SPECIFICATIONS

SUPERIOR COURT OF CALIFORNIA
COUNTY OF SAN JOAQUIN

MANTECA BRANCH
SITE AND BUILDING IMPROVEMENTS
315 EAST CENTER STREET
MANTECA, CALIFORNIA

Issue Date: 05-06-2011

Owner:
Judicial Council of California
c/o Administrative Office of the Courts
2860 Gateway Oaks Drive
Sacramento, CA 95833

Phone (916) 643-8009
Fax (916) 263-2342

Architect:

Fraser Seiple Architects
971 Osos Street
San Luis Obispo, CA 93401

Phone (805) 544-6161
Fax (805) 544-6183

FRASER SEIPLE ARCHITECTS

TABLE OF CONTENTS

DIVISION 1 - GENERAL REQUIREMENTS

01 10 00	SUMMARY OF WORK
01 03 00	SPECIAL PROJECT PROCEDURES
01 30 00	SUBMITTAL PROCEDURES
01 40 00	QUALITY CONTROL
01 42 00	REFERENCE STANDARDS
01 50 00	TEMPORARY FACILITIES AND CONTROLS
01 60 00	PRODUCT REQUIREMENTS
01 70 00	CLOSEOUT PROCEDURES
01 71 23	FIELD ENGINEERING

DIVISION 2 - EXISTING CONDITIONS

02 41 00	DEMOLITION

DIVISION 3 - CONCRETE

03 30 00	CAST-IN-PLACE CONCRETE
03 35 00	CONCRETE FLOOR STAINS
03 40 00	ARCHITECTURAL PRECAST CONCRETE
03 60 00	GROUT

DIVISION 4 - MASONRY

04 20 00	CONCRETE UNIT MASONRY

DIVISION 5 - METALS

05 10 00	STRUCTURAL STEEL
05 50 00	METAL FABRICATIONS

DIVISION 6 - WOOD AND PLASTICS

06 10 00 ROUGH CARPENTRY

06 17 00 PREFABRICATED STRUCTURAL WOOD

06 40 00 ARCHITECTURAL WOODWORK

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07 20 00 INSULATION

07 50 00 MEMBRANE ROOFING

07 60 00 FLASHING AND SHEET METAL

07 80 00 FIRE AND SMOKE PROTECTION

07 90 00 JOINT PROTECTION

DIVISION 8 - DOORS AND WINDOWS

08 10 00 METAL DOORS AND FRAMES

08 20 00 WOOD DOORS

08 40 00 STOREFRONT SYSTEM

08 70 00 DOOR HARDWARE

08 80 00 GLAZING

DIVISION 9 - FINISHES

09 20 00 LATH AND PLASTER

09 25 00 GYPSUM DRYWALL

09 51 20 ACOUSTIC CEILING TREATMENTS

09 90 00 PAINTING

DIVISION 10 - SPECIALTIES

10 14 00 SIGNAGE

10 71 13 EXTERIOR SUN CONTROL DEVICES

DIVISION 11 – EQUIPMENT

11 14 00 PEDESTRIAN CONTROL EQUIPMENT

11 19 00 DETENTION EQUIPMENT

DIVISION 21 - FIRE SUPRESSION

21 50 00 COMMON WORK RESULTS FOR FIRE SUPRESSION

DIVISION 22 - PLUMBING

22 05 00 COMMON WORK RESULTS FOR PLUMBING

22 05 29 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

22 07 00 PLUMBING INSULATION

22 11 16 DOMESTIC WATER PIPING

22 11 19 DOMESTIC WATER PIPING SPECIALTIES

22 13 16 SANITARY WASTE AND VENT PIPING

22 13 19 SANITARY WASTE PIPING SPECIALTIES

22 33 00 ELECTRIC DOMESTIC WATER HEATERS

22 40 00 PLUMBING FIXTURES

DIVISION 23 – HEATING, VENTILATION AND AIR CONDITIONING

23 05 00 COMMON WORK RESULTS FOR HVAC

23 05 29 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

23 05 53 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

23 05 93 TESTING, BALANCING, AND ADJUSTING FOR HVAC

23 07 00 HVAC INSULATION

23 23 00 REGRIGERANT PIPING

23 31 13 METAL DUCTS

23 33 00 AIR DUCT ACCESSORIES

23 37 13 DIFFUSERS, REGISTERS AND GRILLES

23 74 33 PACKAGED, OUTDOOR, HEATING AND COOLING MAKE-UP AIR-CONDITIONERS

23 81 26 SPLIT-SYSTEM AIR-CONDITIONERS

DIVISION 26 – ELECTRICAL SYSTEMS

26 05 00 COMMON WORK RESULTS FOR ELECTRICAL

26 05 01 SELECTIVE ELECTRICAL DEMOLITION

26 05 19 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

26 09 23 OCCUPANCY SENSORS

26 27 26 WIRING DEVICES

26 51 00 INTERIOR LIGHTING

26 56 70 LIGHITNG ACCEPTANCE TESTING

DIVISION 31 - EARTHWORK

31 00 00 EARTHWORK

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 10 13 ASPHALTIC CONCRETE PAVING

32 10 15 CONCRETE PAVING AND SITEWORK

32 30 00 SITE IMPROVEMENTS

DIVISION 33 - UTILITIES

33 10 00 WATER UTILITIES

33 30 00 SANITARY SEWER UTILITIES

33 40 00 SITE DRAINAGE

END OF CONTENTS

SECTION 01 10 00
SUMMARY OF THE WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Description of the Work.

B. Applicable codes.

C. Abbreviations and symbols.

D. Definitions.

E. Coordination.

F. Furnished products.

1.02 RELATED SECTIONS

A. Section 01 40 00 - Quality Control.

B. Section 01 60 00 - Product Requirements.

C. Section 02 41 00 - Demolition.

1.03 DESCRIPTION OF WORK

A. "The Work" under this Contract involves improvements and an addition to and existing one-story courthouse building, with related site improvements and off-site public improvements, as described in Working Drawings titles, “Superior Court of California, County of San Joaquin, Manteca Branch Site and Building Improvements, Phase I.” The job site is located at 315 East Center Street, Manteca, California. The Architect's project number is 1007.

B. Where work is shown on the Drawings or described in the Specifications as By Others or Not in Contract (abbreviated "NIC"), "The Work" under this contract includes provision for, accommodation of, and coordination by the Contractor to permit such work to be installed and completed as shown.

1.04 APPLICABLE CODES

A. Current applicable codes shall be adhered to, including but not necessarily limited to the following:

1. 2010 Building Standards Administrative Code, Part 1, Title 24 C.C.R.

2. 2010 California Building Code (CBC), PART 2, TITLE 24 C.C.R.
(2009) International Building Code and 2010 California Amendments)

3. 2010 California Electrical Code (CEC), Part 3, Title 24 C.C.R.
(2008 National Electrical Code And 2010 California Amendments)

4. 2010 California Mechanical Code (CMC) Part 4, Title 24 C.C.R.
(2009 Uniform Mechanical Code And 2010 California Amendments)

5. 2010 California Plumbing Code (CPC), Part 5, Title 24 C.C.R.
(2009 Uniform Plumbing Code and 2010 California Amendments)

6. 2010 California Fire Code, Part 9, Title 23 C.C.R.
(2009 International Fire Code and 2010 California Amendments)

7. 2010 California Green Building Standards Code (Calgreen), Part 11, Title 24 C.C.R.

8. 2010 California Referenced Standards, Part 12, Title 24 C.C.R.

9. Title 19 C.C.R. Public Safety, State Fire Marshal Regulations.

10.	NFPA 13	Automatic Sprinkler Systems with Ca Amendments	2010 Edition
11.	NFPA 14	Standpipe Systems with Ca. Amendments	2007 Edition
12.	NFPA 17a	Wet Chemical Systems	2002 Edition
13.	NFPA 20	Stationary Pumps	2007 Edition
14.	NFPA 24	Private Fire Mains with Ca. Amendments	2010 Edition
15.	NFPA 72	National Fire Alarm Code with Ca. Amendments	2010 Edition
16.	NFPA 2001	Clean Agent Fire Extinguishing Systems with Ca. Amendments	2008 Edition

1.05 ABBREVIATIONS AND SYMBOLS

A. Abbreviations and symbols used are indicated on some Drawings. Those not so defined are to be used in the current trade sense of the word or symbol. Conflicts or confusion in the application of abbreviations and symbols shall be brought to the immediate attention of the Architect for resolution prior to proceeding with affected Work.

1.06 DEFINITIONS

For the purposes of these Specifications, the following definitions of project roles shall apply:

A. "Owner" shall refer to the Superior Court of California. "Owner's Representative" shall refer to any employee or agent of the Administrative Office of the Courts, Office of Courts Construction and Management, specifically assigned to act on the Owner's behalf.

B. "Tenant" shall refer to the Manteca Branch of the Superior Court. "Tenant's Representative" shall refer to any employee or agent of the Manteca Branch or San Joaquin County Sheriff's Department specifically assigned to the Work.

C. "Contractor" shall refer to Chamblin Landes Construction, and any contractor or subcontractor who, by contract with Chamblin Landes or directly with the Owner, is responsible for the execution of some portion of the Work.

D. "Architect" shall refer to Fraser Seiple Architects, or any of their specifically assigned project staff. Direct correspondence and submittals to Bruce Fraser, AIA.

E. "Engineer" shall refer to any engineering consultant specifically referenced in a given section of Specifications.

F. "Contract Documents" shall refer to the Working Drawings, these Specifications, the Contract for Construction, the General Conditions, and any Special Conditions, Addenda, Change Orders, or related documents included in the above by reference.

G. “Inspector” shall refer to any inspecting agency or consultant retained by the Owner to review the Work.

1.07 COORDINATION

A. Contractors shall schedule and coordinate Work in a fashion that will allow completion within the construction time frame defined in their Contract or Subcontract for Construction.

B. Contractors will assist in the coordination of quality control testing and inspections, giving City officials and Owner's Representative adequate advance notice of construction progress.

1.08 FURNISHED PRODUCTS

Contractors shall be responsible for:

A. Informing Owner’s Representative of anticipated delivery dates for products.

B. Providing shop drawings, product data, samples, and other submittals as defined in these Specifications and notifying the Architect and Inspector of any observed discrepancies or problems anticipated due to non-conformance with the Contract Documents.

C. Receiving and unloading products at the job site.

D. Handling products at the site, including uncrating and storage.

E. Protecting products from damage or exposure to the elements.

F. Assembly, installation, connection, adjustment, finishing, and cleaning of products.

G. Repairing or replacing items damaged by the Contractor.

1.09 WARRANTY

A. Contractors shall warrant their Work in compliance with the laws of the State of California for a minimum period of one year from the date of Substantial Completion, as determined by the Architect. Extended warranties and guarantees required in the Contract Documents shall not be limited by the provisions of this paragraph.

END OF SECTION

SECTION 01 13 00
SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Dust, Air Pollution, and Odor Control.
B. Disposal Operations.
C. Noise Control.
D. Archaeological Resources.
E. Drainage During Construction.

1.02 GENERAL

A. Construction operations shall comply with any special project procedures listed in approved conditions of discretionary approval issued by the City of Manteca.

1.02 DUST, AIR POLLUTION, AND ODOR CONTROL

A. Dust, Air Pollution, and Odor Control: Contractors shall employ measures to avoid the creation of dust, air pollution, and odors.
   1. Wet down unpaved areas as necessary to prevent dust from leaving the site during demolition, earthwork and construction operations, and to create a crust after each day's activities cease.
   2. Store all volatile liquids, including fuels or solvents in closed containers.
   3. No open burning of debris, lumber or other scrap will be permitted.
   4. Properly maintain equipment to reduce gaseous pollutant emissions.

B. Contractors shall comply with the dust control requirements of the City of Manteca.

1.03 DISPOSAL OPERATIONS

A. Solid Waste Management: Supply solid waste transfer containers. Daily remove all debris such as spent air filters, oil cartridges, cans, bottles, combustibles and litter. Take care to prevent trash and papers from blowing onto adjacent property. Encourage personnel to use refuse containers. Convey non-recylceable contents to a sanitary landfill.

B. Washing of concrete containers where waste water may reach adjacent property, storm drains or natural water courses will not be permitted. Remove any excess concrete to the sanitary landfill.

C. Chemical Waste and Hazardous Waste Materials Management: Furnish containers for storage of spent chemicals used during construction operations. Dispose of chemicals and hazardous materials in accordance with applicable regulations as enforced by the Manteca Fire Department.

D. Garbage: Store non-recycleable garbage in covered containers for regularly scheduled pickup and disposal in a sanitary landfill.

1.04 NOISE CONTROL

A. The construction site is surrounded by residential and other noise-sensitive uses; Contractors shall make every effort to minimize the impact of construction noise on neighboring uses, especially residents.

B. Construction operations and delivieries to the project site shall be limited to the hours 7:00 a.m. through 8:00 p.m., Mondays through Saturdays. Any exceptions to this schedule shall only be made with the Owner's Representative's prior permission.

C. Generators, pumps, and related devices are prohibited from overnight operation, except in the case of emergency protection of neighboring property.

D. All construction equipment shall be provided with well maintained, functional mufflers to limit noise emissions.

1.05 ARCHAEOLOGICAL RESOURCES

A. In the event that during grading, construction or development of the project, any potential archaeological resources are uncovered, all work shall be halted until a City-approved archaeological specialist has reviewed the resources for their significance.

B. If human burials are encountered, the coroner's office shall be contacted immediately.

C. Construction shall only be restarted in the area of potential archaeological resources upon the direction of the Building Department, and after any additional studies or mitigations required by the City have been satisfactorily completed.

1.06 DRAINAGE DURING CONSTRUCTION

A. Contractors shall make provisions to direct rainwater drainage into the existing culvert drainage system during construction, using pumps if necessary to prevent water or mud flow onto neighboring properties.

B. In the event of rain during construction operations which are susceptible to erosion, contractors shall use City approved erosion and sedimentation control measures to limit erosion damage on site and erosion-related mud flow or sedimentation off site. Such measures may include but are not limited to plastic sheeting, fabric or plastic netting, hay bales, or temporary debris dams.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 01 30 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Submittal procedures.

B. Shop drawings.

C. Product data.

D. Samples.

E. Manufacturers' instructions.

F. Manufacturers' certificates.

1.02 RELATED SECTIONS

A. Section 01 40 00 - Quality Control

B. Section 01 70 00 - Contract Closeout: Contract warranty and manufacturer's certificates submittals

1.03 SUBMITTAL PROCEDURES

A. Transmit each submittal with a transmittal identifying the number of copies or samples, Specification Section number, and date of transmittal. Submittal numbers will be assigned by the Contractor.

B. Identify Project and Subcontractor or supplier as appropriate.

C. Schedule submittals to expedite the Project, and deliver to Architect, as directed in the preconstruction meeting. Coordinate submission of related items.

D. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed Work.

E. Revise and resubmit submittals as required, identify all changes made since previous submittal.

1.04 SHOP DRAWINGS

A. Format:
   1. Drawings larger than 11 x 17 inches: Submit one reproducible copy and two opaque reproductions; the Architect will return the reproducible copy.
   2. Drawings 11 x 17 inches or smaller: Submit three opaque copies which will be retained by the Architect, plus the number of copies the Subcontractor or supplier requires.

B. Scale: Draw to an identifed scale sufficiently large to describe the nature and construction of the subject products or assemblies, but in no case to a smaller scale than the Construction Drawings.

C. After review, reproduce and distribute in accordance with procedures for Record Documents described in Section 01 70 00.

1.05 PRODUCT DATA

A. Submit the number of returned copies required, plus three copies which will be retained by the Architect, the Owner's Representative or Inspector, and consulting Engineer where applicable.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data as needed to provide information unique to this Project.

1.06 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes from the full range of manufacturers' standard colors (or in custom colors selected), textures, and patterns for Architect's selection.

C. Include identification on each sample, with full Project information.

D. Submit the number or samples specified in individual specification Sections; one of which will be retained by Architect.

E. Reviewed samples which may be used in the Work are indicated in individual Specification Sections.

1.07 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual Specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, or finishing, in quantities specified for “product data,” above.

B. Identify any conflicts between manufacturers' instructions and Contract Documents.

1.08 GUARANTEES, WARRANTIES, MANUFACTURER'S CERTIFICATES

A. When specified in individual specification Sections, submit guarantees, warranties, or manufacturers'certificates to Architect for review, in quantities specified for “product data,” above.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.

PART 2 - PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not used) END OF SECTION

SECTION 01 40 00
QUALITY CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Quality assurance and control of installation.

B. References.

C. Inspection and testing laboratory services.

1.02 RELATED SECTIONS

A. Section 01 42 00 - Reference Standards

B. Section 01 33 00 - Submittal Procedures

C. Section 01 60 00 - Product Requirements

1.03 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers'instructions, including each step in recommended sequence of fabrication, installation, and adjustment.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. In performance of the work, use only persons qualified to produce workmanship of specified quality.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.04 REFERENCES

A. Conform to the current edition of reference standard as defined in Section 01 42 00.

B. Obtain copies of standards when required by Contract Documents.

C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

D. The contractual relationship of the parties to their Contracts shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND CERTIFICATION

A. Owner will employ, and pay for testing services as required in connection with the Work, which may include, but are not necessarily limited to:

1. Stripping and clearing of vegetation and deleterious materials
2. Excavation to recommended depths
3. Soil compaction at excavation bottom
4. Fill placement and compaction
5. Footing excavations
6. Concrete slump and strength
7. Concrete block grout prism strength
8. Special inspection of structural concrete and masonry
9. Welding inspection
10. High strength bolting inspection
11. Roofing and waterproofing core testing

B. Retesting or reinspection required because of non-conformance to specified requirements shall be performed at the Contractor's expense.

C. Contractors shall provide manufacturer's certifications as required by various sections of these specifications.

PART 2 - PRODUCTS

(not used)

PART 3 - EXECUTION

(not used)

END OF SECTION

SECTION 01 42 00
REFERENCE STANDARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Quality assurance.

B. Schedule of references.

1.02 RELATED SECTIONS

A. Section 01 40 00 - Quality Control

1.03 QUALITY ASSURANCE

A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date for receiving bids, or date of Contract for Construction when there are no bids, except where reference standard date is specified in individual sections of these Specifications.

C. Obtain copies of standards when required by Contract Documents. Maintain copy at jobsite during submittals, planning, and progress of the specific work, until Substantial Completion.

D. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

E. The contractual relationship of the parties to the Contract for Construction shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 SCHEDULE OF REFERENCES

AA Aluminum Association
818 Connecticut Avenue, N.W.
Washington, DC 20006

AABC Associated Air Balance Council
1000 Vermont Avenue, N.W.
Washington, DC 20005

AASHTO American Association of State Highway
and Transportation Officials
444 North Capitol Street, N.W.
Washington, DC 20001

ACI American Concrete Institute
Box 19150
Reford Station
Detroit, MI 48219

ADC Air Diffusion Council
230 North Michigan Avenue
Chicago, IL 60601

AGC Associated General Contractors of America
957 E Street, N.W.
Washington, DC 20006

AI Asphalt Institute
Asphalt Institute Building
College Park, MD 20740

AIA American Institute of Architects
1735 New York Avenue, N.W.
Washington, DC 20006

AITC American Institute of Timber Construction
333 W. Hampden Avenue
Englewood, CO 80110

AISC American Institute of Steel Construction
400 North Michigan Avenue
Eighth Floor
Chicago, IL 60611

AISI American Iron and Steel Institute
000 16th Street, N.W.
Washington, DC 20036

AMCA Air Movement and Control Association
30 West University Drive
Arlington Heights, IL 60004

ANSI American National Standards Institute
1430 Broadway
New York, NY 10018

APA American Plywood Association
Box 11700
Tacoma, WA 98411

ARI Air-Conditioning and Refrigeration Institute
1815 North Fort Myer Drive
Arlington, VA 22209

ASHRAE American Society of Heating, Refrigerating and
Air Conditioning Engineers
1791 Tullie Circle, N.E.
Atlanta, GA 30329

ASME American Society of Mechanical Engineers
345 East 47th Street
New York, NY 10017

ASTM American Society for Testing and Materials
1916 Race Street
Phildelphia, PA 19103

AWWA American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235

AWPA American Wood-Preservers' Association
7735 Old Georgetown Road
Bethesda, MD 20014

AWS American Welding Society
550 LeJeune Road
Miami, FL 33135

CDA Copper Development Association
57th Floor, Chrysler Building
405 Lexington Avenue
New York, NY 10174

CLFMI Chain Link Fence Manufacturers Institute
1101 Connecticut Avenue, N.W.
Washington, DC 20036

CRSI Concrete Reinforcing Steel Institute
933 Plum Grove Road
Schaumburg, IL 60195

EJCDC Engineers' Joint Contract Documents Committee
American Consulting Engineers Council
1050 15th Street, N.W.
Washington, DC 20005

EJMA Expansion Joint Manufacturers Association
707 Westchester Avenue
White Plains, NY 10604

FGMA Flat Glass Marketing Association
3310 Harrison
White Lakes Professional Building
Topeka, KS 66611

FM Factory Mutual System
1151 Boston-Providence Turnpike
Norwood, MA 02062

FS Federal Specification
General Services Administration
Specifications and Consumer Information
Distribution Section (WFSIS)
Washington Navy Yard, Bldg. 197
Washington, DC 20407

GA Gypsum Association
1603 Orrington Avenue
Evanston, IL 60201

IEEE Institute of Electrical and Electronics Engineers
345 East 47th Street
New York, NY 10017

IMIAC International Masonry Industry All-Weather Council
International Masonry Institute
815 15th Street, N.W.
Washington, DC 20005

MIL Military Specification
Naval Publications and Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120

ML/SFA Metal Lath/Steel Framing Association
221 North LaSalle Street
Chicago, IL 60601

NAAMM National Association of Architectural Metal Manufacturers
221 North LaSalle Street
Chicago, IL 60601

NEBB National Environmental Balancing Bureau
8224 Old Courthouse Road
Vienna, VA 22180

NEMA National Electrical Manufacturers' Association
2101 L Street, N.W.
Washington, DC 20037

NFPA National Fire Protection Association
1619 Massachusetts Avenue, N.W.
Washington, DC 20036

NSWMA National Solid Wastes Management Association
1120 Connecticut Avenue, N.W.
Washington, DC 20036

NTMA National Terrazzo and Mosaic Association
3166 Des Plaines Avenue
Des Plaines, IL 60018

PCA Portland Cement Association
5420 Old Orchard Road
Skokie, IL 60077

PCI Prestressed Concrete Institute
201 North Wacker Drive
Chicago, IL 60606

PS Product Standard
U. S. Department of Commerce
Washington, DC 20203

RIS Redwood Inspection Service
One Lombard Street
San Francisco, CA 94111

RCSHSB Red Cedar Shingle and Handsplit Shake Bureau
515 116th Avenue
Bellevue, WA 98004

SDI Steel Deck Institute
Box 3812
St. Louis, MO 63122

SDI Steel Door Institute
712 Lakewood Center North
Cleveland, OH 44107

SIGMA Sealed Insulating Glass Manufacturers Association
111 East Wacker Drive
Chicago, Illinois 60606

SJI Steel Joist Institute
1703 Parham Road
Suite 204
Richmond, VA 23229

SMACNA Sheet Metal and Air Conditioning Contractors'
National Association
8224 Old Court House Road
Vienna, VA 22180

SSPC Steel Structures Painting Council
4400 Fifth Avenue
Pittsburgh, PA 15213

TAS Technical Aid Series
Construction Specifications Institute
601 North Madison Street
Alexandria, VA 22314

TCNA Tile Council of North America, Inc.
100 Blemson Research Blvd.
Anderson, SC 29625

UL Underwriters' Laboratories, Inc.
333 Pfingston Road
Northbrook, IL 60062

WCLIB West Coast Lumber Inspection Bureau
Box 23145
Portland, OR 97223

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water, and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.

