Asphalt Paving.
 - C. Section 32 13 13 Concrete Paving.
- 1.2 SECTION INCLUDES
 - A. Painted traffic and parking control markings.
 - B. Painted markings at playgrounds, hard courts and other exterior locations.
- 1.3 SUBMITTALS
 - A. Submit paint samples of each color specified on the drawings.

PART 2 - PRODUCTS

2.1 PAVEMENT MARKING PAINT

- A. Paint for Traffic Striping and Marking: Epoxy-fortified vinyl/acrylic water-based paint, formulated specifically for marking traffic lines on asphaltic concrete and portland cement concrete paving, and manufactured for application in compliance with California Air Resources Board (CARB) and local air quality authorities, as applicable.
- B. Abrasive Grit: At wheelchair-accessible parking stalls and other locations with large markings, include abrasive grit for non-slip finish.
- C. Colors, General: Provide standard factory-mixed, quick drying and non-bleeding colors.
 - 1. For parking and traffic control markings, conform to Standard Specifications, as amended and adopted by City or County authority having jurisdiction, and State of California, Department of Transportation (CALTRANS) Traffic Manual, Chapter 6, Markings.
 - 2. For wheelchair accessible parking stall markings, painted lines and markings on pavement shall be 4-inches minimum wide and international blue in color, equal to Color No. 15090 according to Federal Standard 595B.
 - 3. For playground and hardcourt markings, provide colors as indicated on the Drawings.

PART 3 - EXECUTION

- 3.1 Application, General: Using proper masking, stencils and application equipment, apply marking paint at rate recommended by paint manufacturer or approximately one gallon per 150 square feet (equivalent to approximately one gallon for 450 lineal feet of 4 inch wide stripe), whichever is greater.
- 3.2 Traffic Striping: Uniform line width, typically 4-inches unless otherwise indicated, with uniform, straight edges without overspray. Provide reflective materials in striping.
- 3.3 Traffic Directional Markings and Accessibility Logo: Provide minimum of two coats paint. Provide reflective material in traffic directional markings if required by authorities having jurisdiction.
- 3.4 Curbs: Paint full vertical face and first 6-inches of horizontal plane at top of curb or combination curb/paving.
- 3.5 Hatching: Provide hatching in parking areas, including accessible parking stalls, as indicated on Contract Drawings.
- 3.6 Stall Marking:
 - A. Standard and compact stall markings: Markings style and widths as indicated on the Drawings.
 - B. Accessible stalls: Markings as indicated on Drawings and in compliance with California Building Code (CBC) Section 1129B.5.
- 3.7 Tactile Warning Lines: At accessible stalls and path of travel, provide tactile warning lines in compliance with California Building Code (CBC) Section 1133B.8.3 and Section 1133B.8.4.
- 3.8 Abrasive Grit: Broadcast abrasive grit onto wet paint at wheelchair accessible stall markings and other locations with pavement markings more than six-inches wide.
- 3.9 Playground and Hardcourt Markings: Provide markings as indicated on the Drawings. Apply paint in two coats, allowing minimum 24 hours curing between coats, with each coat at specified application rate.

DIVISION XX – FORMATTING SAMPLE

The Design Professional must coordinate the technical specifications with the District's Division 00 and 01 requirements

00 00 00 – SAMPLE

PART 4 - GENERAL

- 4.1 SUMMARY
 - A. The general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- 4.2 SECTION INCLUDES
 - A. Second
 - 1. Third
 - a. Fourth
 - 1) Fifth
- PART 5 PRODUCTS

PART 6 - EXECUTION