C. Construction Facilities: Access roads, parking, progress cleaning, project signage, and temporary buildings.

1.02 RELATED SECTIONS

A. Section 01 13 00 - Special Project Procedures

B. Section 01 70 00 - Contract Closeout

1.03 TEMPORARY ELECTRICITY

A. Power is available at the jobsite.

B. Contractor shall provide portable generator for field welding if required.

C. Contractors shall provide power outlets for construction operations, with branch wiring and distribution boxes. Provide flexible power cords as required.

1.04 TEMPORARY LIGHTING

A. Contractors shall provide and maintain lighting to adequately illuminate their construction operations for safety and to facilitate accurate, workmanlike construction.

B. Owner shall provide and maintain lighting to adequately illuminate staging and storage areas after dark for safety and security purposes.

C. Permanent building lighting may be used during construction.

1.05 TEMPORARY HEAT

A. Contractors shall provide and pay for heat devices and heat as required to maintain specified conditions for construction operations.

B. Prior to operation of permanent equipment for temporary heating purposes, verify that the installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

C. Maintain adequate ambient temperature in areas where construction is in progress in accordance with product manufacturer's recommendations and as otherwise specified. Maintain adequate material temperatures in accordance with manufacturer's recommendations and as otherwise specified.

1.06 TEMPORARY VENTILATION

A. Contractors shall ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Temporary ventilation shall conform to the requirements of applicable occupational health and safety regulations.

1.07 TELEPHONE SERVICE

A. Contractor shall provide, maintain and pay for telephone service to a field office at time of project mobilization.

B. The site telephone will be available for the construction related use of other parties only as allowed by the Contractor.

1.08 TEMPORARY WATER SERVICE

A. Potable water is available at the site.

B. Water for earthwork operations shall be provided by the Contactor and may be from recycled or non-potable sources.

1.09 TEMPORARY SANITARY FACILITIES

A. Contractor shall provide and maintain required sanitary facilities and enclosures.

B. Existing building sanitary facilities may only be used by Contractor as allowed by Tenant.

1.10 BARRIERS

A. Contractor shall provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Contractors shall provide barricades and walkways as required by governing authorities for public circulation and access when work occurs in the public right-of-way.

C. Contractors shall be responsible for the placement of barriers, barricades, and warnings to protect construction crews, visitors, and the public from hazardous operations, such as trenching, crane operation, loading to upper portions of the Work, and related activities.

D. Contractors shall provide barriers to protect non-owned parked or moving vehicles, stored materials, adjacent sites and structures from damage.

1.11 FENCING

A. Contractor shall provide a temporary fence around the construction site, equipped with locking gate(s).

1.12 PROTECTION OF INSTALLED WORK

A. Contractors shall protect installed Work and provide special protection where specified in individual Specification Sections.

B. Contractors shall provide appropriate protective coverings at walls, projections, jambs, sills, and soffits of openings.

C. Finished floors and other surfaces shall be protected from traffic, dirt, wear, damage, or movement of heavy objects, with durable sheet materials.

D. Traffic or storage upon waterproofed or roofed surfaces is prohibited. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

E. Traffic or storage is prohibited in landscaped areas.

1.13 SECURITY

A. Contractors shall cooperate with the Owner's efforts to protect the Work from unauthorized entry, vandalism, or theft, following all Owner's security procedures.

1.14 ACCESS ROADS

A. Maintain access to fire hydrants, free of obstructions.

B. Access to the construction area for construction traffic shall only be as approved in advance by the Owner's Representative.

1.15 PARKING

A. Temporary surface parking for construction personnel on site shall only be as approved by the Tenant.

B. On-street parking shall respect all City ordinances and requirements.

1.16 PROGRESS CLEANING

A. Maintain site and building areas in a clean and orderly condition, free of waste materials, debris, and rubbish.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Handle waste materials, debris, and rubbish according to Specification Section 01 13 00.

1.17 TEMPORARY FIELD OFFICE

A. Tenant will make existing modular building available for Contractor’s temporary field office.

1.18 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above-grade or buried utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. This Section describes basic requirements governing products including:

1. Workmanship.

2. Manufacturers' instructions.

3. Transportation and handling.

4. Storage and protection.

1.02 RELATED REQUIREMENTS

A. Section 01 33 00 - Submittal Procedures.

B. Section 01 70 00 - Closeout Procedures.

1.03 PRODUCTS

A. Products include material, equipment, and systems.

B. Comply with specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a specification section shall be of the same type, made by the same manufacturer, and shall be interchangeable.

D. Reference to materials or methods of construction by name and catalog number is done to establish standards of quality, design, utility, suitability, and cost, and shall not be construed as limiting competition.

E. All products not conforming to the requirements of the specifications will be considered as defective, and such products will be rejected, whether in place or not. Remove such products immediately from the site of the Work.

F. Materials and equipment, for which Underwriter’s Laboratories, Inc. standards have been established and their label service is available, shall bear the appropriate UL Label.

G. Where the words "or equal" are used following trade names, patented products, or proprietary products or methods, they shall be deemed to read "or equal in quality, design, utility and suitability"; as solely determined by the Owner’s Representative.

1.04 QUALITY ASSURANCE

A. Comply with industry standards except when more restrictive tolerances or requirements indicate more rigid standards or greater quality.

B. Perform work by persons qualified to produce specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.05 MANUFACTURERS' INSTRUCTIONS

A. When work is specified to comply with manufacturers' instructions, submit copies as specified in Section 01 30 00, distribute copies to persons involved, and maintain one set in field office.

B. Perform work in accordance with details of instructions and specified requirements. Should conflict exist between specifications and instructions, consult with Architect.

1.06 TRANSPORTATION AND HANDLING

A. Transport products by methods to avoid product damage, deliver in undamaged condition in manufacturer's unopened containers or packaging.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

C. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

D. Promptly remove damaged and defective products from the site and replace at no increase to Contract Sum.

1.07 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering, provide ventilation to avoid condensation.

C. Store loose granular materials on solid surfaces in well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged and maintained under required conditions.

E. After installation, provide coverings to protect products from damage from traffic and construction operations, remove when no longer needed. Maintain temperature and humidity conditions in interior spaces for the Work in accordance with manufacturers' instructions for the materials and equipment being protected.

END OF SECTION

SECTION 01 70 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Closeout Procedures.

B. Final Cleaning.

C. Adjusting.

D. Project Record Documents.

E. Operation and Maintenance Data.

F. Warranties.

G. Spare Parts and Maintenance Materials.

1.02 RELATED SECTIONS

A. Section 01 30 00 - Submittals: Manufacturer's certificates.

B. Section 01 50 00 - Temporary Facilities and Controls: Progress cleaning.

1.03 CLOSEOUT PROCEDURES

A. When required by the Owner's Representative, the Contractor shall submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents.

B. Provide submittals that are required by governing or other authorities to Architect, in duplicate.

1.04 FINAL CLEANING

A. Execute final cleaning prior to final inspection of any portion of the Work.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.05 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation meeting specified performance criteria.

1.06 PROJECT RECORD DOCUMENTS

A. Where required by other Sections of these Specifications, Subcontractors shall maintain one set of the record drawings for the purpose of recording actual “as-built” revisions to the Work.

B. Record Documents shall be stored separately from documents used for construction.

C. Record information shall be permanently marked in a contrasting color, concurrent with construction progress.

D. Submit record drawings with request for final payment.

1.07 OPERATION AND MAINTENANCE DATA

A. Where required by other Sections of these Specifications, submit two sets of appliance, equipment, and other operation and maintenance data prior to final inspection, bound in 8-1/2 x 11 inch text pages, with durable plastic covers for insertion in a three-ring binder.

B. Prepare a table of contents for each set of data, with each Product or system description identified.

C. Operation and maintenance data shall identify names, addresses, and telephone numbers of Subcontractors and suppliers and identify the following:
   1. Significant design criteria.
   2. List of equipment.
   3. Parts list for each component.
   4. Operating instructions.
   5. Required and recommended inspections in connection with operations and maintenance of equipment and systems.
   6. Complete maintenance instructions for equipment and systems.
   7. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

1.08 WARRANTIES

A. Provide duplicate signed copies of warranties required under specific Specification Sections.

B. Submit warranties prior to final application for payment.

1.09 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual Specification Sections.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final inspection.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

END OF SECTION

SECTION 01 71 23
FIELD ENGINEERING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provision of construction surveying and layout.

1.02 QUALITY ASSURANCE

A. Contractors are solely responsible for the complete, timely and accurate layout of their portion of the Work, including, but not necessarily limited to, horizontal and vertical control and dimensional coordination as necessary to construct the Work in accordance with the Contract Documents.

B. Contractors, Civil Engineers, or Land Surveyors retained by Contractors agree to cooperate with the Architect, if necessary, to accommodate any discovered variations or deviations from the Contract Documents so that the progress of the Work is not adversely affected.

C. Civil Engineers or Land Surveyors involved in field engineering shall be registered or licensed in California and acceptable to the Owner and Architect.

1.03 SUBMITTALS

A. Certification signed by the Civil Engineer or Land Surveyor that the elevations and locations of the Work are in conformance with the Contract Documents shall be submitted in accordance with the provisions of Section 01 30 00 if required by the Owner.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify locations of survey control points prior to starting layout. Promptly notify the Architect of any discrepancies discovered.

3.02. SURVEY REFERENCE POINTS

A. Existing basic horizontal and vertical control points for the Project are indicated in the Drawings and are based on 1) an ALTA/ACSM Land Title Survey prepared 02/17/2005 by Slooten Consulting; and 2) a Topographic Map prepared 02/09/2011 by MBS Land Surveys, and available from the Architect.

B. Locate and protect control points prior to starting site work, and preserve permanent reference points during construction. Make no changes or relocations without prior notice to the Architect.

C. Promptly report to the Architect when a control or reference point is lost or destroyed or requires relocation because of necessary changes in grades, locations or other reasons. Replace lost or destroyed control or reference points based on original survey control.

3.03 PROJECT LAYOUT

A. The Owner shall retain and pay expenses of a licensed Civil Engineer or Land Surveyor to do construction survey work as required to locate buildings and improvements on the site.

B. The licensed Civil Engineer or Land Surveyor shall establish a minimum of one permanent bench mark on site, referenced to established control points.

C. The licensed Civil Engineer or Land Surveyor shall record location(s) of permanent bench marks(s), with horizontal and vertical data and record Drawings under provisions of Section 01 70 00.

D. Lines and levels shall be located and laid out by instrumentation and similar appropriate means, including:

1. Existing known above and below grade utilities (identify, stake and flag).
2. Site improvements, including pavements, stakes for grading, fill and topsoil placement, utility locations, slopes and invert elevations.
3. Corners, grid or axis for all structures.
4. Building foundation, column locations, and ground floor elevations.
5. Controlling lines and levels required for mechanical and electrical Work.

E. The licensed Civil Engineer or Land Surveyor shall periodically verify layout by the same means.

3.04 CONSTRUCTION LAYOUT

A. Contractors shall rely on control points established by the licensed Civil Engineer or Land Surveyor as a basis for the horizontal and vertical layout of their Work.

B. Any apparent discrepancy in the accuracy of control points, vertical or horizontal alignment of construction, or other aspects of construction layout shall be brought to the immediate attention of the Architect for resolution prior to proceeding with affected Work.

3.05 RECORDS

A. The licensed Civil Engineer or Land Surveyor shall maintain a complete, accurate log of control and survey work as it progresses.

B. On completion of foundation and major site improvements Record Drawings shall be prepared showing any dimensions, locations, angles, and elevations of construction which vary from those indicated in the Drawings, under provisions of Section 01700.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Clearing of shrubs, grasses and related vegetation from site.

B. Removal of designated curb, site walls, sidewalk and paving.

C. Cutting and removal of designated building walls, roof, and finishes.

D. Removal of debris and undisclosed structures.

1.02 RELATED WORK

A. Section 01 13 00 - Special Project Procedures

B. Section 31 00 00 - Earthwork

1.03 COORDINATION

A. Contractors performing demolition procedures shall be responsible for contacting Underground Service Alert to confirm location of any underground utilities which may be damaged during demolition.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 PREPARATION

A. Erect and maintain temporary barricades under provisions of Section 01 50 00 and as required to keep members of the public at a safe distance from demolition operations.

B. Protect existing items which are not indicated to be demolished.

C. Disconnect, remove, and cap terminated utility services within demolition areas in compliance with utility company standards and requirements of the local authority with jurisdiction.

3.02 EXECUTION

A. Demolish in an orderly and careful manner. Identify and protect existing improvements to remain.

B. Immediately notify Architect or Owner's Representative of contaminated, hazardous, or potentially dangerous materials encountered; proceed with removal and disposal as directed.

C. Except for where noted otherwise, immediately remove demolished materials from site. Do not burn or bury materials on site.

D. Upon completion of demolition work, leave areas surrounding work area, including public streets, in a clean condition.

E. Control the spread of dust during site demolition operations by moistening affected surfaces; refer to additional dust control provisions in Special Conditions.

F. Comply with all requirements of the local authority with jurisdiction, as identified on the drawings.

G. Plant and tree removal shall include removal of all roots.

H. Refer to Section 31 00 00 (Earthwork), for treatment of voids created by removal of subsurface structures.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cast-in-place concrete foundations and building slabs

1.02 RELATED WORK DESCRIBED ELSEWHERE

A. Section 31 00 00 - Earthwork

B. Section 32 10 15 - Concrete Paving and Flatwork

C. Section 03 35 00 - Concrete Floor Stains

D. Section 03 60 00 - Grout

1.03 QUALITY ASSURANCE

A. Footing Inspection: Footing excavations shall be inspected and approved by the Soils Engineer.

B. Testing: Concrete slump and strength testing shall be performed in accordance with the provisions of Section 01 40 00.

1.04 SUBMITTALS

A. Submit mix designs, product data and manufacturer's instructions under provisions of Section 01 30 00.

B. Submit certified copies of mix designs for each class of concrete. Include results of testing or test data used to establish mix proportions. Include data on joint filler and any proposed admixtures or curing compounds.

C. Submit proposed location of all control and construction joint locations for the Architect's review and approval.

D. Submit all concrete delivery tickets to jobsite superintendent for filing until all strength testing has been satisfactorily completed.

PART 2 - PRODUCTS

2.01 CEMENT

A. Portland Cement Type 1 or Type II, low alkali, conforming to ASTM C150-09, a single brand of cement throughout structural concrete work.

2.02 AGGREGATE

A. Fine aggregate: ASTM C33-11

B. Coarse aggregate: Clean, hard, fine grained crushed rock or washed gravel with a minimum of 25% crushed faces; ASTM C33-11, maximum 1-1/2" size; maximum loss in Los Angeles Rattler Test shall not exceed 50% in 500 revolutions, per ASTM C535-09.

2.03 SAND

A. Sand for slab cushion: Clean, homogenous inland sand of which less than 3 percent passes the #200 sieve; free of deleterious, organic or expansive materials.

2.04 WATER

A. Mixing water: Clean, fresh water, free from acid, alkali, organic matter or other impurities which may be detrimental to concrete. Conform to ASTM C1602.

B. Washing and curing water: Same as above.

2.05 READY-MIXED CONCRETE

A. Reference Standards: Comply with ASTM C94-11.

B. Strength: 3,000 p.s.i. minimum compressive strength after 28 days (unless noted otherwise).

C. Slump: 4 +/- 1 inches maximum.

D. Mix: Minimum cement content of 5.0 sacks per cubic yard; maximum water-cement ratio of 7.2 gallons per sack of cement.

2.06 DEFORMED BAR REINFORCING

A. Reference Standards: Comply with ASTM A615-11, grade 40

B. Provide reinforcing steel in sizes described on drawings, clean of rust, grease, or contaminants that may impair concrete bonding.

2.07 WELDED WIRE FABRIC

A. Reference Standards: Comply with ASTM A185-08.

B. Provide wire fabric in size and gage indicated on drawings, clean of rust, grease, or contaminants that may impair concrete bonding

2.08 MOISTURE BARRIER

A. Plastic moisture barrier: 10 mil or heavier poly sheeting or equivalent product.

B. Moisture barrier tape: Plastic tape designated for poly sheeting, minimum 2 inches wide.

2.09 PREFORMED JOINTS

A. Construction joints: Burke Keyed Kold Joint or approved equivalent.

B. Control joints: Burke Zip Strip or approved equivalent.

2.10 FORM MATERIALS

A. Reference Standards: Comply with ACI 301.

B. Plywood Forms: Douglas fir or spruce species; solid one side grade; sound undamaged sheets.

2.11. CURING MATERIALS

A. Water: Clean and potable, see 2.04.

B. Membrane Curing Compound: Comply with ASTM C309-07.

C. Clear Sealer: Chemstone Berylex “Penetrating Clearseal Matt” or equivalent matt finish sealer/hardener.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect completed earthwork in area of concrete work and verify that it is ready to receive the work of this Section.

B. Beginning of trenching means acceptance of existing surfaces.

3.02 COORDINATION

A. Obtain information and instructions from other trades and suppliers in ample time to schedule and coordinate the installation of items furnished by them to be embedded in concrete under this Section so that provisions for their work can be made without delaying the project.

B. Cutting and/or patching made necessary by failure or delay in complying with these requirements shall be done at no cost to the Owner, and under the direction of the Architect.

3.03 SPREAD AND CONTINUOUS FOOTING TRENCHING

A. Excavate at locations and to dimensions and depths shown on the drawings, making allowance for footing forms.

B. Drain all surface and ground water from excavations, using pumps, dams, or drainage ditches as required to remove water from trenches.

C. Fill over-excavated portions with structural concrete.

D. Maintain all excavations true to line and dimensions shown and free of loose earth and debris of any kind. Trenching is subject to Architect's approval.

E. Prior to placement of concrete, reinforcing or formwork, obtain approval of Soils Engineer for footing excavations.

3.04 FORMWORK

A. Coordinate carefully with other trades for the provision of sleeves, chases, knock-outs, and ties for other work.

B. Build and brace forms sufficiently to prevent leaking of concrete and any bulging or deflection of forms; double form footings.

C. Construct forms true to line and dimensions shown on drawings, with exterior surfaces flat and plumb. Formwork is subject to Architect's approval.

3.05 MOISTURE BARRIER AND REINFORCING STEEL PLACEMENT

A. Place moisture barrier at midsection of sand free of sharp objects, organic material or rubble.

B. Lap all moisture barrier joints a minimum of 6 inches and tape; tape moisture barrier at penetrations.

C. Place a minimum of 2 inches of clean sand over the moisture barrier.

D. Place reinforcing steel with accurate spacing and clearances as shown on drawings; support securely to prevent movement during pour.

E. Use only clean concrete or metal items to support reinforcing steel.

3.06 CONCRETE PLACEMENT

A. Lightly wet forms, trenches, and sand just prior to concrete placement.

B. Mechanically vibrate concrete footings to prevent honeycombing; honeycombing in excess of 1 inch in depth or 4 inches in width will be unacceptable.

C. Provide construction joints as called out on drawings or as required by good trade practice to control cracking. To the maximum extent feasible, lay out construction joints under walls or at changes in flooring material.

D. Finish slabs with power-driven disc floats; do not use cement dust to dry excess water.

E. After initial set, hand trowel concrete surface to a slick burnished finish, free of tool marks, exposed aggregate, or other defects; finish exterior flatwork with a medium broom texture.

F. Cure slabs only with water or a curing compound approved in advance through the submittal process. DO NOT APPLY curing compound to slabs designated for concrete floor stains.

G. Leave forms in place a minimum of one day after pour is completed.

H. Clean, patch and sack all horizontal surfaces and any exposed-to-view concrete work to a uniform finish, free of high spots, slumps, fins, bleeds, and other defects.

I. Finished concrete shall meet the following tolerances:
   1. Horizontal lines: 1/4 inch in 20 feet.
   2. Plumb: 1/4 inch in 10 feet.
   3. Slab deviation from a true plane (multi-directional):1/8 inch in 10 feet.

J. Drying shrinkage shall not exceed 0.04% after 28 days, in accordance with ASTM C157.

K. Apply approved concrete sealer/hardener to surfaces identified in Finish Schedule in Drawings, in accordance with manufacturer’s recommendations.

3.07 CLEAN-UP

A. All truck discharge and cleaning shall be in areas that will not receive landscaping. At completion of concrete work, remove all concrete debris, slurry, hardened concrete and other waste products.

B. Do not wash out tools, pumps, trucks, or other concrete related items in a fashion that will damage or stain road surfaces or property.

END OF SECTION

SECTION 03 35 00
CONCRETE FLOOR STAINS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for furnishing and applying concrete floor stains and sealers.

1.02 RELATED WORK

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 09 90 00 – Painting.

1.03 QUALIFICATION REQUIREMENTS

A. Chemical Stain Manufacturer: L. M. Scofield Company “Lithochrome Chemstain” is specified to set a standard; use specified manufacturer, or approved equivalent.

B. Dry Shake Colored Hardener Manufacturer: L.M. Scofield Company “Lithochrome Color Hardener” is specified to set a standard; use specified manufacturer, or approved equivalent.

C. Applicator: An authorized representative of materials manufacturer or as approved, regularly providing applications of types required for this Work.

1.04 SUBMITTALS

A. Samples: Submit samples of each color selected showing texture and slip resistance; approximately 12-inches square.

B. Product Data: Submit manufacturer's descriptive, technical data and illustrations, marked to indicate specific product types, variations, and materials involved, including substantiating test data and reports. Include manufacturer’s printed application instructions.

C. Certification: Submit manufacturer’s Certificates of Compliance indicating that materials used for the Work comply with specified requirements, and that coverage rate was as recommended by the manufacturer. Certificate shall be issued and signed by a duly authorized representative of the manufacturer.

D. Guarantee: Submit manufacturer's written five-year guarantee against dusting as a result of wear and abrasion.

1.05 PROTECTION

A. Protect products against damage during transport, field handling, and application.

B. Store products inside enclosed storage facilities or enclosed building.

C. Follow manufacturer's special instructions and precautions.

D. Protect adjacent construction and finishes to prevent damage during application of this Work.

1.06 JOB CONDITIONS

A. Observe and follow manufacturer's precautions when using materials considered toxic or otherwise hazardous.

B. Do not apply materials when ambient air and substrate temperatures or wind and humidity exceed specified extremes.

1.07 COORDINATION

A. In advance of concrete Work, furnish instructions regarding texture and condition of concrete substrates required for proper application of concrete floor sealer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stain: L.M. Scofield “Lithochrome Chemstain” in custom colors as selected by Architect. All products shall be in compliance with EPA codes and regulations and applicable air quality control district.

B. Densifier: L.M. Scofield “Lithochrome Color Hardener” in standard colors as selected by Architect. All products shall be in compliance with EPA codes and regulations and applicable air quality control district.

C. Stain Sealer: L. M. Scofield “Colorcure Concrete Sealer”, transparent concrete sealer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that concrete surfaces to receive sealer are level to within specified tolerances, sound, properly finished and free from dirt, dust, droppage, oil, grease, asphalt, and other deleterious matter. Concrete may be damp but not wet. Surfaces shall be acceptable to applicator. Commencement of application shall be construed as acceptance of substrates.

B. Concrete shall have been cured as recommended by manufacturer.

3.02 SUBSTRATE PREPARATION

A. Clean substrates free from dirt, dust, and other loose particles and materials.

B. Grind substrate as necessary to remove contaminants, level unevenness, and bring surface characteristics of old and new concrete into conformance.

C. Maintain temperature between 65 and 85 degrees Fahrenheit for 24 hours prior to and during application, and for 7 days following application.

3.03 APPLICATION

A. Apply dry-shake color hardener in colors scheduled. Apply evenly by machine or hand in accordance with manufacturer’s recommendations.

B. Apply stains and sealers after color hardeners, in colors scheduled. Apply with methods and coverage rates in accordance with manufacturer's recommendations.

C. Drying Time: Allow a minimum of 3 hours between coats, and 7 days after application before permitting normal foot traffic.

3.04 COMPLETION

A. When complete, surfaces with stains shall be match accepted samples uniform in gloss and texture, and free from pin holes, discoloration, bleeding, and other damage and defects.

END OF SECTION

SECTION 03 40 00
ARCHITECTURAL PRECAST CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Extent of architectural precast concrete work is indicated on Drawings.

B. Architectural precast concrete includes wall caps at exterior walls.

1.02 RELATED DOCUMENTS

A. Section 04 20 00 - Concrete Unit Masonry.

B. Section 09 20 00 - Lath and Plaster.

1.03 QUALITY ASSURANCE

A. Comply with PCI (Precast/Prestressed Concrete Institute) MNL-117 "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Product" for production and quality control of architectural precast units, and as specified herein.

B. Fabricator Qualification:

1. Fabricator shall have a minimum of 5 years successful experience in fabrication of architectural precast concrete units similar to units required for this Project.
2. Fabricator shall have sufficient production capacity to produce, transport, and deliver required units without causing delay in the work.

1.04 SUBMITTALS

A. Submit manufacturer's specifications, data, and instructions for manufactured materials and products. Include manufacturer's certifications and laboratory test reports as required.

B. Submit samples representative of available colors and surface textures for the subject precast units.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver precast concrete units to site and store units at Project site to prevent cracking, distortion, warping, staining, or other physical damage. Broken, chipped, stained, or damaged units will be subject to rejection.

PART 2 - PRODUCTS

2.01 PRECAST WALL CAPS

A. Design is based on Stone Transitions wall and pier cap collection by Napa Valley Cast

Stone. Equivalent products may be used based on review of submittals under Section 01 30 00.

1. Wall Cap: Stone Transitions WCM-FLS-10
2. Dimensions: 10” wide x 20” long x 2-1/2” thick.
3. Color: as selected by Architect from standard range.
4. Texture: standard

2.02 CONCRETE MATERIALS

A. Portland Cement: per ASTM Standard C150, et seq. Type I White or Type III Colton Black for its special color mixes; Type I or II gray cement for typical color mixes.

B. Aggregate: per pertinent sections of ASTM Standard C33; fine sand and plasterer’s sand, full grade mix with Sieve sizes No. 16 to No.100 typical, to Pan Fines [#140 & #200 minimum size passing].

C. Water: potable, free from foreign materials in amounts harmful to concrete and embedded steel.

D. Pigment: conform to per the ASTM Standard C979

2.03 FABRICATION

A. Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of PCI MNL-117, unless otherwise indicated.

B. Fabricate units straight, smooth, and true to size and shape, with exposed edges and corners precise and square, unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSPECTION

A. Carefully inspect the in-place work at the substrate to receive products of this Section.

B. Beginning of installation means acceptance of substrate.

3.02 INSTALLATION

A. Do not install precast units until concrete has attained its design compressive strength.

B. Install precast concrete members plumb, level, and in alignment within limits of erection tolerances, as specified in PCI MNL-117. Provide temporary supports and bracing as required to maintain position, stability and alignment until setting mortar reaches design strength.

C. Use color-matched grout at joints and tool flush.

END OF SECTION

.

SECTION 03 60 00
GROUT

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Grouting and patching at concrete surfaces.

1.02 RELATED WORK

A. Section 03 30 00 - Cast-In-Place Concrete

1.03 SUBMITTALS

A. Submit product data under provisions of Section 01 30 00.

PART 2 - PRODUCTS

2.01 GROUT

A. Acceptable manufacturer: The Burke Company

B. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01300.

C. Product description: "Burke Stone" quick setting, non-shrinking anchoring and patching cement, product no. 332.

D. Design Strength: 4,300 psi after initial cure period.

E. Mixed only with clean, potable water.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect surfaces to receive cementitious grout to verify they are clean and prepared for grouting according to the manufacturer's requirements.

B. Beginning grouting means acceptance of existing surfaces.

3.02 APPLICATION

A. Pour or trowel cementitious grout into place according to manufacturer's recommendations.

B. Finish surface of patches smooth and even with adjacent concrete or masonry surfaces.

END OF SECTION

SECTION 04 20 00
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Concrete block at building walls.

B. Reinforcement, anchorages, and accessories.

1.02 RELATED WORK

A. Section 03 30 00 - Cast in Place Concrete

B. Section 09 90 00 - Painting

1.03 REFERENCES

A. ACI 315 - Details and Detailing of Concrete Reinforcement.

B. ASTM A615-09 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

C. CBC Standards - Masonry Units.

D. ASTM C90-11 - Hollow Load-Bearing Concrete Masonry Units.

E. AWS D12.1 - Reinforcing Steel Welding Code.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 01 30 00.

PART 2 - PRODUCTS

2.01 MASONRY MATERIALS

A. Acceptable Manufactuers - Hollow Load Bearing Concrete Masonry Units
   1. Air Vol Block, Inc.
   2. Angelus Block
   3. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

B. Hollow Load Bearing Units: As specified below and on the Drawings for other applications.
   1. Concrete units conforming to ASTM C90, standard weight, Type 1, Grade N. Units shall be steam cured, and shall be a minimum of 28 days old when delivered to the job site.
   2. Concrete units elsewhere shall be “precision” design in natural grey color.
   3. Concrete unit nominal sizes shall be 8” high x 8” deep x 16” long, unless noted otherwise.
   4. Any accessory concrete units not specifically drawn, but required for this work, shall comply with all requirements of this section.

C. Shrinkage: Shrinkage of concrete units shall not exceed .05% when tested in accordance with ASTM C426-10.

D. Water Content: When delivered to the job site, concrete units shall not contain more than 35% moisture by weight; units shall be stored on site in a fashion which limits additional saturation from rainwater.

2.02 MORTAR

A. General:
1. All mortar shall conform to ASTM C270-10, Type S, natural color.
2. Mortar strength at 7 days shall be 1,000 psi minimum; at 28 days shall be 1,800 psi minimum.

B. Composition:
1. Cement: per ASTM C150-09, Type II, low alkali.
2. Hydrated lime: per ASTM C207-06.
3. Quicklime: per ASTM C5-10, non-hydraulic type.
4. Aggregate: per ASTM C144-04.

C. Pre-mixed mortar: All pre-mixed mortar shall be the product of one manufacturer, meet the criteria listed in 2.02 a and b, above, and conform to ASTM C387-11.

2.03 GROUT

A. General:
1. All grout shall conform to ASTM C476.
2. Strength at 7 days shall be 1,250 psi minimum; at 28 days shall be 2,000 psi minimum.

B. Composition:
1. Cement: per ASTM C150-09, Type I or II, low alkali.
2. Aggregate: per ASTM C404-07; pea gravel shall be graded so that 100% will pass the 3.8" sieve, and no more than 5% will pass the No. 8 sieve.

2.04 REINFORCING STEEL

A. All reinforcing steel required for concrete unit masonry work shall be deformed iron bar, conforming to ASTM A615, Grade 40 min.

2.05 REINFORCING ACCESSORIES

A. Provide appropriate reinforcing positioners and brackets to maintain all reinforcing in the proper locations during grouting, and per California Building Code Section 2104.

2.06 WATER

A. Use fresh, clean and potable water, free from minerals and organic components in concentrations which would affect the hardening of cement mortar.

2.07 STORAGE ON SITE

A. Immediately after delivery to the job site, masonry units shall be stacked under coverings or otherwise protected from weather exposure and from soil contact. Care shall be exercised in handling to avoid chipping and breaking. Use of damaged units will not be permitted. Units shall be stored on pallets or temporary wood dunnage off the ground.

2.08 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper concrete unit masonry installation, shall be new, of first quality, and subject to the Architect's approval.

PART 3 - EXECUTION

3.01 GENERAL

A. Follow procedures specified below and indicated on the Drawings. Use the drawings as diagrams indicating the extent of the Work to be installed, and its location relative to other Work. In the event of discrepancy, immediately notify the Architect and obtain direction prior to proceeding.

3.02 PREPARATION

A. Verify items provided by other Sections of work are properly sized and located.

B. Establish lines, levels, and coursing. Protect from disturbance.

C. Confirm that retaining wall layout respects property lines as indicated on Drawings.

D. Dampening or wetting of units prior to installation is not permitted.

3.03 MIXING MORTAR

A. Mix mortar in a mechanical mixer of one sack minimum capacity.

B. Mix mortar at least three minutes after all materials have been added.

C. Mix only as much mortar as can be used in one hour after water has first been added; continuous mortar mixing is not permitted.

D. Maintain a slump of 2-3/4", +/- 1/4".

E. Mortar shall not be re-tempered in any way.

3.04 COORDINATION

A. Carefully coordinate with all other trades to ensure that footings, attachments and related items allow a smooth interface between concrete unit masonry and other work.

3.05 COURSING AND JOINTS

A. Place masonry to lines and levels indicated.

B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.

C. Lay concrete masonry units in running bond. Course one block unit and one mortar joint to equal 8 inches. Tool mortar joints as a very shallow concave shape.

D. All cells shall be grouted solid unless noted otherwise.

3.06 PLACING AND BONDING

A. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.

B. Fully bond intersections, and external and internal corners.

C. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.

D. Remove excess mortar.

E. Perform jobsite cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges. Any chipped or broken units in the finished wall shall be removed and replaced at no additional cost to the Owner.

F. Cut mortar joints of units flush in any location where waterproofing is applied.

3.07 REINFORCING STEEL

A. Place reinforcement in accordance with ACI 315.

B. Locate reinforcing splices at points of minimum stress.

C. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2 inch of true dimension.

D. Verify reinforcement is clean, free of scale, dirt, or other foreign coatings which would reduce bond to grout.

3.08 TOLERANCES

A. Variation from Unit to Adjacent Unit: 1/32 inch maximum.

B. Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Variation from Plumb: 1/4 inch per story non-cumulative.

D. Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch maximum.

E. Variation of Joint Thickness: 1/8 inch in 3 feet.

F. Maximum Variation from Cross Sectional Thickness of Walls: Plus or minus 1/4 inch.

3.09 GROUTED COMPONENTS

A. Perform grouting of walls in strict accordance with CBC Chapter 21, using 2,000 psi (28 days) strength grout.

B. Place and consolidate grout fill without disturbing reinforcing.

C. Do not grout any concrete unit masonry until at least 24 hours after completion of unit installation.

3.10 BUILT-IN WORK

A. As work progresses, build in items to be inserted in the work supplied by other Sections.

B. Build in items plumb and level.

C. Bed anchors in mortar joints. Fill frame voids solid with mortar.

D. Do not build-in organic materials subject to deterioration.

3.11 CLEANING

A. Remove excess mortar and smears.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with a non-acidic solution which will not harm masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners.

D. Use non-metallic tools in cleaning operations.

3.12 PROTECTION

A. Protect finished installation under provisions of Section 01 50 00.

END OF SECTION

SECTION 05 10 00
STRUCTURAL STEEL

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work includes but is not necessarily limited to structural steel fabrication and erection as shown on the Drawings and as specified herein.

1.02 REFERENCES

A. American Institute of Steel Construction (AISC):
   1. Steel Construction Manual, 13th Edition
   2. AISC 360-05, Specification for Structural Steel Buildings

B. American Society for Testing Materials (ASTM):
   1. A36-08 Structural Steel
   2. A307-10 Carbon Steel Externally Threaded Standard Fasteners
   3. A325-10 High-Strength Bolts for Structural Joints
   4. A563-07 Carbon and Alloy Steel Nuts
   5. A500-10 Seamless Carbon Steel Structural Testing
   6. A706-09 Low Alloy Steel Bars for Concrete Reinforcement
   7. F436-10 Hardened Steel Washers
   8. A992-069 Standard Specification for Structural Steel Shapes

C. American Welding Society (AWS):
   1. D1.1 Structural Welding Code, Steel
   2. D1.4 Structural Welding Code, Reinforcing Steel

1.03 RELATED WORK

A. Section 05 50 00 - Metal Fabrications

B. Section 06 10 00 - Rough Carpentry

1.04 QUALITY ASSURANCE

A. Welders shall be certified for the welding of structural steel and reinforcement in compliance with the requirements of AWS D1.1 and D1.4, respectively.

B. Material mill certification shall be made available to the Owner's Special Inspector if requested.

1.05 SUBMITTALS

A. Shop Drawings: Drawings shall show, but not be limited to anchor bolt and framing placement plans, sections and details as required, locations of field welding and details for shop-fabricated, field-assembled structural assemblies.

B. Bolts and Washers: Submit product brochure for load indicator bolts and washers proposed for use.

1.06 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Shapes Plate: ASTM A36.

B. Steel Wide Flange: ASTM A992

C. Tube Steel: ASTM A500, Grade B.

D. Bolts: ASTM A307, Grade A with hex nuts conforming with ASTM A 563, Grade A.

E. High-strength Bolts: ASTM A325, Type I, regular hexagon-head type utilizing load indicator bolts with heavy hex nuts conforming with ASTM A363, Grade C.

F. Washers: ASTM F436, supply with all bolts and washers.

G. Welded Reinforcement: ASTM A706.

G. Welding Electrodes: All electrode coatings shall be low hydrogen. Electrodes shall meet or exceed the following rating for the specified base metal:

1. Structural Steel: ASTM A36 A500,: E70XX (SMAW)
   A992 F7X-EXXX (SAW)
   ER70S-X (GMAW)
   E7XT-X (FCAW)
2. Reinforcing Steel: ASTM706: E70XX (SMAW)

PART 3 - EXECUTION

3.01 GENERAL

A. Before starting fabrication, obtain field measurements of all existing conditions. Verify the location of all existing structural elements that effect the work. Notify the Architect of any discrepancies.

B. Fabrication shall conform to the applicable provisions contained in the AISC, except where these requirements differ or infer differences therefrom, in which event these requirements shall govern. Before being fabricated or worked, material shall be thoroughly wire-brushed, cleaned of loose mill scale and rust and straightened by methods that will not injure the steel. After punching or working the component parts of a member, remove twists or bends before the parts are assembled. Finished members shall be free from twists, bends, and open joints when erected.

C. Thermal cutting of structural steel shall be done by machine. Cuts shall be smooth and regular. Gouges with amplitudes over 1/8" shall have the edges finished smooth.

D. Standard holes shall be provided in member connections. Oversized holes may be used where indicated by the Drawings or with prior approval of the Architect with regards to location and orientation. If the thickness of the material is not greater than the nominal diameter of the bolt plus 1/8-inch, the holes may be punched. If the thickness of the material is greater than the nominal diameter of the rivet or bolt plus 1/8-inch, the holes shall be either drilled from the solid, or sub-punched and reamed. The dies for all sub-punched holes, and the drill for all sub-drilled holes, shall be at least 1/16-inch smaller than the nominal diameter of the bolt.

3.02 WELDING

A. Welding and welded joints shall be detailed and executed in accordance with the requirements of the AWS or as detailed and noted on the Drawings, which shall then take precedence. Structural welding shall be done by one of the following processes:
1. Shielded Metal Arch (SMAW)
2. Submerged Arc (SAW)
3. Flux Cored Arc (FCAW)
4. Gas Metal Arc (GMAW)

B. The coating of low hydrogen type electrodes shall be thoroughly dry when used. Electrodes taken from hermetically sealed packages shall be used within four (4) hours of the time the packages are opened. Electrodes that are not used within this four-hour (4-hour) period and electrodes that have been exposed more than one hour to air having a relative humidity of 75% or greater shall be dried for at least two (2) hours at a temperature between 300 and 400 degrees F or shall be stored for 24 hours at a temperature of 200 to 250 degrees before they are used or shall be reconditioned according to the manufacturer's recommendations. Electrodes of any classification that have been wet shall not be used under any conditions.

C. Thoroughly clean surfaces to be welded of paint, grease, scale, and foreign matter. Clean welds each time the electrodes are changed and chip entire area of hand-guided and controlled flame cut edges before welds are deposited thereon. In general, surfaces made by automatic or mechanically guided and controlled equipment need not be ground or chopped before welded thereto. After being deposited, welds shall be wire brushed and shall exhibit uniform section, smoothness of welded metal, feather edges without undercuts or overlays, and freedom from porosity and clinkers. Visual inspection at edges and ends of fillet welds shall indicate good fusion and penetration into base metal.

3.03 SHOP QUALITY CONTROL

A. Welding: Perform all shop welding in the presence of the Owner's Special Inspector.

B. Supply mill certificates to the Owner's Special Inspector for identification of all structural steel prior to fabrication if requested. Questionable or unidentifiable structural steel shall be tested by the Owner's Testing Agency and at the Contractor's expense, as described below.

C. When material cannot be identified or its source is questionable, one tension and bend test shall be made for each 2-1/2 tons or fractional part thereof, of each shape of stock as may be used in the work.

3.04 ERECTION

A. Provide temporary bracing and support as required for completion of the work. Leave in-place as long as it may be necessary for safeguarding all parts of the work. No field welding shall be done until the work has been properly aligned, plumbed, and leveled. Refer to construction staging notes on the Drawings for erection sequencing.

B. Erection: Erect the work plumb, square, true to line and level and in precise positions as indicated. Provide temporary bracing and required guys wherever to provide for loads and stresses to which the structure may be subjected, including those due to erection equipment and its operation, and leave in place as long as it may be necessary for safeguarding all parts of the work.

C. Temporary Connections: As erection progresses, the work shall be securely bolted up as required to maintain the steel in proper position while field bolting and welding is being done, and to take care of dead loads, wind, and reaction stresses. No field welding or high-strength bolting shall be done until the work has been properly aligned, plumbed and leveled.

D. Set Column Base Plates: In exact position to alignment, level and elevation and support on steel wedges or equivalent until the grout thereunder has thoroughly set the center of each base shall be true to the column center within 1/16 inch and elevation adjusted to ± .0025 feet (1/32 inch). Plates shall be exactly level on both axes. Refer to construction staging notes for loading adjustment due to beam camber.

E. Sequence: The erection of structural steel work shall be done in proper sequence with the work of other trades and shall be framed, bedded, and anchored to the concrete, masonry, and related work in strict accordance with the detailed drawings, approved setting diagrams, and construction staging notes.

F. Erection Tolerances: Shall comply with the 2010 Edition of the AISC Code of Standard Practice for Steel Buildings and Bridges.

3.05 FIELD QUALITY CONTROL

A. Welding and Bolting: Perform all field welding and high strength bolting in the presence of the Owner's Special Inspector.

B. All rejected welding and base material shall be removed and replaced in conformance with AWS requirements.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Fabricated stainless steel handrails.

B. Fabricated aluminum stair nosings and handrail brackets.

C. Fabricated steel roof access ladder and equipment tower.

1.02 RELATED WORK

A. Section 04 20 00 - Concrete Unit Masonry

B. Section 05 10 00 - Structural Steel

C. Section 06 10 00 - Rough Carpentry

D. Section 09 90 00 - Painting

1.03 REFERENCES

A. ASTM A36-08 - Structural Steel.

B. ASTM A500-10 - Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

C. ASTM A501-07 - Hot-formed Welded and Seamless Carbon Steel Structural Tubing.

D. ASTM A276-10, A554-10, et al - Type 304 Stainless Steel Tubing and Shapes.

E. ASTM A668-04 - Steel Plates.

F. ASTM A53-10 - Steel Pipe.

G. ASTM A47-99 - Malleable Iron Castings.

H. ASTM A307-10 - Bolts and Nuts.

I. ASTM A123-09, A153-09 - Zinc Galvanized Coating.

J. AWS D1.1 - Structural Welding Code.

K. FS TT-P-31 - Paint, Oil: Iron Oxide, Ready Mix, Red and Brown.

L. FS TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.

1.04 SHOP DRAWINGS

A. Submit shop drawings for shop or site fabricated items under provisions of Section 01 30 00.

B. Indicate profiles, sizes, connections, reinforcing, anchorage, size and type of fasteners, and accessories.

C. Indicate welded connections using standard AWS welding symbols; indicate net weld lengths.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Sections: ASTM A36.

B. Steel Plates to be bent or cold formed: ASTM A283, Grade C.

C. Steel Tubing: ASTM A500, Grade B.

D. Steel Pipe: ASTM A53, Grade B.

E. Stainless Steel Tubing: ASTM 554-10, Type 304; satin finish.

F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Primer: FS TT-P-31, red; for shop application and field touch-up.

H. Galvanized Coating, Identified Exterior Use Products:
1. Rolled, pressed, or forged steel shapes: ASTM A123
2. Iron and steel hardware: ASTM A153
3. Assembled steel products: ASTM A386.

I. Equipment Tower Screen Panels: McNichols perforated sheet, or approved equivalent:
1. Product: perforated metal sheet with staggered rows of 3/4” diameter holes at 1” on center, as shown on Drawings.
2. Material: galvanized steel, 16 gauge.
3. Frame: galvanized steel trims, as shown on Drawings.
4. Fasteners: galvanized bolts or screws into tapped holes in structure, as required.
5. Finish: galvanized and powder coated in color as selected by Architect, touched up at cuts to match.

J. Cast-in Stair Nosings: Balco two-component nosing, or approved equivalent:
1. Model: XH-330.
2. Material: 6063-T6 aluminum.
3. Insert Material: non-slip abrasive composite.
4. Finish: mill finish aluminum; integral insert color as selected by the Architect from the standard range.

K. Brackets for exterior handrails: Julius Blum wall bracket or approved equivalent:
1. Model: 270.
2. Material: stainless steel.
3. Mounting: blind mount to tapped stud.

2.02 FABRICATION

A. Verify dimensions on site prior to shop or site fabrication.

B. Fabricate items with joints tightly fitted and secured.

C. Fit and shop assemble in largest practical sections, for delivery to site.

D. Grind exposed welds flush and smooth with adjacent finished surface. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; locate unobtrusively, consistent with design of structure, except where specifically noted otherwise.

F. Make exposed joints butt tight, flush, and hairline.

G. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.

2.03 FINISH

A. Clean metal fabrication surfaces of rust, scale, grease, and foreign matter prior to galvanizing, priming, or painting.

B. Do not prime surfaces in direct contact bond with concrete or where field welding is required.

C. Prime paint items scheduled below with two coats.

D. Touch up holidays or damage at galvanized coatings with galvanized touch-up paint.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean and strip site primed steel items to bare metal where site welding is scheduled.

B. Make provision for erection loads with temporary bracing. Keep work in alignment.

C. Supply items required to be anchored into concrete with setting templates.

3.02 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects, and anchored firmly in place for long life under hard use.

B. Perform field welding in accordance with AWS D1.1, taking special care to protect adjacent wood surfaces from open flame or damage.

C. After installation of fabrications, touch-up field welds, scratched or damaged surfaces with primer.

3.03 CLEANUP

A. After installation of metal fabrications is complete, remove any burrs or welding slag from finished surfaces and touch up with primer prior to painting.

B. Remove any debris related to the work of this section from the job site.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Lumber and framing hardware

B. Framing practices and procedures

1.02 RELATED WORK DESCRIBED ELSEWHERE

A. Section 01 60 00 - Material and Equipment

B. Section 05 10 00 - Structural Steel

C. Section 05 50 00 - Miscellaneous Metals

D. Section 06 17 00 - Prefabricated Wood Structural Members

E. Section 06 40 00 - Architectural Woodwork

1.03 REFERENCES

A. American Plywoood Association.

B. Western Wood Products Association.

C. American Wood Preservers Institute.

D. California Redwood Association.

E. American Institute of Timer Construction.

F. Structural "General Notes," on Structural Drawings.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01 60 00.

B. Store and protect products under provisions of Section 01 60 00.

PART 2 - PRODUCTS

2.01 GENERAL

A. Where these specifications conflict with the Structural Engineer’s structural general notes the structural general notes shall take precedence.

2.02 GRADE CERTIFICATION

A. Each piece of lumber shall be grade marked by an agency acceptable to the local building official, in accordance with WWPA grading for solid lumber, AITC for glue laminated products, and APA grading for plywood products.

2.03 LUMBER MATERIALS

A. Foundation sills, nailers, or ledgers in direct contact with concrete or masonry, or within 6 inches of the ground: pressure treated DF-L No. 2, per AWPA Standard C1 and C2

B. Beams, girders and posts: DF-L No. 1 or better, maximum moisture content 19%, except as noted otherwise on drawings.

C. Joists, rafters, headers, plates, blocking, 2 X 6 thru 4 X 16, and miscellaneous wood not specifically described: DF-L No. 2 or better, moisture content 19%, except as noted otherwise on drawings.

D. Wall framing, 2 X 2 thru 4 X 6 (except headers): DF-L Stud grade or Standard and better, maximum moisture content 19%.

E. Subflooring and sheathing: Plywood conforming to U.S. Product Standard PS-1-07, Group 1 or 2, or APA Performance Rated Panels (plywood, composite board, oriented strand board). Roof or wall sheathing plywood shall bear the designation CDX Structural II or better.

2.04 ROUGH HARDWARE

A. Bolts and rods: ASTM A307-10, Grade A, square or hexagonal head.

B. Lag screws: Federal Specification FF-B-561C.

C. Nails: galvanized at exterior applications per Federal Specification FF-N-105A; sinkers allowed at interior; box nails prohibited.

D. Wood screws: Federal Specification FF-B-111D.

E. Framing clips, hangers, hold-downs, and connectors: standard "Strong-Tie" products of the Simpson Company.

F. Clamps, expansion bolts, washers, and anchors: steel or iron, subject to the approval of the Architect.

2.05 MISCELLANEOUS MATERIALS

A. Wood preservative for in-plant treatment: a solution of pentachlorophenol using either oil or LPG as the primary solvent in accordance with AWPA Standard LP-3 or LP-4.

B. Wood preservative for field treatment and field touch-up of plant treated wood: Copper napthanate.

C. Elastomeric adhesive: per APA Performance Specification AFG-01, as manufactured by DAP, Franklin, Georgia Pacific, or equal, compliant with current California VOC limitations.

PART 3 - EXECUTION

3.01 WOOD PRESERVATION TREATMENT

A. Treat all wood in direct contact with, or embedded in, concrete or within 6 inches of the ground, including sills, nailers, ledgers, wood grounds, and blocking. Treatment is not required if approved redwood products have been used in place of the specified lumber.

B. Treat all end cuts of above-grade lumber exposed to the exterior.

C. Treatment Method
1. In-plant treatment: Treat wood in strict accordance with product manufacturer's published recommendations and with AWPI Standards C1 and C2.
2. Field treatment: For field touch-up of plant treated wood, including at notches, holes, and cuts in treated lumber, and for field treatment of above grade lumber exposed to the exterior, treat wood in strict accordance with product manufacturer's published recommendations, using either a 15-minute dipping method or a 2 coat brushing method.

3.02 INSTALLATION AND WORKMANSHIP

A. The work of rough carpentry shall only be performed by skilled carpenters, in accordance with good standards of trade practice. All framing lumber shall be accurately cut and properly fit, true to dimension, line, rake or level and permanently secured in place.

B. Layout: establish the following items of layout work as shown on the drawings and as required for a complete and accurate installation:
1. Lines, levels, and locations for this work and other related work specified under other Sections of these Specifications.
2. Cutting, fitting, and patching to accomodate work specified under other Sections of these Specifications.
3. Backing, blocking, anchors, grounds, plates, and furring as required.

C. Lumber Selection: Select individual pieces of lumber so that knots and obvious minor defects will not interfere with connections, and so that the crown of the piece and tight knots are in the uppermost position. Lumber with splits longer than half the wide face of 2X lumber, or longer than the thickness of 3X and larger lumber shall not be used in the work. Select lumber for exposed exterior millwork with no visible recessed knots, splits, cheching, wanes, or similar defects.

3.03 FASTENINGS

A. Provide fastenings as required to produce framing without warping, sagging, buckling or similar defects. The number and size of nails, bolts, and other fasteners shall be as required by connector manufacturers, good trade practice, or as shown on the Drawings for specific structural conditions.

B. Nailing: provide nail size and spacing as called out on the Drawings, specified in CBC Table 2304.9.1, or as indicated in connector manufacturers' published recommendations.

C. Wood Screws shall be driven, not nailed into place. Provide embedment for anchorage of not less than six tenths (0.6) of the screw length. Bore starter holes for wood screws with a bit of not more than the diameter of the base of the threads.

D. Bolts:
1. Drill bolt holes 1/32" to 1/16" larger than bolt diameter, accurately located.
2. Use washers at each bolt head and nut.
3. Tighten nut at initial installation; retighten once more before the work is closed in.
4. Provide expansion shields as required or as directed by the Architect.

E. Lag Bolts:
1. Bore lead holes for lag bolts of the same diameter and depth as the unthreaded shank of the bolts.
2. Bore starter holes for threaded portion of lag bolts 60% to 75% of the threaded shank diameter and a length at least equal to the length of the threaded shank.
3. Insert lag bolts by turning with a wrench rather than driving with a hammer.
4. Use soap or another lubricant to facilitate insertion and avoid damage to the lag bolt.

F. Adhesives:
1. Apply an approved panel adhesive to supporting framing at all subfloor, subfloor/underlayment, and stair tread installations throughout the Work.

3.04 FRAMING

A. Provide framing that is closely fitted, accurately set in plumb planes, straight, true and level, and firmly secured in place.

B. Walls and Partitions: Anchor sills in place as shown on the Drawings; unless otherwise noted, non-structural walls may be secured with minimum 3/16" power driven fasteners at 16" o.c. maximum, penetrating at least 1-1/2", and not over 9" from ends.

C. Coordinate with painting under Section 09900 so that backprimed materials may be painted prior to installation without delay to the framing process.

D. Framed Platforms
1. Install joists and blocks with the crown edge up.
2. Blocking shall be a minimum 2X nominal thickness, intalled the full depth of joists or beams; block all panel edges at floor plywood and apply panel adhesive prior to plywood installation.
3. Set all flooring nails or connectors at or slightly below the panel surface.

3.05 SHEATHING

A. Roof Sheathing and Shearwall Sheathing: Install and fasten in strict compliance with General Structural Notes, Framing Notes and schedules on Drawings.

B. Continuity of Planes: Where sheathing is required by structural Drawings on only a portion of a wall, soffit, roof, or other plane, extend the plane with additional sheathing material or furring strips as required to achieve flatness and continuity of the finished surface.

3.06 CLEAN-UP

A. Periodically remove all scrap products, debris, and trash from the work site.

B. After framing is completed, thoroughly sweep or vacuum floor surfaces.

END OF SECTION

SECTION 06 17 00
PREFABRICATED STRUCTURAL WOOD

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Prefabricated wood trusses for roof framing.

B. Laminated structural lumber wood beams.

C. Bridging, bracing, and anchorage.

1.02 RELATED WORK

A. Section 05 50 00 - Miscellaneous Metals: Fabricated framing connectors.

B. Section 06 10 00 - Rough Carpentry

1.03 REFERENCES

A. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.

B. ASTM A167-99 - Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

C. ANSI/ASTM A446-93 - Sheet Steel, Zinc Coated (Galvanized) by the Hot-Dip Process, Physical (Structural) Quality.

D. AWPA - American Wood Preservers' Association.

E. FS TT-W-571 - Wood Preservation: Treating Practices.

F. NFPA - National Forest Products Association.

G. TPI - Truss Plate Institute.

H. UL - Underwriters' Laboratories, Inc.

I. WCLIB - West Coast Lumber Inspection Bureau: Standard Grading Rules for West Coast Lumber.

J. WWPA - Western Wood Products Association

K. ASTM D-5055 - structural performance of wood I beams

1.04 SYSTEM DESCRIPTION

A. Design roof live and dead load: per Structural Notes on Drawings.

B. Conform to wind loading and uplift requirements of the City of Manteca.

1.05 QUALITY ASSURANCE

A. Manufacturers: Companies specializing in manufacture of prefabricated wood structural members with three (3) years minimum experience.

B. Design prefabricated structural wood members under direct supervision of Professional Engineer experienced in structural framing design currently registered in good standing in the State of California, taking into consideration local wind speeds and the weight of specified roofing materials.

C. Lumber Grading Agency: Certified by ALSC.

D. Truss Plates: In accordance with Truss Plate Institute.

1.06 SUBMITTALS

A. Submit shop drawings, product data, and manufacturer's instructions under provisions of Section 01300.

B. Manufacturer's instructions shall include direction regarding off-loading, storing, stacking, and temporary bracing of trusses.

PART 2 - PRODUCTS

2.01 ROOF TRUSSES

A. Acceptable Manufacturers:
1. Redbuilt Trusses, 200 E. Mallard Drive, Boise, Idaho 83706 P.O. Box 60, Boise, Idaho, 83707 Phone: (866) 859-6757
3. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01300.

B. Materials
1. Materials shall comply with ICC ES Report No. ESR-1774 Chord members, web members, connecting pins and bearing hardware/attachments shall be of material and size as required by design.
2. Each of the trusses shall be identified by a stamp indicating the truss series, ICC ES evaluation report number, manufacturer’s name, plant number, date of fabrication, and the independent inspection agency’s logo.

C. Fabrication
1. Verify dimensions and site conditions prior to fabrication.
2. Cut members accurately to length to achieve tigh joint.
3. Jig trusses during fabrication to assure accurate configuration. Press connectors into lumber, both sides of joint simultaneously.
4. Build camber into truss to avoid soilid bearing at interior non-bearing partitions.

2.02 LAMINATED STRUCTURAL LUMBER BEAMS

A. Acceptable Manufacturers:
1. Anthony “Power Beams.”
2. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01300.

B. Materials:
1. Lumber: kiln dried Southern Pine.
2. Adhesive: ASTM D2559; Type for dry condition of service.

C. Fabrication:
   1. Fabricate laminated structural lumber beams in accordance with ICC Report ESR-1104; joints shall comply with ANSI/AITC A190.1-2002.
   2. Verify dimensions and site conditions prior to fabrication.
   3. Cut and fit members accurately to length to achieve tight joint fit.
   4. Fabricate member with camber built in.
   5. Do not splice or join members in locations other than that indicated, without approval of Structural Engineer.

PART 3.00 - EXECUTION

3.01 INSPECTION

A. Verify that supports and openings are ready to receive prefabricated structural wood members.

B. Verify that end bearing area complies with prefabricated member manufacturer's requirements.

C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Stack, spread, and install trusses, wood I beams and laminated structural lumber beams in accordance with manufacturer's instructions, at spacing indicated on drawings.

B. Place prefabricated members level and plumb, in correct positions.

C. Provide temporary bracing and bridging to hold prefabricated members in position until permanently secured.

D. Place permanent bracing, bridging and anchors to maintain prefabricated members straight and in correct position before inducing loads.

E. Fit prefabricated members together accurately without unauthorized trimming, cutting, or modifying. Do not field cut trusses.

F. Coordinate the placement of sheathing with the work of this Section; place bracing and bridging in a fashion which will allow the installation of panel edge backing as necessary.

G. Do not install any prefabricated members which are damaged or have poorly secured components, laminations, or connectors until the manufacturer has made or directed appropriate repairs or their Structural Engineers have confirmed the member will not be compromised.

3.03 TOLERANCES

A. Framing Members: 1/2 inch maximum from true position.

END OF SECTION

SECTION 06 40 00
ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items, other than prefabricated casework.

B. Interior and exterior trim.

C. Damaged wood restoration and preservation.

D. Hardware and attachment accessories.

E. All labor and materials necessary for a complete installation of the work of this Section, whether or not specifically described.

1.02 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry

B. Section 08 20 00 - Wood Doors

1.03 REFERENCES

A. ANSI/HPHA HP - American Standard for Hardwood and Decorative Plywood.

B. ANSI A135.4 - Basic Hardboard.

C. AWI - Quality Standards.

D. FS MM-L-736 - Lumber; Hardwood.

E. FS MMM-A-130 - Adhesive, Contact.

F. NEMA LD-3 - High Pressure Decorative Laminates.

G. PS 1 - Construction and Industrial Hardwood.

H. PS 20 - American Softwood Lumber Standard.

I. UL - Underwriters Laboratories.

J. APA - Specialty Plywood Panels.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 01 30 00.

B. Submit instructions for use of adhesives, attachment hardware and finish hardware.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver Products to site under provisions of Section 01 60 00.

B. Store and Protect products under provisions of Section 01 60 00.

C. Store materials in ventilated, interior locations under constant minimum temperatures of 60 degrees F and maximum relative humidity of 55 percent.

PART 2 - PRODUCTS

2.01 MATERALS - GENERAL

A. Where not shown or specified otherwise, softwood materials may be used for the work of this Section.

2.02 LUMBER MATERIALS

A. Interior Softwood Lumber: PS 20; Custom grade in accordance with AWI; maximum moisture content of 8 percent; fir or pine species, with mixed grain, paint grade unless specifically required to be stain grade. Finger jointed material is allowed in paint grade applications.

B. Exterior Softwood Lumber: Custom grade per AWI; maximum moisture content of 19%; Douglas fir or hemlock species, with mixed grain, paint grade unless specifically required to be stain grade.

C. Hardwood Lumber: FS MM-L-736; Custom grade in accordance with AWI; maximum moisture content of 8 percent; American Cherry or similar species as approved by Architect, stain grade.

2.03 SHEET MATERIALS

A. Wood Particleboard: Composed of wood chips, shavings or flakes made with waterproof resin binders of high density; sanded faces.

B. Hardboard: ANSI A135.4; pressed wood fiber with resin binder; tempered service grade.

C. Overlaid Plywood: Medium Density Overlay (MDO), APA rated Group 1, Exterior.

2.04 ADHESIVE

A. Contact Adhesives: FS MMM-A-130; solvent release type.

2.05 WOOD REPAIR MATERIALS

A. Consolidant: Abatron LiquidWood epoxy consolidant.

B. Fungicide: Nisus Corporation Bora-Care (Disodium Octaborate Tetrahydrate-40%).

C. Filler: Abatron WoodEpox non-shrinking adhesive putty.

D. Sealer: Amteco TWP-1500 series penetrating preservative sealer.

2.06 WOOD TREATMENT MATERIALS

A. Fire Retardant (`FR-S' Type): Chemically treated, and pressure impregnated; capable of providing a maximum flame/fuel/smoke rating of Class I or Class A, as appropriate to use and location.

B. Wood Preservative (`PT' Type): clear, as appropriate to use and location.

2.07 ACCESSORIES

A. Nails: Size and type to suit application, coated finish.

B. Bolts, Nuts, Washers, Blind Fasteners, Lags, and Screws: Size and type to suit application; plain finish.

C. Lumber for Shimming, Blocking: Softwood lumber of fir or pine species.

D. Primer: Alkyd primer sealer type per Section 09 90 00.

E. General Purpose Wood Filler: Oil base, tinted to match surface finish color.

2.08 FABRICATION

A. Fabricate to W.I.C. Custom standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and openings are ready to receive work and field measurements are as shown on shop drawings or instructed by the fabricator.

B. Verify mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this work.

C. Beginning of installation means acceptance of existing conditions and substrate.

3.02 PREPARATION

A. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.03 INSTALLATION

A. General: Install work in accordance with W.I.C. Custom quality standards.

B. Set and secure materials and components in place, plumb and level.

C. Install components and trim with nails, screws or bolts as indicated on the Drawings and in these Specifications; install in a way which conceals fasteners to the maximum extent practical.

D. Install hardware in accordance with manufacturer's instructions.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

3.05 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: Refer to Section 09 90 00.

3.06 BEAM-END WOOD DAMAGE REPAIR

A. Remove rotted wood, splinters, dirt, etc. to a continuous working surfaces for repairs.

B. Consolidate soft, weathered, and partially rotted wood with combination of epoxy consolidant and fungicide.

C. Fill voids with non-shrinking epoxy putty to approximate original beam shape.

D. Carefully sand in order to re-create original beam shape.

E. Finish with sealer/preservative.

F. Apply new flashing caps per Drawings.

3.07 PROTECTION

A. Protect finished installation under provisions of Section 01 50 00.

END OF SECTION

SECTION 07 20 00
INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Sound insulation at new interior walls.

1.02 RELATED WORK

A. Section 06 10 00 - Rough Carpentry

B. Section 09 25 00 - Gypsum Board

1.03 REFERENCES

A. ASTM C665-06, Type III, Class B - thermal performance

B. ASTM C423-09, Type E-405 - sound absorption of materials

C. ASTM E136-11 - flammability of materials

1.04 SUBMITTALS

A. Submit product data under provisions of Section 01 30 00.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the site under provisions of Section 01 60 00.

B. Store and protect products under provisions of Section 01 60 00.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Owens-Corning, Sound Control Batts.

B. CertainTeed, Sound Control Batts.

C Alternate products may be used on the basis of submittals made under provisions of Section 01 30 00.

2.02 SOUND INSULATION

A. 3-1/2 inch unfaced fiberglass Sonobatts, at identified interior walls and attics, as follows:
1. Sound Transmission Coefficient: 45 or better
2. Flame Spread: 25 or less
3. Flammability Rating: Class A
4. Insulation Value: R-11

PART 3.00 - EXECUTION

3.01 EXAMINATION

A. Verify that conduit, plumbing, and other installations in walls or insulated attic space have been completed, and necessary inspections have been made so that insulating may commence.

B. Beginning of work means acceptance of existing conditions.

3.02 INTERIOR WALL INSULATION

A. Install sound insulation batts at all new framed walls or other conditions shown on Drawings.

B. Install batts friction fit between studs. If stud spacing allows batts to slump, use wire to hold batts up in wall cavity.

3.03 CLEAN-UP

A. After completion of insulation installation, remove all scrap material, packaging, and debris from the work site.

END OF SECTION

SECTION 07 50 00
MEMBRANE ROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Scope of Work:
1. Installation of PVC roof membrane.
2. All parts of the Contract Documents that relate to the work specified in this section also applies to this section.
3. The preparation of substrate and/or related areas, installation of roof system, sheet metal and accessories.
4. Contractor is responsible to verify all existing conditions relative to fulfill contract documents and installation of roof system per intent of contract specifications. This shall include familiarity with information provided in but not limited to the documents referenced in this paragraph.

1.02 RELATED SECTIONS

A. Installation relating to roof system:
1. All Work of 1.02 is to be provided by the Roofing Contractor or his subcontractor as part of this Section.
2. All work to comply with project detail drawings.
3. As per SMACNA Architectural Sheet Metal Manual “Sixth Edition.”
   a. All Components: Conform to applicable building code.
   b. Maintain one copy on site.
4. As per latest manufacturers and Project detail drawings.

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry
2. Section 07 90 00 - Joint Sealers
3. Section 09 20 00 - Lath and Plaster
4. Section 09 90 00 - Painting
5. Section 15 40 00 - Plumbing
6. Section 15 60 00 - Heating, Ventilating, and Air Conditioning

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM): Reference latest revisions of standards unless otherwise indicated.
1. ASTM D 4434-87: Standard Specification for Polyvinyl Chloride Sheet Roofing
2. ASTM C 203-92: Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
3. ASTM C 272-91: Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions
4. ASTM C 1289-95: Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board:
5. ASTM C 303-90: Test Method for Density of Pre-formed Block - Type Thermal Insulation
6. ASTM D 162173: Test Method for Compressive Properties of Rigid Cellular Plastics.
7. ASTM C 578-91a - Federal Specification No. H-H-I-524B. Types I & II EPS Insulation
8. ASTM E 108: Standard Method for Fire Testing of Roof Coverings.

B. Underwriters Laboratories:
   1. ANSI/UL Standard 790: Test for Fire Resistance of Roof Covering Materials

C. Factory Mutual:
   1. Factory Mutual System Approval Standard: Class I Roof Covers, Class Number 4470

1.04 ROOF SYSTEM DESCRIPTION

A. The following paragraphs are generally applicable requirements for performance of work on this project.
   1. Installation of roof system, insulation and roof deck shall conform to contract specification requirements. Industry practices apply only when specification and/or project documents do not address an item. Manufacturers specification designed specifically for this project may supersede printed literature. Project drawings shall not be exclusive and used mutually with requirements set forth in project specification.
   2. Reference Section 01 30 00.
   3. Reference Section 01 40 00.
   4. The Contractor shall exercise all due precaution to prevent disruption to the occupancy of the facility interior or grounds. Every effort must be employed to prevent causing additional damage to the existing roofing assembly while working in an adjacent area, point overloading of the roof deck, and damage to roof areas not in this contract.
   5. During periods of precipitation, the Contractor shall be responsible for performing, at least daily interior building inspections for leaks in the area of his work. Contractor's representative shall report to the Owner's facility engineer to inquire about known building roof leaks. Should there be any such leaks, the contractor shall repair them immediately to prevent interior building damage.
   6. The Contractor shall maintain a complete set of Project Specifications, Contract Drawings and other items identified in the project documents on the rooftop during the course of work on this facility. Failure of proper installation by the contractor, due to unavailability of Project Specifications or Drawings on the roof, constitutes negligence.

B. Roof deck shall meet the project document criteria as minimum standards.

1.05 SUBMITTALS

A. Reference Section 01 30 00.

1.06 QUALITY ASSURANCE

A. Qualifications
   1. Reference Section 01400
   2. Contractor Qualifications: Submit the following as a supplement to Section 01400.
      a. Name of "Approving Authority" for Contractor
      b. Name of designated individual to complete daily inspection forms for contractor.
      c. Name of designated individual to attend Pre-Construction Conference and Final Close out and Maintenance conference.
      d. Current California C-39 Roofing Contractor license.
      e. Written proof of manufacturers approved applicators status for this project.
      f. Contractor shall assure that the installed roof system complies with specifications by providing written evidence documenting the work as per contract documents on format acceptable to Architect.
      g. Written assurance that he is aware of and proficient in all safety, control measures, precautions, and programs in connection with the Work as to familiarize and full understanding of the manufacturer's safety programs and their recommended procedures for safe application of their product as to include its crew, the owner and all occupants of building.

3. Manufacturer Qualifications: Submit the following as a supplement to Section 01 40 00:
   a. Will provide approval stamp from manufacturers technical department on all project drawings with notations, and/or attachments for material applicability, installation and warranty criteria to the “Approving Authority” for review and approval prior to construction.
   b. Sample of manufacturers warranty and/or addendum’s to be issued for this project in conjunction with specification warranty.
   c. Name of “Approving Authority” for Manufacturer responsible and authorized to make technical decisions for installation and warranty eligibility.
   d. Describe method of periodic inspections during the course of the project as required by the Architect.

B. Regulatory Requirements
   1. Underwriters Laboratories (UL):
      a. Fire Classification Rating: UL 790 Standard "Class A."
   2. Factory Mutual:
      a. Factory Mutual approved fastening.
   3. Building Code:
      a. Meet applicable provisions of local, state and national building codes. This is also applies to agencies regulating safety, environmental, transportation etc..
      b. Meet applicable requirements of “California Building Code (CBC, CCR, Title 24)

C. Pre-Installation Meetings
   1. Prior to ordering materials and commencing roofing, attend a pre-installation conference to discuss the specified roofing system and its proper application. Notify the manufacturer’s designated project representative when the pre-installation conference is scheduled.
   2. Pre-installation conference shall include manufacturer’s designated representative, approving authority and Contractor to establish application criteria and procedures for Project.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver roofing materials and accessories in manufacturer's original protective containers with labels intact and legible. Comply with manufacturer's published instructions for storage and handling.

B. Store materials in dry protected areas, on clean, raised platforms with securely anchored weather protective covering.

C. Store flammable products away from spark or open flames.

D. Store roofing materials at a minimum of forty-five (45) degrees Fahrenheit prior to use as recommended by the manufacturer. Protect materials from freezing.

1.08 PROJECT CONDITIONS OR SITE CONDITIONS

A. Proceed with roofing work only when weather conditions comply with manufacturer's recommendations. Do not exceed temperature limitations recommended by the manufacturers.

1.09 WARRANTY

A. Manufacturer Warranty:
   1. Provide a NDL twenty (20) year warranty covering materials and workmanship as to include leaks and defective materials. The effective date of the warranty shall be the "date of completion" as determined in accordance with contract documents. Contractor shall notify Manufacturers Designated Representative prior to start of roof system installation. If a longer period or greater coverage is prescribed by Federal or California law, the stricter or one providing greater protection to the Owner shall prevail.
   2. The Manufacturer shall at the same time correct any condition which was caused by the defective or non-conforming Work, without expense to the Owner except if such leaks and defects were the caused by acts of god, owner, structural deficiencies, vandalism, civil insurrection, improper maintenance and other trades after completion. The correction of any Work found defective during the period of any guarantee, warranty or the like shall be of first class workmanship, and any replacement materials and equipment shall be new and of recent manufacture, free of faults and defects, and shall conform with the Contract Documents. The Owner will inspect the Work prior to the expiration of the guarantee.

B. Contractors Warranty:
   1. The Contractor shall guarantee the Work for a period of three (3) years from the date of Substantial Completion. Unless the Owner accepts a designated part of the Work as Substantially Complete, the period of any guarantee, warranty or the like shall run for the accepted designated part from the date Architect accepts in writing. If a longer period is prescribed by law or by the terms of any applicable special guarantee, warranty, or the like required under the Contract Documents, then the stricter or one providing greater protection to the Owner shall prevail. If during any period of any guarantee, warranty or the like, any of the Work is found to be in need of repair or replacement, the Contractor shall, at no expense to the Owner, repair or replace any such Work after receipt of notice from the Owner.
   2. The Contractor shall at the same time correct any condition which was caused by the defective or nonconforming Work, without expense to the Owner except if such leaks and defects were the caused by acts of god, owner, structural deficiencies, vandalism, civil insurrection, material defects unless otherwise provided for in Manufacturers warranty, improper maintenance and other trades after completion. The correction of any Work found defective during the period of any guarantee, warranty or the like shall be of first class workmanship, and any replacement materials and equipment shall be new and of recent manufacture, free of faults and defects, and shall conform with the Contract Documents. The Owner will inspect the Work prior to the expiration of the guarantee.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Accepted Manufacturers:
   1. Manufacturer must currently meet established criteria of this section and related contract documents. Accepted manufacturers:
      a. Johns Manville
      b. Firestone
   2. Wherever applicable, all insulation, fasteners, vents, drains, adherents, coatings, sheet metal, base, ply, flashing and membrane sheets shall be supplied by the manufacturer providing roof system warranty. Separate warranties for items such as insulation adhesives/fasteners, insulation and substrates that are available from the respective manufacturer may be included as an addition to the membrane manufacturer’s warranty.

3. Exceptions to 2.01 A.3:
   a. All additional items not furnished by warranting manufacturer but required for completion of roof system must be listed and approved in writing by the warranting manufacturer that while not provided by them, will not alter the performance of or warranty for the specified roof system.

2.02 FASTENERS

A. Fasteners for Wood /Nailers
   1. Reference Section 06 10 00 - Rough Carpentry.

B. Fasteners for Sheet Metal:
   1. Stainless Steel Sheet Metal Screw: One quarter (1/4) inch Phillips head, twin lead fifteen and one half (15-1/2) threads per inch of sufficient length to penetrate the metal a minimum of one-half (1/2) inch.
      a. Neoprene washer.
   2. Solder: ASTM B32; 50/50 type.

2.03 ADHERENTS/ADHESIVE/SEALANTS

A. To Bolts/Sealant:
   1. Clear Silicone, gunable to minus twenty (-20°) degrees. Mildew and fungus resistant, alkaline and acid stable, paintable, minimum of eight hundred (800) percent elongation. Conforming to ASTM-C-920.

B. To Seal: Caulk/Sealant
   1. Product: Caulk
   2. Description: Single component, gun grade, non-sag, elastomeric polyurethane sealant.
   3. Usage: All details requiring caulk/sealant.

C. To Seal: Seams
   1. Product: Thermoplastic Sealant
   2. Description: Liquid Thermoplastic compound
   3. Usage: Placed at the edge of PVC membrane seams.

D. To Seal: Water Cutoff
   1. Description: One component low viscosity, self-wetting butyl blend mastic
   2. Usage: Sealing agent for temporary watertight seals

2.04 ROOFING MEMBRANE

A. Surface Membrane/Flashing Membrane
   1. Product: UltraGard SR - 80
      a. Description: Fused thermoplastic fiber reinforced PVC
      b. Thickness: (80) mil (.080”)
      c. Usage: Surface membrane
      d. Color: White

2.05 FLASHING

A. Unreinforced Flashing Membrane:
   1. Product: UltraGard PVC Detail Membrane:
      a. Description: Unreinforced PVC membrane
      b. Thickness: Eighty (80) mil (.080”)
      c. Usage: Flashing membrane
      c. Color: White

B. Foil Tape:
   1. Product: UltraGard Aluminum Tape
      a. Description: Dead soft aluminum foil tape with acrylic adhesive backing
      b. Usage: As indicated in project drawings.
      c. Thickness: 3 mil

C. Prefabricated Pipe Boots:
   1. Product: UltraGard PVC Vent Pipe Boot
      a. Description: Fused thermoplastic fiber reinforced /nonreinforced PVC
      b. Usage: Flashing
      c. Color: White
      c. Dimensions: ASTM D-751-79
      a. Cone Shaped with 35 x 35 cm (14" x 14") flange.
      e. Thickness: (60) mil (.060")

2.06 ACCESSORIES

A. Sheet Metal:
   1. General:
      a. Match existing components when possible. All replacement components to meet current code and industry standards for size, quality and applicability.
   2. Product: Metal Flashings:
      a. Product: UltraGard PVC Clad Metal
      b. Description: Laminate of PVC membrane and galvanized steel. PVC Clad Metal:
      c. Usage: Provide monolithic watertight flashing metal at curbs and transitions as indicated in project drawings.
      d. Color: White
      e. Galvanized Steel: 24 gauge
      f. Vinyl Backing Coating: 40 mil (1.0 mm)
      g. Vinyl Thickness: ASTM B-604:
   3. Product: Termination Bar
      a. Description: Aluminum flat bar
      b. Usage: Termination for flashings
      c. Material: Corrosion resistant aluminum
      d. Edge: Caulk reservoir channel on top
      e. Holes: Pre-punched 100 mm (3.93") OC with 7 x 10 mm (0.28" x 0.38") slotted holes
      f. Bar: 2.3 mm (.090") thick x 32 mm (1.25") wide x 3 m (10')

B. Drains:
   1. Reference Section 15400 Plumbing.

C. Vents / Sheet Metal Ductwork:
   1. Section 15600 - Heating, Ventilating, and Air Conditioning
   2. Section 07600 – Flashing & Sheet Metal.

D. Walkpads:
   1. UltraGard PVC WBP-100
      a. Description: Texturized nonreinforced PVC sheet
      b. Usage: Heavy-duty walkway pad.
      c. Color: Blue
      d. Thickness: 100 mil (2.5mm)

PART 3 - EXECUTION

3.01 SITE CONDITIONS, PRE-CONSTRUCTION, REMOVAL

A. Pre-Construction Requirements:
   1. Contractor shall not proceed with any removal or installations until all submittals, certifications, required pre-constructions conferences, changes or variations in project specifications have been submitted, conducted and approved for start.

B. Site Conditions
   1. Contractor shall submit to Architect a video or photographs and a written report of existing interior and exterior damage, leakage etc. Damage not recorded and submitted may be subject to repair by the contractor at no additional cost to owner.
   2. All supplies, equipment, materials, coatings, containers, etc. shall be stored in an orderly manner, carefully arranged and adequately protected.

C. Equipment / Electrical Disconnects:
   1. Roof Mounted Equipment:
      a. Removal or raising of roof top equipment, skylights, vent, ductwork, or other appurtenances shall be in accordance with the contract drawing notation, contract specification, and, as necessary, to accommodate manufacturer's warranty requirements for a proper installation of the new roofing assembly components.
   2. Electrical conduit and junction boxes located on the roof deck and walls. Do not proceed with roofing until:
      a. Determine if existing electrical is live or abandoned.
      b. Verify attachment and conditions of live electrical equipment meet current regulatory requirements.
      c. Mark all live junction boxes prior to installation of new roof system and disconnect as required to safely installing roof membrane.
      d All electrical disconnects to be performed by a licensed electrical contractor.

3.02 EXAMINATION

A. Verify securely supported and attached deck, free of depressions, waves or projections.

B. Verify deck surfaces are dry and free of moisture in any form.

C. Verify proper placement of roof openings, pipes, curbs, sleeves, ducts, vents, drains and other penetrations.

D. Verify proper securement of penetration or roof-mounted equipment.

E. Verify proper installation and drainage of all metal crickets.

3.03 JOB AND WEATHER CONDITIONS

A. Suspend all application and installation activities during inclement weather.

B. Protect adjacent building surfaces against damage and adhesive / adherent / bitumen spillage.

C. Protect roof deck from moisture by providing water cut-off at the end of each day's work or when the weather is threatening. Failure to protect the deck and roofing from moisture will result in the removal of damaged materials or materials containing excessive moisture. Remove water cut-off prior to start of new work.

1. Reference Project Drawings.
2. Remove cut-off and tie-ins prior to continuing application. Remove all wet insulation or damaged portions of the roof system.
3. In accordance with quality control requirements continue installation of roof system as specified.

D. Remove debris from roof deck and site on a daily basis and dispose at an approved disposal site.

E. Do not permit traffic or material storage on completed roof surfaces.

F. Any application of roofing / waterproofing materials below forty (40) degrees F. shall require the contractor to address special procedures. It is the contractor's responsibility to insure that the following minimum requirements are met:
1. Maintain proper operating temperatures of all equipment
2. Maintain proper application temperatures of all adherents, sealant etc.
3. Maintain proper storage of all materials.
4. Adjust application techniques to insure proper application of materials as per specifications criteria.

3.04 ADHERENTS/ADHESIVES/SEALANTS

A. Per manufacturers written requirements for storage and application temperatures. Keep one set of written requirements on site at all times.

B. Consult all container labels and MSDS sheets prior to application. Provide protection for all building occupants by preventing fumes; vapors etc. from entering building air supply, open windows and doors. Provide building occupants with MSDS sheets and curing times prior to installation.

C. Single Ply Adhesive:
1. Adhesives should be stored between (16°C) (60°F.) and (27°C) (80°F). Adhesive should only be applied when ambient temperatures are above forty (40) degrees F. (82°C). When applied at lower temperatures care should be taken to make sure temperature at actual point of application complies with specifications.
2. Do not thin adhesive with solvents. Cements and solvents and their fumes may be extremely flammable. Do not breathe vapors or use near fire. Store away from open ventilators.
3. Consult manufacturer of all adhesives for appropriate protective clothing and eye protection.

3.05 SUBSTRATE PREPARATION

A. Comply with applicable manufacturers published instructions for preparation of substrates to receive sheet roofing. Prior to priming, clean substrate of dust, debris, and other substances detrimental to roofing work.

B. Decks must be adequately smooth and level to provide support and maximum contact surface for roofing materials. The deck must be dry, clean, and free of debris, sharp projections and depressions.

C. Complete, repair and/or replace and subsequently seal all openings, drains, vents, conduit or other projections through the deck prior to roof system installation.

D. Steel Decks:
   1. Verify removal of surface corrosion and application of protective coating, repairs to holes or severely corroded areas, treatment to loose or inadequately secured decking, and replacement of irreparable or otherwise defective decking, as applicable.
   2. Repairs and replacement shall be made by deck installing contractor.
   3. Insure that decks provide specified slope to drain.

3.06 SURFACE MEMBRANE

A. Insure installation of required membrane to meet Class “A” fire rating.

B. No underlayment required.

C. Mechanically attach roof membrane parallel to roof slope.
   1. Layout chalklines beginning at drains or low points to provide accurate placement. Do not use factory-applied lines if in conflict with chalklines.
   2. Position unfolded membrane over substrate without stretching. Allow membrane to relax one-half (1/2) hour prior to application. Repeat for additional sheets.
   3. Laps: Minimum five (5) inch.
   4. Stagger laps a minimum of eighteen (18) inches from underlying plies or seams.

D. Attaching Membrane
   1. Ensure membrane is smooth and free of wrinkles or buckles.
   2. Place fasteners six (6) inches on center along all seams/laps
      a. Maximum distance between edge of top sheet and fastener penetration on bottom sheet shall be four (4) inches.
      b. Do not overdrive fasteners. Reinstall loose or overdriven fasteners.
   3. Additional perimeter attachment requirements:
      a. Calculated by membrane manufacture to comply with latest Factory 1-90 wind uplift criteria
      b. Utilize copings and/or metal edging with membrane turned down over edge of roof and fastened a minimum of twelve (12) inches on vertical nailer.
      c. Fasteners shall provide a minimum of one hundred seventy-five (175) pounds pull withdrawal.

E. Seam Application:
   1. Allow membrane to relax one-half (1/2) hour.
   2. Place fasteners six (6) inches on center along all seams/laps
      a. Maximum distance between edge of top sheet and fastener penetration on bottom sheet shall be four (4) inches.
      b. Do not overdrive fasteners. Reinstall loose or overdriven fasteners.
   3. Heat weld all seams with approved equipment.
   4. Allow seams to cool and check for voids or deficiencies.
   5. All seams and laps shall be completed daily.

F. Additional Attachment
   1. Mechanical attachment is required at all penetrations and areas of transition with slopes greater than two (2) inches.
   2. Attachment is required to pressure treated nailers. Nailers shall be a minimum of three and one-half (3-1/2) inches wide with depth conforming to roof system dimensions.
   3. Fasteners shall provide a minimum of one hundred seventy-five (175) pounds pull withdrawal and spaced every eight (8) inches on center.
   4. Non-nailer fastened terminations shall be mechanically fastened through manufacturer supplied plate extending through membrane, substrate and roof deck.

G. Areas not meeting the above criteria shall be reapplied. Cut out all voids / blisters or other areas of improper application and reapply to match specified configuration.

3.07 FLASHINGS

A. General:
   1. Inspect roof system to insure full adhesion and proper application of all components prior to flashing and walkpad.
   2. Allow membrane to fully cure prior to application of flashings. All surfaces to be adhered should be compatible, dry and smooth with no excessive surface roughness.
   3. All metal counterflashing shall be designed to completely cover and shield the flashing membrane a minimum of four (4) inches or as indicated in project drawings.
   4. All protrusions shall be at least eight (8) inches from the curbs, walls, and edges to provide adequate space for proper sealing or as specified. All other projections will require specific detail/approval by Owners' Representative and Manufacturer.
   5. Mechanically fasten the top of all flashing membranes per project drawings. Do not overdrive fasteners.
   6. Verify wood nailers are of proper thickness, width and chamfer to accommodate flashing metal and transition to roof membrane.

B. Project Drawings:
   1. The detail requirements as they pertain to this project must be followed for metal perimeter/copings, roof vents, etc. This includes all metal flange surfaces, approved adherent/sealants and membrane configurations.
   2. Install flashing membrane in a smooth manner to avoid any voids, ridges or fishmouths in the approved adhesive at the rate of two (2) gallons per one hundred (100) square feet. Allow all adhesive to dry properly for optimal application. Do not apply any adhesive to portions of membrane to be heat welded. Apply seam sealant to all welded seams as directed by manufacturer.
   3. Install per project and manufacturers drawings. If not specifically addressed otherwise in drawings, adhere flashing membrane in a smooth manner to avoid any voids, ridges or fishmouths. Inspect for any voids, fishmouths or other imperfections. Cut and repair fishmouth with additional layer of membrane.
      a. Extend completed flashing membranes a minimum of four (4) inches above the cant strip and/or a minimum of eight (8) inches above the roof surface. Flashing membrane shall extend a minimum of four (4) inches onto the roof membrane past horizontal/vertical and/or metal deck flange transitions.
      b. All heat-welded laps shall overlap all adjacent sheets a minimum of two (2) inches beyond any fasteners and shall be applied per roof membrane section of Specification.

3.08 ACCESSORIES

A. General:
   1. New metal accessories shall be carefully handled and returned to usable condition upon completion of the roofing work. Damage done to such materials shall require replacement with new metal to match the original in thickness, type, attachment method, and configuration. Replacement shall be at the cost of the contractor and subject to acceptance by the Owner regarding quality of workmanship and materials.
   2. Damaged metal is defined as metal that has either been bent or disfigured to such degree that it cannot be properly reformed as to closely approximate the original installation or has been dislodged from its fastening point sufficiently as to prevent proper reinstallation.

B. Sheet Metal:
   1. Reference Contract Drawings & Roof Plan.
   2. Reference Manufacturers Drawings/Requirements:
   3. Reference Section 07 60 00.
   4. As per SMACNA Architectural Sheet Metal Manual “Fifth Edition.”
   5. Make watertight all worn, loose or missing tape/sealants at existing HVAC ducts. Use only accepted materials and install as per Inspector.
   6. Seal all metal joints watertight.
   7. Paint concealed metal surfaces with protective backing.
   8. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
   9. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
   10. Join parts with rivets or sheet metal screws where necessary for strength or stiffness. Solder all steel joints and weld all aluminum joints unless otherwise directed in detail drawings.
   11. Weld or solder all corner pieces. Corner pieces should be twenty-four (24) inches long on each side.
   12. Any details where metal caps are being folded upward and then returned to original position to facilitate installation of new baseflashing, roofing contractor shall provide new metal caps at the corners of existing metal caps extending a minimum of three (3) inches in both directions.

C. Drains:
   1. Reference Contract Drawings & Roof Plan
   2. Reference Manufacturers Drawings/Requirements

D. Vents:
   1. Reference Contract Drawings & Roof Plan.
   2. Reference Manufacturers Drawings/Requirements

E. Specialty:
   1. Walkpads:
      a. All dirty or contaminated areas that may interfere with surfacing adhesion must be cleaned prior to application.
      b. Insure that all field and flashing membranes, accessories and other areas directly related to the roof system have been properly installed and thoroughly cured prior to application of walkboards. All deficiencies, regardless of trade, must be corrected prior to application. Do not proceed until all areas have been inspected and approved by Inspector.

c. Verify location of all pads with owner representative prior to installation.
d. Install heat welded applied walkboard.
   1) Walkboard shall be heat welded with minimum of 2" lap on perimeter.
   2) Application in areas that may impede proper drainage. Place boards with a minimum of two (2) inch spacing.
   3) Prevent all foot traffic until walkboard has cured.
e. Install in areas as follows:
   1) Under support blocks.
   2) Around equipment panels.
   3) Around access hatch.
   4) Under duct legs.

F. Sealants:
1. General
   a. Install as per contract drawings and approved Manufacturers drawing for this project
   b. Install sealants at all points of termination or other locations necessary to render the entire roofing assembly and related substrates watertight. Additional points of installation shall be based on field conditions and as necessary per good roofing practices, to include doorframes, window frames and lintels, and other such wall related appurtenances where the roofing membrane is terminated at the base of a rising wall. Caulking and sealant products and installation shall be in accordance with Specification
   c. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.
2. Preparation per mfg. requirements.
3. Installation of back-up material:
   a. Use on the back-up material recommended by the manufacture of the sealant and approved by the Inspector for the particular installation, compressing the back-up material to a secure a positive and secure fit.
   b. Materials must be one and one-half (1-1/2) times the width of the joint.
4. Joint design:
   a. Joint depth shall never be greater than width.
   b. In deep joints, the sealant depth shall be controlled by the use of backup materials to retain the recommended depth.
   c. Where depth of joint does not permit back-up material then a bond breaker strip must be installed to prevent three (3) point bonding.
5. Installation of sealant:
   a. General: Prior to the start of installation in each joint, verify the joint type according to the details in the drawings and verify that the required proportion of width of joint to depth of joint has been secured.
   b. Installation of Sealant: Install the sealant in strict accordance with the manufacturer's recommendations as approved by the Inspector, thoroughly filling all joints to the recommended depth.

3.09 REINSTALLATION

A. Clean out and reinstall any drains. Water test. Correct leaks and defects.

B. Mechanical Contractor shall reconnect all disconnected equipment and start to insure proper working order.

3.10 FIELD QUALITY CONTROL

A. All inspections shall be in accordance with Section 01400.

B. Manufacturer shall provide quality assurance inspections, technical assistance and membrane application guidance as may be necessary to complete the roofing membrane application in accordance with project specification and warranty requirements.

C. Contractor shall inspect completed roofing and correct all defects to meet the specification requirements and project documents.

D. It is the responsibility of the Contractor to coordinate all activities required by the manufacturer to obtain the warranty per 1.12.

3.11 CLEANING

A. Upon the Substantial Completion of the Work, the Contractor shall remove all waste materials and rubbish from and about the Site, as well as all tools, construction equipment, machinery, and surplus materials and leave the Work “broom-clean” or equivalent.

B. The Contractor and Subcontractors shall be responsible for cleanup as indicated in accordance with the Contract Documents.

C. Clean any drips or spills of roofing materials, accessories or other cosmetic deficiencies as noted by the Owners representative.

D. If the Contractor fails to clean up, after notice to do so, the Owner may do so and the cost shall be charged to the Contractor.

END OF SECTION

SECTION 07 60 00
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Metal gutters and downspouts.

B. Miscellaneous flashings and counterflashings as required to protect building from water penetration.

1.02 RELATED WORK

A. Section 06 10 00 - Rough Carpentry

B. Section 07 50 00 - Membrane Roofing

C. Section 09 20 00 - Lath and Plaster

D. Section 09 90 00 - Painting

E. Section 22 00 00 - Plumbing

F. Section 23 00 00 - Heating, Ventilating, and Air Conditioning

1.03 REFERENCES

A. AA (Aluminum Association) - Aluminum Construction Manual: Aluminum Sheet Metal Work and Building Construction.

B. ANSI (American Iron and Steel Institute) - Stainless Steel - Uses in Architecture.

C. ANSI/ASTM B32 - Solder Metal.

D. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate.

E. ASTM A525 - Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process.

F. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

G. FS O-F-506 - Flux, Soldering, Paste and Liquid.

H. FS QQ-S-571 - Solder, Tin Alloy.

I. FS SS-C-153 - Cement, Bituminous, Plastic.

J. NAAMM - Metal Finishes Handbook.

K. NRCA (National Roofing Contractors Association) - Roofing Manual.

L. SMACNA - Architectural Sheet Metal Manual.

1.04 SYSTEM DESCRIPTION

A. Work of this Section shall be applied in a fashion which will physically protect roofing, exterior walls, openings in exterior surfaces, and exterior joints between materials from damage and water penetration that would permit water leakage to building interior.

1.05 QUALITY ASSURANCE

A. Design and Fabrication: In accordance with the standards and practices described in the SMACNA Architectural Sheet Metal Manual, latest edition.

B. Applicator: Company specializing in sheet metal flashing work with three years minimum experience.

1.06 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 30 00 for any custom fabricated flashings.

B. Submit product data under provisions of Section 01300 for gutter and downspout products. Include color samples for any factory applied finishes.

1.07 STORAGE AND HANDLING

A. Store products under provisions of Section 01 60 00.

B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation.

C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

PART 2 - PRODUCTS

2.01 SHEET MATERIALS AND FLASHING PRODUCTS

A. Except where special flashings integral to the membrane roof system are described in Section 07 50 00, design of flashings for the work is based on the use of galvanized steel sheet; aluminum or stainless steel sheet may be substituted as specified herein.

B. Galvanized Steel: ASTM A525, 26 gage minimum thickness core steel unless otherwise noted.

C. Aluminum Sheet: ASTM B209, 0.032 inch, plain finish.

D. Stainless Steel: ASTM A167, Type 304, soft temper; 26 gage minimum thickness, smooth finish.

E. Parapet Wall Reglet System: Fry “Springlok” MA-4 masonry reglet, 24 ga. galvanized steel or approved equivalent.

2.02 ACCESSORIES

A. Fasteners: Galvanized steel, aluminum, stainless steel with soft neoprene washers at exposed fasteners; fastener of same material as flashing metal.

B. Underlayment: ASTM D266; No. 15 asphalt saturated roofing felt.

C. Metal Primer: per Section 09 90 00.

D. Protective Backing Paint: Zinc chromate alkyd.

E. Slip Sheet: Rosin sized building paper.

F. Sealant: Per Section 07 90 00.

G. Plastic Cement: FS SS-C-153, Type I-asphaltic base cement.

H. Solder: ANSI/ASTM B32.

I. Flux: FS O-F-506.

2.03 FABRICATION

A. General: Fabricate all flashings and sheet metal pieces shown or implied on the Drawings and which are not provided by the roofing contractor under Section 07 50 00, the plaster contractor under Section 09 20 00, or the mechanical contractor under Sections 22 00 00 and 23 00 00.

B. Form sections true to shape, accurate in size, square, and free from distortion or defects.

C. Fabricate any cleats or starter strips of same material as sheet, minimum 1 inch wide, interlockable with sheet.

D. Form pieces in longest practical lengths.

E. Hem exposed edges on underside 1/2 inch; miter and seam corners.

F. Form exposed-to-view material with flat lock cover plate seam.

G. Solder and seal metal joints. After soldering, remove flux, wipe and wash solder joints clean.

H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

I. Fabricate flashings to allow toe to extend 2 inches minimum over roofing. Return and brake edges.

J. Fabricate gutter and downspout sections only in shapes as approved by the Architect on the basis of submittals made under provisions of Section 01300. Seamless prefinished aluminum products are acceptable. Design is based on fascia gutter and smooth rectangular downspout; light gage “wrinkle-wall” downspout is not acceptable.

2.04 FINISH

A. Paint over any holidays in galvanized finish resulting from fabrication, assembly, or installation, with galvanizing touch-up paint.

B. Back paint concealed metal surfaces with protective backing paint.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips in place, and nailing strips located.

B. Verify membrane termination and base flashings are in place, sealed, and secure.

C. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Field measure site conditions prior to fabricating work.

B. Install starter and edge strips, and cleats before starting installation.

C. Secure flashings in place using concealed fasteners recommended in SMACNA manual. Use exposed fasteners only in locations approved in advance by Architect.

D. Lap, cleat, or seam and seal all joints.

E. Apply plastic cement compound between metal flashings and felt flashings.

F. Fit flashings tightly in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

G. Seal metal joints watertight.

3.03 INSTALLATION

A. Conform to details and profiles as indicated on approved shop drawings and comply with SMACNA standard practices.

B. Replace any exposed-to-view installations which become dented, warped, or "oil canned" by actions of flashing and sheet metal fabricators or installers, at no additional cost to Owner.

C. In place repairs of damaged flashing or sheet metal shall only be as authorized and approved by the Architect.

D. Install gutters to slope 1/16” per foot minimum toward downspouts.

E. Install Fry Springlok reglets and flashings according to manufacturer’s instructions.

3.04 CLEAN UP

A. After completion of flashing and sheet metal installation, remove any excess sealant, cement, or solder from exposed-to-view surfaces.

B. Remove metal scraps, excess fasteners, and related debris from job site.

END OF SECTION

SECTION 07 80 00
FIRE AND SMOKE PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provision of fire retardant insulation, manufactured fire barrier systems, fire caulking and sealant, firestopping systems, and related materials for protection of fire and smoke barrier construction. Rated barrier construction includes corridor and exit enclosures, shaft enclosures, rated fire and smoke barriers, rated occupancy separations, and all construction assemblies where opening protection is required.

1.02 RELATED WORK

A. Section 07 20 00 – Insulation.

B. Section 07 90 00 – Joint Protection.

C. Section 09 25 00 – Gypsum Board.

1.03 REFERENCES

A. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this Section where cited by abbreviations noted below:
1. American Society for Testing and Materials (ASTM).
2. Underwriters Laboratories, Inc. (UL).

B. State of California, California Code of Regulations, Title 24, (CCR, Title 24), Part 2, Sections 709 and 710.

1.04 QUALITY ASSURANCE

A. Applicator's Qualifications: Applicator of firestopping materials shall be experienced in applying firestopping products similar to those specified.

B. Firestopping materials shall be:
1. Listed in accordance with requirements of UL Fire Resistance Directory.
2. When tested in accordance with ASTM E119-07, E84-05, flame-spread and smoke contributed ratings shall not exceed 25.

C. Form materials to remain in place in the completed Work and sealant used for firestopping Work, shall be UL listed.

1.05 SYSTEM DESCRIPTION

A. Design Requirements:
1. Fire-rated Construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibrations absorption, and at other construction gaps.

2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement or sound vibration absorption, and at other construction gaps.
3. Single Membrane Firestopping System: Comply with CCR Title 24, Section 709.7.

B. Design Compliance:
Complete information for any system proposed for use, whether or not detailed on the Drawings, shall be submitted for review and approval in accordance with these specifications to demonstrate system design requirements.

1.06 SUBMITTALS

A. Product Data.

B. Samples: Only as requested.

C. Certificates: Upon completion of work, furnish written statement signed by the Contractor, applicator, and manufacturer stating firestopping application complies and drawings, specifications, and manufacturer's recommendations and was proper and adequate for conditions requiring firestopping.

D. The Contractor shall submit for approval by the Architect, the UL number and a detailed shop drawing of each type of firestopping assembly to be installed. Single membrane penetration systems shall be submitted for approval by the State Fire Marshal.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver firestopping materials and related accessories in factory-sealed, unopened containers bearing manufacturer's name, batch number, product designation, and UL label.

B. Storage: Store in unopened containers, off the ground and protected from environmental conditions. Follow manufacturer's recommendations for storage temperature and shelf life.

C. Handling: Follow manufacturer's recommendations for handling products containing toxic materials. Keep flammable material away from heat, sparks, and open flame. Use recommended solvents and cleaning agents for cleaning tools, equipment, and skin.

1.08 JOB CONDITIONS

A. Environmental Requirements: Apply materials only when surface and ambient temperatures fall within manufacturer-recommended ranges and ventilation and safety requirements are in accordance with manufacturer.

B. Protection:
1. Use masking tape where required to control lap of materials on adjacent surfaces and remove upon completion.
2. Be responsible for damage to adjacent surfaces caused by firestopping operations.
3. Protect firestopping as necessary against damage from other construction activities.

C. Scheduling, Sequencing: Schedule application only after concrete has cured and joints are most likely to be normal size.

PART 2 PRODUCTS

2.01 PRODUCTS

A. General Requirements:
1. The term “firestopping” as used herein means a complete system of components which provides a barrier to flame and heat for the time period stipulated in the listing. Firestopping used in this project shall be tested and listed by UL, Warnock Hersey, or other testing laboratory recognized by the building authority. Such tested systems shall be fully described in the laboratory’s published directory listings.
2. Firestopping shall be compatible with contacting material.
3. Firestopping shall not stain adjacent exposed surfaces.
4. Firestopping material shall be free of asbestos.
5. Firestopping material shall provide flame rating as noted for assembly being penetrated as tested in accordance with ASTM E814-11.

B. Through-penetration Firestopping:
1. Description:
Subject to the submittal process of Section 01 30 00, any listed firestopping system may be used providing that it conforms to the construction type, penetrating material type, annular space requirements, fire (F) rating and temperature (T) rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free. Mortar systems must be Warnock Hersey approved.
2. Additional Requirements:
Withstand the passage of cold smoke, either as an inherent property of the system or by the use of a separate product included as a part of the UL system or device, and designed to perform this function.
3. Acceptable Manufacturers and Products:
Those listed in the UL Fire Resistance Directory, edition current at time of installation, for the UL system involved or mortar systems approved by Warnock Hersey. Acceptable systems include but are not necessarily limited to Hilti Corporation’s Firestop Systems, 3M Fire Protection Products, and Rectorseal Corporation’s Metacaulk Products.

C. Construction-Gap Firestopping System:
1. Description: Any listed firestopping system may be used providing that it conforms to the construction type and fire rating involved. Systems must be asbestos-free.
2. System Types:
a. Firestopping at construction gaps between edges of floor slabs and exterior wall construction.
b. Firestopping at construction gaps between tops of rated barrier partitions and underside of structural systems.
c. Firestopping at construction gaps between tops of rated barrier partitions and underside of ceiling or ceiling assembly.
d. Firestopping of control joints in rated barrier masonry partitions.
e. Firestopping expansion joints.

D. Smoke Stopping at Smoke Partitions:
   1. Through-penetration Smoke Stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.
   2. Construction Gap Smoke Stopping: Any system complying with the requirements for construction gap firestopping in fire-rated construction is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

2.02 MATERIALS

A. Firestop sealant for use in barrier penetrations described in the drawings:
   1. Description: Acrylic or silicone based sealant that provides movement capability in fire rated joint applications,
   2. Product: Hilti's "CP 606 Flexible Firestop Sealant," 3M Company's "Fire Barrier 2000" or an equivalent appropriate to the application as approved through the submittal process.

B. Accessories:
   1. Primers, Sealers, Surface Conditioners, Solvents: As recommended by manufacturer of approved firestopping material for each substrate. Solvents shall be residue-free.
   2. Typical Back-Up Material: As recommended by firestopping manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect joints and spaces to receive firestopping and verify following:
   1. That surfaces are satisfactory for proper installation of firestopping.
   2. That cementitious work has been completed and cured properly.

B. Do not start application until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Cleaning:
   1. Thoroughly clean receiving surfaces, joints, and spaces of foreign material such as dirt, dust, mill-scale, rust, oil, grease, sealer, curing compound, paint, and other coatings.
   2. Blow joints free of loose particles.
   3. Use only cleaning materials approved by firestopping manufacturer.

B. Verify proper surface and ambient temperatures.

C. Mask where necessary to protect adjoining surfaces. Remove excess material and stains on surfaces as required.

D. Primers, If Required.
   1. Make preliminary tests to insure primers will not stain exposed materials or deteriorate back-up material.
   2. Prime surfaces as recommended by firestopping manufacturer immediately prior to sealing.

E. In all other respects, prepare surfaces in accordance with manufacturer's recommendation.

3.03 APPLICATION

A. General Requirements:
   1. Apply in exact accordance with manufacturer's specifications to provide fire rating of assembly being penetrated.
   2. Use only skilled mechanics on work.
   3. Install firestopping with sufficient pressure to properly fill and seal openings.

B. Firestopping:
   1. Surface Depth: Provide full depth and width of spaces around penetration, and on each side of wall or partition construction for a depth not less than the thickness of the wall or partition finish materials.
   2. Tooling:
      a. Using tooling agent recommended by firestopping manufacturer, neatly tool joints to compress material, improve adhesion to surfaces joined, and achieve slightly concave surface.
      b. Repair air pockets exposed by tooling.
      c. Use masking tape where required to facilitate tooling and remove upon completion.
   3. Pipe Penetration: Caulk sleeves set in fire rated construction with sealant specified for fireproof penetration and caulk sleeves set in non-fire rated construction with sealant specified for non-fireproof penetrations. All piping through fire and smoke barriers shall be sleeved and caulked in accordance with UL listed through-penetration firestop seal assembly.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Representative: Conduct periodic inspections to ensure adherence to previously approved procedures.

3.05 PATCHING

A. Patch or replace defective and damaged firestopping as directed by the Architect.

3.06 CLEANING

A. Clean adjacent surfaces soiled in applying firestopping in accordance with firestopping manufacturer's recommendations.

B. Remove spilled and excess materials from adjacent surfaces before it has set.

C. Remove all debris and excess materials entirely from site and leave work in a neat and tidy condition.

END OF SECTION

SECTION 07 90 00
JOINT PROTECTION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Preparation of sealant substrate surfaces.

B. Sealant and backing at construction joints.

1.02 RELATED WORK

A. Section 06 20 00 - Architectural Woodwork

B. Section 07 50 00 - Membrane Roofing

C. Section 08 10 00 - Metal Doors and Frames

E. Section 08 40 00 - Storefront Systems

F. Section 08 80 00 - Glazing

1.03 REFERENCES

A. ASTM C790 - Use of Latex Sealing Compounds.

D. ASTM C804 - Use of Solvent-Release Type Sealants.

E. ASTM C834 - Latex Sealing Compounds.

F. FS TT-C-00598 - Calking Compound, Oil and Resin Base Type.

G. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, solvent Release Type.

H. FS TT-S-00227 - Sealing Compound: Elastomeric Type, Multi- Component.

I. FS TT-S-00230 - Sealing Compound: Elastomeric Type, Single Component.

J. FS TT-S-001543 - Sealing Compound, Silicone Rubber Base.

K. SWI (Sealing and Waterproofers Institute) - Sealant and Caulking Guide Specification.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 01330.

B. Product data shall indicate sealant chemical characteristics, performance criteria, limitations, color availability and applications.

C. Submit manufacturer's installation instructions under provisions of Section 01 30 00.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

B. Applicator: Company specializing in applying the work of this Section with minimum three years experience.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with all Sections referencing this Section.

PART 2 - PRODUCTS

2.01 SEALANTS

A. Polysulphide Sealant: one-component or multi-component, non-sagging, non-shrinking, self-leveling liquid polysulphide polymer; Polysulphide LP as manufactured by Morton-Thiokol or equivalent.

B. Acrylic Emulsion Latex: Single component, non-staining, non- bleeding, non-sagging; Acrylic Latex 15-Year Calk, as manufactured by Red Devil or equivalent.

C. Butyl Sealant: Single component, solvent release, non-skinning, non-sagging; Architectural Butyl Sealant, as manufactured by Red Devil or equivalent.

D. Silicone Sealant: Single component, solvent curing, non-sagging, non-staining, non-bleeding; Silpruf, Contractor's 1000, or Sanitary 1700 (depending on use), as manufactured by General Electric or equivalent.

E. Polyurethane Sealant: Two component, moisture curing, non-sagging, 50% extension/50% compression; Sonolastic NP 2 as manufactured by Sonneborn or equivalent.

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces, or joint openings are ready to receive work.

B. Beginning of installation means installer accepts existing surfaces.

3.02 SELECTION OF JOINT SEALANT

A. From the approved joint sealant materials, select only that joint sealant or calking which is best suited to a given application, and is so recommended by the product's manufacturer.

B. Select a joint sealant which is available in a color compatible with the subtrate or adjacent surface color. Sealant color is subject to the Architect's approval.

C. Select a joint sealant for conditions of high moisture which has anti-fungal characteristics.

D. Select a joint sealant for joints involving painted surfaces which is painter grade, represented by the sealant manufacturer as a compatible substrate for paint.

E. Select exterior sealant materials which are rated for high winds, high ultraviolet light exposure, and a marine environment.

3.03 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions.

B. Remove loose materials and foreign matter which might impair adhesion of sealant or firestopping.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Protect elements surrounding the work of this Section from damage or disfiguration.

3.04 INSTALLATION - SEALANTS

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.

D. Install bond breaker where joint backing is not used.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Tool joints slightly concave.

3.05 CLEANING AND REPAIRING

A. Clean work under provisions of Section 01 70 00.

B. Clean adjacent soiled surfaces.

C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.06 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Section 01600.

B. Protect sealants until cured.

END OF SECTION

SECTION 08 10 00
METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Rated and non-rated interior and exterior steel doors.

B. Rated and non-rated interior and exterior steel door frames.

1.02 RELATED WORK

A. Section 04 20 00 – Concrete Unit Masonry.

B. Section 08 20 00 – Wood Doors.

C. Section 08 40 00 – Storefront System.

D. Section 08 70 00 – Door Hardware.

F. Section 09 90 00 – Painting.

1.03 REFERENCES

A. Steel Door Institute Standard SDI-100 - Standard Steel Doors and Frames; SDI 105 - Recommended Erection Instructions for Steel Frames.

1.04 QUALITY ASSURANCE

A. Conform to referenced standards for door and frame constuction and installation.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 30 00.

B. Indicate door elevations and frame configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, priming and finishing options.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect products under provisions of Section 01 60 00.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – STEEL DOORS AND FRAMES

A. Republic, Trussbilt.

B. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

2.02 DOORS (see Door Schedule and Door Types)

A. Exterior Flush Panel Door
1. Design: Republic DE Series Grade 3 Heavy Duty, steel stiffened, full flush steel with polystyrene core.
2. Metal Thickness: 14 gauge.
3. Door Thickness: 1-3/4 inches.
4. Stiffeners: 16 gauge, vertical.
5. Core: 1 lb. polystyrene.
6. Labeling: not required.
7. Hardware Preparation: cylinder lockset bore (see Section 08 70 00).
8. Finish: “galvanealed” primed finish for field painting.

B. Interior Flush Panel Door
1. Design: Republic DE Series Grade 3 Heavy Duty, full flush steel with honeycomb core.
2. Metal Thickness: 16 gauge.
3. Door Thickness: 1-3/4 inches.
4. Core: 3/4” honeycomb.
5. Labeling: 45 minute min.
6. Hardware Preparation: cylinder lockset bore (see Section 08 70 00).
7. Finish: “galvanealed” primed finish for field painting.

C. Interior Detention Doors
1. Design: Trussbilt Security Door Type 2 with view lite.
2. Metal Thickness: 12 gauge.
3. Door Thickness: 1-3/4 inches.
4. Construction: spot welded 28 gauge trusscore.
5. Labeling: not required.
6. Hardware Preparation: cylinder lockset bore (see Section 08 70 00).
7. View Lite: continuous stop for glazing by others, horizontal shutter per Drawings.
8. Finish: primed finish for field painting.

2.03 FRAMES (see Door Schedule and Frame Types)

A. Exterior Frame for Metal Door
1. Design: Republic ME Series mitered masonry frame.
2. Metal Thickness: 14 gage.
3. Face Dimension: 2 inches.
4. Labeling: not required.
5. Anchoring: masonry anchors.
6. Finish: “galvanealed” primed finish for field painting.

B. Interior Frames for Wood or Metal Doors
1. Design: Republic ME Series mitered masonry frames.
2. Metal Thickness: 16 gage.
3. Face Dimension: 2 inches.
4. Labeling: 45 minute, 90 minute, per Door Schedule.
5. Anchoring: masonry anchors.
6. Finish: “galvanealed” primed finish for field painting.

C. Interior Frames for Detention Doors
1. As provided by manufacturer with door.

2.04 PREPARATION

A. Prepare doors and frames to receive door hardware as approved through the submittal process, providing all necessary reinforcement or backing.

B. Confirm that approved locksets/latchsets will fit within stiles of doors with proposed backset dimension. Bring any conflicts to the attention of the Architect for resolution prior to door preparation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install steel doors and frames in accordance with SDI standards.

B. Install detention door and frame in full compliance with approved shop drawings.

3.02 TOLERANCES

A. Maximum Diagonal Distortion: 1/8 inch measured with straight edge, corner to corner.

3.03 ADJUSTING AND CLEANING

A. Adjust hardware for smooth and balanced door movement.

B. Replace any metal doors or frames which are, in the opinion of the Owner, unacceptably dented, scraped, or otherwise damaged, at no additional cost to the Owner. Repairs to damaged doors shall only be allowed if acceptable to the Owner’s representative.

END OF SECTION

SECTION 08 20 00
WOOD DOORS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Rated and non-rated solid core wood doors.

1.02 RELATED WORK

A. Section 08 10 00 - Metal Doors and Frames

C. Section 08 40 00 - Storefront System

D. Section 08 70 00 - Door Hardware

E. Section 09 90 00 - Painting

1.03 REFERENCES

A. ANSI/NWMA I.S.1 - Industry Standard For Wood Flush Doors (Includes Standards I.S.1.1 through I.I.S.1.7).

B. AWI - Quality Standards of Architectural Woodwork Institute, 8th edition.

C. ANSI A135.4 - Basic Hardboard.

D. ASTM E90 - Measurement of Airborne Sound Transmission Loss of Building Partitions.

1.04 PERFORMANCE

A. Acoustic Rating for Doors: ASTM E90, minimum STC 32.

1.05 QUALITY ASSURANCE

A. Conform to requirements of AWI Quality Standard Section 1300 and 1400 "Custom Grade I or II."

1.06 SUBMITTALS

A. Submit shop drawings, product data and manufacturer's installation instructions under provisions of Section 01 30 00.

B. Indicate door elevations, stile and rail reinforcement, internal blocking for hardware attachment, and cutouts for louvers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect products under provisions of Section 01 60 00, and in accordance with AWI and ANSI/AWMA requirements.

B. Protect doors with resilient packaging, sealed with plastic. Break seal on site to permit ventilation.

1.06 WARRANTY

A. Provide five year manufacturer's warranty under provisions of Section 01 70 00.

B. Warranty: materials and workmanship, including warping, delamination and related defects.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Oregon Door.

B. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

2.02 DOORS

A. Flush Interior Stain Grade Doors, Solid Core, Fire Rated
1. Manufacturer/Model: Oregon Door FD-7 Fire-Rated Mineral Core
2. Rating: 90 minute, per Door Schedule.
3. Thickness: 1-3/4".
4. Core Construction: mineral fire core.
5. Adhesives: Type I waterproof bond.
6. Faces: plain slied, stain grade Cherry veneer (PSC).
7. Finish: stained and clear finished per Section 09 90 00.
8. Reference Standard: Woodwork Institute Section 12.

B. Flush Interior Stain Grade Doors, Solid Core, Non-Rated
1. Manufacturer/Model: Oregon Door Particle Board Core PC-9VE.
2. Rating: non-rated
3. Thickness: 1-3/4".
4. Core Construction: Particle board.
5. Adhesives: Type I waterproof bond.
6. Faces: plain slied, stain grade Cherry veneer (PSC).
7. View Window: square wood stopped, clear tempered glass per section 08 80 00.
8. Finish: Stained and clear finished per Section 09 90 00.
9. Reference Standard: Woodwork Institute Section 12.

C. Flush Interior Paint Grade Doors, Solid Core, Non-Rated
1. Manufacturer/Model: Oregon Door Particle Board Core PC-9VE.
2. Rating: non-rated
3. Thickness: 1-3/4".
4. Core Construction: Particle board.
5. Adhesives: Type I waterproof bond.
6. Faces: paint grade hardboard.
7. Finish: sealed and painted per Section 09 90 00.
8. Reference Standard: Woodwork Institute Section 12.

2.03 FABRICATION

A. Fabricate doors in accordance with AWI and WIC Quality Standards.

B. Provide flush doors with minimum 1/2 inch thick solid wood edge without holidays or rough grain.

C. Premachine doors for finish hardware.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install doors in accordance with manufacturer's instructions.

B. Machine cut relief for hinges and closers and coring for locksets and cylinders.

C. Trim door width from lock edge only, to a maximum of 3/16 inch.

D. Trim door height by cutting equally on top and bottom edges to a maximum of 3/4 inch.

E. Pilot drill screw and bolt holes.

F. Prepare doors to receive finish hardware in accordance with AWI requirements.

G. Conform to AWI and UBC Standard 43-2 requirements for fit tolerances.

3.02 INSTALLATION TOLERANCES

A. Maximum Diagonal Distortion: 1/8 inch measured with straight edge, corner to corner.

3.03 ADJUSTING AND CLEANING

A. Adjust for smooth and balanced door movement.

END OF SECTION

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Aluminum storefront framing system

B. Aluminum entry door.

1.02 RELATED WORK

A. Section 08 10 00 - Metal Doors and Frames

B. Section 08 80 00 - Glazing

1.03 REFERENCES

A. ASTM E283-04 - air infiltration

B. ASTM E331-00 (2009) - water penetration

C. AAMA 1502 and 1503 - glazing performance

D. ASTM B221-08 - aluminum alloy for extruding

E. AAMA 605.2 - high performance specification for organic coatings on aluminum extrusions

1.04 REFERENCE DOCUMENTS

A. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this Section where cited by abbreviations noted below.
   1. American Society for Testing and Materials (ASTM).
   2. The Aluminum Association's "Designation System for Aluminum Finishes" (AA).
   3. American Architectural Manufacturers Association's
      a. "Methods for Test for Metal Curtain Walls" (AAMA 501-83).
      b. "Field Check of Metal Curtain Walls for Water Leakage" (AAMA 501-2-83).
   4. California Building Code, 2010 Edition.

1.05 QUALITY ASSURANCE

A. Design Criteria for Storefront System
   1. Drawings show external profiles required. Minor modifications for better water tightness or greater strength may be proposed for the Architect's approval.
   2. Storefront framing system shall conform to CBC 1609 for wind load criteria.
   3. Performance Standards for Storefront System:
      a. Thermal Movement: Construct storefront system to proved for expansion and contraction of component materials as will be caused by ambient temperature ranging from 10 to 120 degrees Fahrenheit without causing buckling, opening of joints, glass breakage, undue stress of fasteners, or other detrimental effects.
      b. Air Infiltration: Do not exceed 0.06 cubic feet per minute per square foot of fixed wall area plus permissible allowance for operable windows within test areas when wall is tested in accordance with ASTM E283-04.

c. Water Infiltration:
   1) Water infiltration is defined as appearance of water other than condensation on inside face of any part of the storefront system.
   2) Make provisions to drain to exterior face of wall any water leakage and condensation occurring within storefront system construction.
   3) Water Infiltration: None when system is tested in accordance with ASTM E331-00 at test pressure of 7.5 psf.

d. Structural:
   1) Design storefront system to withstand 40 psf wind load acting inward (positive pressure) and outward (negative pressure) with both wind loads acting normal to plane of storefront system.
   2) Deflection Normal to Storefront Plane: Do not exceed 1/175 of clear span of any metal framing member when tested in accordance with AAMA 501-83, Test for Structural Performance.
   3) Deflection Parallel to Wall Plane: When carrying full design load to not exceed 75 percent of design clearance dimension between that member and panel, glass, or other part immediately below it.

1.06 SUBMITTALS

A. Structural Calculations and Details: Show that the storefront framing system meets CBC wind load requirements. Such calculations and details must be approved by the Architect and (if required) the City of Manteca prior to fabrication.

B. Shop Drawings:
1. Show storefront framing system and details including component parts, and attachments or junctions with adjacent work.
2. Show construction of all components including metal, glass, weather-stripping, and similar items.
3. Show finishes, sealant brands and all other information showing compliance with specifications.
4. Show proposed locations of nay exposed fasteners.

C. Product Data.

D. Samples: Color samples for approval of hue and sheen.

E. Test Reports:
1. Test reports to be from qualified, certified, independent testing agency.
2. Tests shall have been performed after January 1, 2001 on assemblies identical to those proposed for this project. The actual assemblies required for this project may be larger than the tested assembly, provided calculated deflection and set does not exceed maximum specified when applying "effective" moment(s) of inertia and section properties of window wall elements obtained from test of smaller units.
3. Submit test reports for each window wall performance standard specified.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged products in original containers or bundles with seals unbroken and labels intact until time for use.

B. Keep materials dry. Where necessary, stack materials off ground on level flat forms, fully protected from weather.

PART 2 - PRODUCTS

2.O1 ACCEPTABLE MANUFACTURERS - STOREFRONT SYSTEMS

A. U.S. Aluminum Corporation

B. Kawneer Company

C. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

2.02 STOREFRONT PRODUCTS

A. Storefront System: U.S. Aluminum Corporation Series 400 center glazed framing components, with the following characteristics:
1. All components must the products of the same manufacturer.
2. Frame Dimensions: 1-3/4 inch X 4 inch; ADA bottom rail.
3. Material: 6063-T5 aluminum alloy.
4. Finish: Duranar fluoropolymer coating, as selected by Architect from standard range.

B. Aluminum Entry Doors (Doors 1.1 and 1.2): U.S. Aluminum Corporation #400 Medium Stile standard full single glazed storefront entry door, with the following characteristics:
1. Entry doors must be products of the same manufacturer as storefront system.
2. Material: 6063-T5 aluminum alloy.
3. Stiles: 1-3/4 inch X 3-1/2 inch.
4. Top Rails: 1-3/4 inch X 3-3/16 inch.
5. Bottom Rails: 1-3/4 inch X 10 inch.
6. Finish: Duranar fluoropolymer coating, as selected by Architect from standard range.
7. Door Hardware: per Section 08 70 00.

2.03 ACCESSORIES

A. Storefront Connectors and Stiffeners: manufacturer's standard product as approved through submittal process.

B. Sealants for Use Within Storefront System Assemblies: Tremco's "Small Joint Sealer" or Seam Sealer"; or approved equal.

C. Weatherstripping: manufacturer's standard application as approved through submittal process.

D. Compressive Tape Filler: Closed cell, black neoprene tape conforming to ASTM C509-84, size as noted, with adhesive system as recommended by the manufacturer.

2.03 FABRICATION

A. Fabricate aluminum in accordance with referenced standards and good trade practice for commercial or institutional storefront applications.

B. Coordinate details with details of adjacent work to assure water tightness, proper attachments, sealed joints, tight flashings, and clean junctions.

C. Metal-to-Metal Joints Between Members: Insure water tightness by setting in mastic recommended by approved window wall manufacturer; remove excess prior to hardening.

D. Provide reinforcement as required.

E. Conceal welds and fasteners wherever possible.

F. Do not label exposed portions with trade or manufacturer's name.

G. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of asembly, yet enabling installation.

H. Provide permanent protection between dissimilar metals.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine openings to receive storefront system and verify that openings are plumb, level, clean, in full accord with contract documents and provided solid anchoring surface.

B. Do not start erection until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install aluminum in accordance with manufacturer's recommendations.

B. Make flashings absolutely watertight.

C. Lead collected moisture or water to outside as directly as possible.

D. Waterproof joints from back as required.

E. Employ only skilled workers, especially trained and experienced in this work.

F. Whenever aluminum comes into direct contact with steel, masonry, concrete, or non-compatible materials, separate them by bituminous paint, zinc chromate primer, or suitable insulating materials.

G. Plumb and align storefront faces in a single plane for each wall plane. Erect storefront system and materials square, true, and adequately anchored to maintain positions permanently when subjected to normal thermal and building movement and specified wind loads.

H. Coordinate storefront framing installation with security screen installation. Bring any conflicts to the attention of the Architect before proceeding.

3.03 ADJUSTING AND CLEANING

A. After completion of glazing and finish painting of surrounding surfaces, verify watertight conditions and make corrections as required.

B. Clean aluminum using only products specifically recommended by the manufacturer.

3.04 PROTECTION

A. Protect work from damage to surface, profile, and shape during and after erection and until project is accepted.

3.05 FIELD QUALITY CONTROL

A. Water Penetrations Tests: After completion of the installation and nominal curing of sealants, and before installation of interior trim members, test for water leaks in accordance with AAMA 501.2. Repair or replace any components, including joints and sealants, which leak or are observed to be defective in any way, and retest as directed.

END OF SECTION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Hardware for interior and exterior doors.

B. Weatherstripping and thresholds at door frames.

1.02 RELATED WORK

A. Section 08 10 00 – Metal Doors and Frames.

B. Section 08 20 00 – Wood Doors.

C. Section 08 40 00 – Storefront System.

D. Division 16 – Electrical

1.03 REFERENCES

A. ANSI A117.1, CAC Title 24, U.S. Dept. of Justice 28 CFR Part 36 (ADA) - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

B. AWI - Architectural Woodwork Institute.

C. BHMA - Builders' Hardware Manufacturers Association.

D. DHI - Door and Hardware Institute.

E. NFPA 101 - Life Safety Code.

F. Underwriters Laboratories Inc.

1.04 COORDINATION

A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

B. Coordinate keying requirements with Owner's representative as described below.

C. Coordinate connection of all electric hardware control and alarm wiring with building power wiring provided by electrical contractor.

1.05 QUALITY ASSURANCE

A. Design Criteria: The intent of this Section is the provision of all required items of finish hardware. Any work less than this intent shall form the basis for corrective measures under the Contractor's guarantee of all work.

B. Hardware Supplier: Company specializing in supplying commercial and institutional door hardware with minimum three (3) years' experience.

1.06 SUBMITTALS

A. Submit schedule, shop drawings, and product data under provisions of Section 01 30 00.

B. Indicate locations, mounting heights, finishes, accessories, and anchorage of each type of hardware.

C. Provide product data on specified hardware, including explanation of all abbreviations, symbols, and codes used to identify components or functions.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 01 70 00.

B. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect under provisions of Section 01 60 00.

B. Deliver keys to Owner by secure shipment direct from hardware supplier.

1.09 WARRANTY

A. Provide minimum two year warranty on all locksets, latchsets, and closers under provisions of Section 01 70 00.

1.10 MAINTENANCE MATERIALS

A. Provide special wrenches and tools applicable to each different or special hardware component.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Hinges and Miscellaneous Hardware: Hager (HAG)

B. Latchsets, Locksets, and Cylinders: Schlage (SCH)

C. Stops, Holders and Miscellaneous Hardware: Ives (IVE), Amerock (AME)

D. Closers: LCN (LCN)

E. Weatherstripping, Thresholds, and Door Bottoms: Pemko (PEM)

F. Panic Exit Hardware: Von Duprin (VON)

G. Storefront Entrance Hardware: United States Aluminum (USA), Blumcraft (BLU)

H. Electric Functions: Falcon (FAL), HID Global (HID)

J. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

2.02 OTHER MATERIALS

A. Provide all mounting hardware, plates, trims, accessories, attachments, relays, actuators, and power connections as required for a complete and operable installation.

2.03 KEYING

A. Keying shall be carefully coordinated with Owner's representative, using at least three master levels.

B. Supply 2 keys for each lock, plus 2 keys for each level of master keying; stamp all keys "Do Not Duplicate."

C. Use temporary cores for construction keying; convert to permanent cores in response to Owner's written instructions.

D. Cylinders shall be keyed at the factory of the lock manufacturer where permanent records are maintained.

2.04 FINISHES

A. Finishes are listed in the Hardware Schedule, below.

B. Where not otherwise described, metal finishes shall be either satin stainless steel, satin chrome, or brushed chrome.

2.05 MATERIALS

A. Materials shall be as identified in the Hardware Schedule, below. Hardware Groups are called out in the Door Schedule on the Drawings.

B. Additional or accessory products as required to provide a complete and functional installation shall be compatible with the above materials and are subject to the Architect's approval.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on approved shop drawings.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware from finished floor to center line of hardware item shall be the same as adjacent, existing hardware of the same type, or as indicated on the drawings.

D. Conform to ANSI A117.1, CAC Title 24, or ADA (whichever is lowest) for positioning requirements for the handicapped.

E. Install transformers, relays and actuators, make electrical connections, and install low-voltage wiring to the point of connection with building power as required for electrical hardware control and alarm systems, carefully following manufacturer's recommendations.

F. Coordinate installation timing with Owner's Representative in a fashion that does not leave building unlocked.

3.03 CLEANUP

A. After installation remove all plastic sheets, manufacturer's temporary markings, and construction dirt or markings from finish hardware.

B. Use only cleaners compatible with hardware finish.

3.04 DOOR HARDWARE SCHEDULE

GROUP 1: EXTERIOR ENTRY DOOR PAIR (Door 1.1)

FUNCTION	MFGR	QTY	NO./FINISH	REMARKS
Hinges	USA	3 pair	D series/#22 dark bronze	Offset pivots
Panic Device	USA	2	DH200/US32	Concealed device
Lock	USA	1	(mfgr. standard)	Keyed cylinder per Court requirements
Closer	USA	2	Dorma	Overhead concealed
Pulls	BLU	2	H110/320	Custom installation
Seals	USA	1 set	(mfgr. standard)	Compression insert, head and jambs
Door Bottom	PEM	1	90137DP	Brush sweep, shim as necessary
Threshold	PEM	1	271A	Full width of opening

GROUP 2: EXTERIOR EXIT DOOR PAIR (Door 1.2)

FUNCTION	MFGR	QTY	NO./FINISH	REMARKS
Hinges	USA	3 pair	D series/#22 dark bronze	Offset pivots
Panic Device	USA	2	DH200/US32	Concealed device
Lock	USA	1	(mfgr. standard)	Keyed cylinder per Court requirements
Closer	USA	2	Dorma	Overhead concealed
Seals	USA	1 set	(mfgr. standard)	Compression insert, head and jambs
Door Bottom	PEM	1	90137DP	Brush sweep, shim as necessary
Threshold	PEM	1	271A	Full width of opening

GROUP 3: INTERIOR PASSAGE DOOR (1.3)

FUNCTION	MFGR	QTY	NO./FINISH	REMARKS
Hinges	HAG	4 pair	BB1279/US10B	4-1/2" x 4-1/2"
Closers	LCN	2	1460/DKBRZ	Inside surface jamb
Seals	PEM	1 set	S88	Head and jambs
View Lites	(per Section 08 20 00)			
Pulls	IVE	2	8103EZ/US32	12", accessible hand clearance
Pull Plates	IVE	2	8300/US10B	8" x 24" (custom)
Push Plates	IVE	2	8200/US10B	8" x 24" (custom)

GROUP 4: INTERIOR SECURE PASSAGE DOOR (Door 1.4)

FUNCTION	MFGR	QTY	NO./FINISH	REMARKS
Hinges	HAG	1.5 pair	BB1279/US26D	4-1/2" x 4-1/2"
Lockset	SCH	1	D72PD/ Rhodes/626	Key per Court requirements
Closer	LCN	1	4110/689	Surface jamb
Seals	PEM	1 set	S88	Head and jambs
Threshold	PEM	1	270A	Full width of opening
Door Bottom	PEM	1	217AV	Full width of door
Stop	IVE	1	411R-W	Wall stop
View Lite	ANE	1	LoPro-IS/primed	NR fasteners, glazing per 08 80 00
Elect. Function	FAL	1	EL	Electric latch retraction
Access Control	HID	2	Thinline II	Each side

GROUP 5: INTERIOR SECURE PASSAGE DOOR (Door 1.5)

FUNCTION	MFGR	QTY	NO./FINISH	REMARKS

(Prepare frame per Group 4; no door installation in this phase)

GROUP 6: INTERIOR SECURE PASSAGE DOOR (Door 1.6)

FUNCTION	MFGR	QTY	NO./FINISH	REMARKS
Hinges	HAG	1.5 pair	BB1279/US26D	4-1/2" x 4-1/2"
Lockset	SCH	1	D72PD/ Rhodes/626	Key per Court requirements
Closer	LCN	1	4110/689	Surface jamb
Seals	PEM	1 set	S88	Head and jambs
Threshold	PEM	1	270A	Full width of opening
Door Bottom	PEM	1	217AV	Full width of door
Elect. Function	FAL	1	EL	Electric latch retraction
Access Control	HID	2	Thinline II	Each side

GROUP 7: DETENTION CELL DOOR (Doors 1.7, 1.8, 1.9)

FUNCTION	MFGR	QTY	NO./FINISH	REMARKS
Hinges	HAG	1.5 pair	BB1168/US26D	4-1/2" x 4-1/2"
Lock	SCH	1	B664P/626	Key per Court requirements
Pull	IVE	1	8103-8/US32D	8"
Pull Plate	IVE	1	8300/US32D	4" x 16", custom cylinder prep
Seals	PEM	1 set	S88	Head and jambs
Cabinet Pull	AME	1	CH-40425/32D	View lite shutter

GROUP 8: EXTERIOR CHASE ACCESS DOOR (Door 1.10)

FUNCTION	MFGR	QTY	NO./FINISH	REMARKS
Hinges	HAG	1.5 pair	AB700/US26D	4-1/2" x 4-1/2"
Lock	SCH	1	B600/626	Key per Court requirements
Seals	PEM	1 set	S88	Head and jambs
Door Bottom	PEM	1	3452AV	Full width

GROUP 9: INTERIOR CHASE ACCESS DOOR (Doors 1.11, 1.12)

FUNCTION	MFGR	QTY	NO./FINISH	REMARKS
Hinges	HAG	1.5 pair	AB700/US26D	4-1/2” x 4-1/2”
Lock	SCH	1	B600/626	Key per Court requirements
Seals	PEM	1 set	S88	Head and jambs

GROUP 10: EXTERIOR SECURE ENTRY DOOR (Door 1.14)

FUNCTION	MFGR	QTY	NO./FINISH	REMARKS
Hinges	STA	1.5 pair	BB1279/US26D	4-1/2” x 4-1/2”
Lockset	SCH	1	D72PD/ Rhodes/626	Key per Court requirements
Closer	LCN	1	4110/689	Surface jamb
Seals	PEM	1 set	S88	Head and jambs
Threshold	PEM	1	271A	Full width of opening
Door Bottom	PEM	1	217AV	Full width of door
Elect. Function	FAL	1	EL	Electric latch retraction
Access Control	HID	2	Thinline II	Each side

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Glass and glazing for doors and storefront systems.

B. Impact resistant glazing for holding cell openings.

1.02 RELATED WORK

A. Section 08 10 00 - Metal Doors and Frames.

B. Section 08 20 00 - Wood Doors.

C. Section 08 40 00 - Storefront System.

1.03 REFERENCES

A. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.

B. "Manual of Glazing" of the Flat Glass Marketing Association.

C. U.S. General Service Administration Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings.

D. ASTM C1349-04 Standard Specification for Architectural Flat Glass Clad Polycarbonate.

E. ASTM Z97.1 Test for Safety Glazing Materials Used in Buildings.

1.04 QUALITY ASSURANCE

A. All glass shall bear the label of its manufacturer and quality.

B. Conform to Flat Glass Marketing Association (FGMA) recommendations for glazing installation methods.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 01 30 00.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to site, store and protect under provisions of Section 01 60 00.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - GLASS PRODUCTS

A. Glass: Viracon; Glass-Clad Polycarbonate: Global Security Glazing

B. Alternate products may be approved based on submittals made under provisions of Section 01 30 00.

2.02 NON-TEMPERED GLASS - EXTERIOR

A. Glass Type G.1: Dual pane, clear, regular strength insulating glass, 1/8” or 3/16” as required to comply with CBC wind loading criteria; Viracon VRE 2-67 Radiant Low-E Insulating Glass with Argon Gas, or equivalent.

2.03 TEMPERED GLASS - EXTERIOR

A. Glass Type G.2: Dual pane, clear, tempered safety insulating glass, 1/4”, where required by CBC 2406.4; Viracon VRE 2-67 Radiant Low-E Insulating Glass with Argon Gas, tempered, or equivalent.

2.04 GLASS-CLAD POLYCARBONATE GLAZING - EXTERIOR/INTERIOR

A. Glass Type G.3: Glass clad polycarbonate, Global Security Glazing Secur-Tem+Poly 3, product SP2117, 9/16”, clear, or equivalent.

2.05 TEMPERED GLASS - INTERIOR

A. Glass Type G.4: Single pane 1/4” tempered, clear.

2.06 GLAZING COMPOUNDS

A. Glazing compound may be any Class A, single component compound intended for the specified application.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for work of this Section.

B. Beginning of installation means acceptance of substrate.

3.02 INSTALLATION

A. Install glass panels resting on setting blocks. Install applied stop and place spacer shims at 1/4 inch below sightline.

B. Locate and secure using glaziers' clips.

C. Fill gaps between panel and stops with glazing compound until flush with sightline. Tool surface to straight line.

D. Glazing with glazing tape is an acceptable alternate installation.

E. At openings provided with manufacturer's glazing bead, install bead per manufacturer's recommendations, using glazing compound or sealant only as specifically directed.

3.03 CLEANING

A. After installation, mark vision glass with an "X" by using plastic tape or removable paste.

B. Remove glazing materials from finish surfaces.

C. Remove labels and clean glass after work is completed.

END OF SECTION

SECTION 09 20 00
LATH AND PLASTER

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Building paper and metal lath.

B. Plaster inserts and accessories.

C. Three coat Portland cement plaster at exterior walls and soffits.

1.02 RELATED WORK

A. Section 07 60 00 - Flashing and Sheet Metal

B. Section 08 40 00 - Storefront System

D. Section 09 90 00 - Painting

1.03 REFERENCES

A. Federal Specification UU-B-70 - building paper, stucco lath.

B. ASTM C150 - Portland cement.

C. ASTM C-206 - lime.

D. ASTM C-144-62T - graded sand.

E. "Lathing and Plastering Data Guide and Reference Specifications,"by the Southern California Plastering Institute.

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in the application of exterior portland cement plaster finishes, with at least three (3) years' experience.

1.05 SUBMITTALS

A. Submit product data and samples under provisions of Section 01 30 00.

B. Submit product data, with manufacturer's installation instructions, for all proposed plaster additives.

C. Submit two (2) copies of color charts for integrally-colored finish plaster coat.

D. Submit two (2) samples, 12 inches long, of each proposed plaster insert or accessory.

E. Prepare one mock-up, at least 48 inches by 48 inches, of each proposed plaster texture and color, for Architect's and Owner’s approval prior to application of plaster brown coat. Mockup may be used as a portion of the actual building Work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and protect lath and plaster materials under provisions of Section 01600.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not apply plaster when the outside air temperature is below 40 degrees F, or above 90 degrees F.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Paper-backed Stucco Lath, Vertical Surfaces: K-Lath, Western Metal Lath Company.

B. Stucco Lath, Soffits and Other Horizontal, Near Horizontal or Beveled Surfaces: Inland Ryerson, Western Metal Lath Company.

C. Screeds, Moldings, and Accessories: Fry, Western Metal Lath Company, Delta Star (Superior), California Expanded Metal Products Corporation.

D. Integral Color Additive: La Habra, Expo Stucco Products, Omega Products.

E. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

2.02 LATHING MATERIALS

A. Lath at Walls and Other Vertical Surfaces: 1-1/2 inch mesh, hexagonally woven, galvanized wire mesh, attached to Class B, waterproofed building paper in a self-furring fashion; Paperbacked Stucco Netting SFB by K-Lath.

B. Lath at Soffits and Other Horizontal, Near Horizontal or Beveled Surfaces: 3/8 inch galvanized, expanded metal rigid lath; Stay-Rib by Inland Ryerson.

C. Line wire backing: 18 gage galvanized, Class I annealed steel wire.

2.03 SCREEDS, MOLDINGS, AND ACCESSORIES

A. General: Prefabricated standard shapes, manufactured for the designated use of hot-dip zinc galvanized steel or extruded aluminum.

B. Horizontal and Vertical Reveal: Superior reveal screed in sizes indicated on Drawings, with fabricated intersections.

C. Corner Reinforcement (at outside corners): Western Stucco-Lok corner reinforcement.

D. Casing Bead (where plaster panel abuts dissimilar material other than aluminum): Western No. 66/Expanded Flange.

E. Soffit Reveal, Drip Screed (at all plaster soffit conditions): Superior reveal screed in sizes indicated on Drawings.

F. Casing Bead in contact with or adjacent to aluminum flashing, storefront, curtain wall, pre-formed aluminum panels and other aluminum material (to avoid galvanic action): Flannery, inc. J-Mold 6063 T5 aluminum alloy extrusion.

2.04 WOOD GROUNDS

A. Temporary wood grounds: seasoned wood of uniform thickness and free from pitch or defects.

B. Permanent wood grounds shall not be used.

2.05 CEMENT

A. Portland cement: Conform to ASTM designation C-150, Type I.

B. Plastic additives are limited to 12 percent by volume.

2.06 LIME

A. Dry Hydrated Lime: Conform to ASTM designation C-206, Type S.

B. Lime putty, if used, shall weigh no less than 83 pounds per cubic foot.

2.07 SAND

A. Sand Aggregate: Clean, well graded from coarse to fine, conforming to ASTM C-144-62T.

2.08 INTEGRALLY COLORED FINISH COAT

A. Product: Omega Semi-Smooth Finish or approved equivalent acrylic finish coat.

B. Texture: Smooth troweled “Santa Barbara” texture.

C. Colors: Integral color by Omega as selected by Architect from standard range.

2.09 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of lath and plaster, shall meet or exceed the requirements of the referenced standards and shall be subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that substrates are ready to receive lath and plaster.

B. Verify that lath and plaster may be installed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.

C. Beginning of installation means acceptance of existing conditions.

3.02 WEATHER CONDITIONS

A. Do not apply plaster when prevailing outdoor temperature is below 40 degrees Fahrenheit; if freezing is expected, do not apply plaster beyond the period required for proper hydration.

B. Do not apply plaster when prevailing outdoor temperature is above 90 degrees Fahrenheit.

3.03 LATHING - VERTICAL APPLICATIONS

A. Install line wire backing at open wall framing, where exterior sheathing does not occur. Install line wire at 6" o.c. vertically; run horizontally, stretched taut but not tight, fastened at 32" o.c.

B. Install paper-backed stucco lath with the long dimension horizontal, lapping the paper of upper courses over the paper of lower courses at least two (2) inches, and lapping vertical paper joints at least six (6) inches. Tie lath laps together above paper laps.

C. At exterior corners, wrap paper and lath around corner and reinforce with external corner reinforcement.

D. At interior corners, fold the lath and paper through the corner and reinforce with interior corner reinforcement.

E. Take care in attachment of paper-backed lath to building surfaces to allow lath to remain furred approximately 1/4 inch above the surface of building paper.

F. Attach all screeds, moldings, or accessories firmly to supporting structure per the recommendations of the reference standards. Where screeds, moldings, and accessories meet or intersect, cut non-continuous member to fit snug and square against through member. Where screeds continue around outside corners, miter to maintain a continuous line.

G. Attach paper backed lath to concrete block at site walls with power driven concrete fasteners.

3.04 LATHING - HORIZONTAL / NEAR HORIZONTAL APPLICATIONS

A. Attach rigid lath with reinforcing ridges running perpendicular to building structure.

B. Install lath at horizontal, near horizontal or beveled surfaces per lath manufacturer's recommendations and in compliance with the reference standards.

C. Install screeds, moldings, and accessories according to 3.03 F, above.

3.05 PLASTERING

A. Perform all mixing, plastering, and plaster curing in strict accordance with the provisions of the referenced standards.

B. Scratch Coat: Apply the scratch coat with sufficient material and force to form good keys, embedding and filling all spaces of the lath, and scoring the plaster horizontally.

C. Brown Coat: Do not apply the brown coat sooner than forty eight (48) hours after application of the scratch coat. Apply brown coat to scratch coat, bring out to grounds, straighten to a true surface, float, compact, and leave sufficiently rough to ensure adequate bond for finish coat.

D. Finish Coat
   1. Do not apply finish coat sooner than seven (7) days after application of brown coat. Apply smooth, dense, flat and true float finish coat, textured as approved by the Architect on the basis of field mock-ups, beginning and ending application at naturally occurring joints, edges, and boundaries on finish surfaces. Unsightly laps and joints will not be acceptable.
   2. Finish coat shall be continuous across brown coat.
   3. Finish coat shall be finished in one integrally pigmented color, as approved by Architect on the basis of field mock-ups.

E. Finish all plaster surfaces true and even within 1/8 inch tolerance in ten (10) feet. Leave the finished surfaces free from tool marks, scaffold ties, and other blemishes.

3.06 CLEANING AND PROTECTION

A. Protect all window and door frames, thresholds, and other products from plaster debris or splatter with tape, building paper, plastic sheet, or similar methods. Immediately clean splatter from unprotected products or surfaces.

B. After application of finish coat, remove all tape, inserts and protective covers from screeds, moldings and accessories, and clean metal surfaces as described in Section 09900 to receive paint finish.

C. After completion of plastering work, remove all plaster related debris from work areas and clean any spilled plaster products from building and site areas.

D. Do not wash out plastering tools and equipment in a fashion that will stain finish surfaces or run off into public drainage courses.

END OF SECTION

SECTION 09 25 00
GYPSUM DRYWALL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Gypsum drywall at walls and ceilings.

B. Gypsum drywall trims and finishing.

1.02 RELATED WORK

A. Section 06 10 00 - Rough Carpentry

B. Section 09 20 00 - Lath and Plaster

C. Section 09 90 00 - Painting

1.03 REFERENCES

A. Gypsum Association publication GA 216-2007.

B. ASTM c1396-09 Standard Specification for Gypsum Board.

C. ASTM C475-07 Standard Specification for Joint Compound and Joint Tape.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 01 30 00.

1.05 DELIVERY, HANDLING, AND STORAGE

A. Deliver, handle, and store materials under provisions of Section 01600.

B. Replace damaged materials at no cost to the Owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. United States Gypsum Company.

B. Gold Bond Products.

C. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 0.

2.02 GYPSUM DRYWALL PANELS - WALLS AND CEILINGS

A. Product Description: USG "Sheetrock" brand gypsum panels.

B. Thickness: 5/8 inch.

C. Moisture Resistance: use "W/R" panels where panels will experience regular exposure to moisture, including but not limited to walls behind tub/showers, walls within 4 feet horizontally of tub/showers, and plumbing walls in common restrooms, laundries and equipment rooms.

2.03 FASTENERS

A. All fasteners shall be of the length and pattern recommended by the manufacturer of the gypsum panels used, required by the rated system, and as indicated on Drawings.

2.04 METAL CORNERBEAD AND TRIM

A. All metal cornerbead, casing bead, and trim, and all accessory items, shall be a system recommended by the manufacturer as compatible with the gypsum panels. Outside corners shall be square.

2.05 JOINT SYSTEM

A. The joint system, including tape and compounds, shall be a system recommended by the manufacturer as compatible with the gypsum panels.

B. Only non-shrinking joint compounds are allowed.

2.06 TEXTURE SYSTEMS

A. Preparation Coating: Hamilton "Prep-Coat" high solids drywall sealer or approved equivalent.

B. Interior Walls and Ceilings: USG “Sheetrock” brand Tuf-Tex Wall and Ceiling Spray Texture or approved equivalent, to be painted.

2.07 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of gypsum drywall and compliance with rated assembly criteria, shall be as selected by the Contractor subject to approval by the Architect.

PART 3.00 - EXECUTION

3.01 INSPECTION

A. Verify that wall and ceiling surfaces are ready to accept the work of this section in compliance with the reference standards.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. General installation standards
1. Install per GA 216 and USG 923 and 927.
2. Place metal corner bead at all exterior corners.
3. Use "L" casing bead where indicated on drawings and wherever gypsum panels abut rather than overlap dissimilar materials; hold molding back 1/8 inch from adjacent surface for sealant.
4. Tape, fill and sand to achieve a smooth, even surface.
5. Apply preparation coating directly to gypsum panels and joint system per manufacturer's recommendations.
6. Texture panels to receive the specified finish.

3.03 FINISH AND TEXTURES

A. Unless otherwise required, finish and texture gypsum drywall walls and ceilings as follows:
   1. Walls and ceilings unless noted otherwise: Light sprayed orange peel without sharp detail, sanded before sealing.

3.04 CLEAN UP

A. Maintain the premises in a neat and orderly condition at all times. Periodically remove all trash, debris, and waste from the work in order to maintain clear and unobstructed access.

B. In the event of spilling or splashing compound onto other surfaces, immediately remove the spilled or splashed material and all trace of the residue to the approval of the Architect.

END OF SECTION

SECTION 09 51 20
ACOUSTIC CEILING TREATMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Suspended metal grid ceiling system at lay-in acoustical tile ceilings and suspended gypsum board lobby ceilings.

B. Lay-in acoustical tile panels.

1.02 RELATED WORK

A. Section 09 25 00 - Gypsum Drywall.

B. Section 21 00 00 - Fire Protection System.

C. Section 23 00 00 - Heating, Ventilating, and Air Conditioning.

D. Section 26 51 00 - Interior Lighting.

1.03 REFERENCES

A. ASTM C635-07 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

B. ASTM C636-08 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of ceiling suspension system and ceiling tile with three years minimum experience.

B. Installer: Company with three years minimum experience.

1.05 SUBMITTALS

A. Submit product data and samples under provisions of Section 01 30 00.

B. Submit two samples of acoustic tiles with full scale pattern, illustrating material and finish of acoustic units.

C. Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and edge trim.

D. Submit manufacturer's installation instructions under provisions of Section 01 30 00.

1.06 EXTRA STOCK

A. Provide 10 extra acoustic tile units under provisions of Section 01 70 00.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - SUSPENSION SYSTEM

A. Armstrong

B. U. S. Gypsum Company

C. Chicago Metallic Corporation

D. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 60 00.

2.02 SUSPENSION SYSTEM MATERIALS – ACOUSTIC TILE CEILINGS

A. Grid: Armstrong Suprafine, intermediate duty exposed T system with ESR-1308 seismic evaluation; components die cut and interlocking.

B. Accessories: Stabilizer bars, clips, splices, edge moldings, and other components as required for suspended grid system.

C. Grid Materials: commercial quality cold rolled steel with galvanized coating and bake paint finish.

E. Grid Color: white.

F. Support Channels and Hangers: Galvanized steel; size and type to suit application, to rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

G. Edge Trim at Floating Installation: Axiom Classic 2” channel.

2.03 ACCEPTABLE MANUFACTURERS - LAY-IN ACOUSTICAL TILES

A. Armstrong

B. U.S. Gypsum Company

C. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

2.06 LAY-IN ACOUSTICAL TILE MATERIALS

A. Tile Characteristics:

1. Product: Armstrong Cirrus Second Look III
2. Size: 24 x 48 inches
3. Thickness: 9/16 inches
4. Composition: Mineral
5. NRC Range: .65
6. Edge: Beveled Tegular
7. Surface Color: white
8. Pattern: 6” linear plank
9. Surface Finish: fine texture

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that existing conditions are ready to receive work.

B. Verify that layout of hangers will not interfere with other work.

C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION – SUSPENDED CEILINGS

A. Install system in accordance with manufacturer's instructions and as supplemented in this Section.

B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

D. Supply hangers or inserts for installation as described on the drawings.

E. Hang system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Locate system on room axis according to reflected ceiling plan.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Do not eccentrically load system, or produce rotation of runners.

J. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions. Field rabbett panel or tile edge.

K. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.

L. Install acoustic units level, in uniform plane, and free from twist, warp and dents.

M. Install hold-down clips to retain panels tight to grid system within 20 ft of an exterior door.

3.03 SEISMIC REQUIREMENTS

A. Install all system components, including intersections, splay bracing, compression struts, splices and perimeter fastenings to meet seismic requirements of UBC 2336.

3.04 TOLERANCES

A. Variation from Flat and Level Surface: 1/8 inch in 10 ft

B. Variation from Plumb of Grid Members Caused by Eccentric Loads: Two degrees maximum.

3.05 CLEANING AND TOUCH-UP

A. After acoustic tiles are in place, used manufacturer's touch-up paint to repair cut edges as necessary

B. Clean all fingerprints, smudges, and packaging marks from grid and tiles

C. Remove all debris and packaging materials from work area.

END OF SECTION

SECTION 09 90 00
PAINTING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Surface preparation.

B. Exterior and interior surface finishes.

C. Surface finish schedule.

D. All labor and material necessary for a complete installation of the work of this section whether or not specifically described.

1.02 RELATED WORK

A. Section 03 35 00 - Concrete Floor Stains.

B. Section 04 20 00 - Concrete Unit Masonry.

C. Section 05 50 00 - Metal Fabrications.

D. Section 06 40 00 - Architectural Woodwork.

E. Section 08 10 00 - Metal Doors and Frames.

F. Section 08 20 00 - Wood Doors.

G. Section 09 25 00 - Gypsum Drywall.

1.03 REFERENCES

A. ANSI/ASTM D16-11 - Definitions of Terms Relating to Paint, Varnish, Laquer, and Related Products.

1.04 DEFINITIONS

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

1.05 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with ten years experience.

B. Applicator: Company specializing in commercial painting and finishing with five years documented experience, approved by product manufacturer.

1.06 SUBMITTALS

A. Submit product data under provisions of Section 01 30 00.

B. Provide product data on all finishing products, including full current color selector fans if requested by Architect.

C. Submit under provisions of Section 01 30 00 two samples brushouts 8 x10 inch in size illustrating range of colors and textures specified for each surface finishing product scheduled.

D. Submit manufacturer's application instructions under provisions of Section 01 30 00.

1.07 FIELD SAMPLES

A. Provide samples under provisions of Section 01 30 00.

B. Provide field sample panel, a minimum of 10 square feet of painted surface, illustrating coating color, texture, and finish, for each coating color when requested by the Architect or Owner's representative.

C. Locate where directed.

D. Accepted sample may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01 60 00.

B. Store and protect products under provisions of Section 01 60 00.

C. Deliver products to site in sealed and labelled containers; inspect to verify acceptance.

D. Container labelling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

E. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in well ventilated area, unless required otherwise by manufacturer's instructions.

F. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F (7 degrees C) for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings during rain or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish Finishes: 65 degrees F (18 degrees C) for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.10 EXTRA STOCK

A. Provide a one gallon container or 5% of total job amount of each color (whichever is more) to Owner.

B. Label each container with color, texture, and room locations, in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - PAINT, STAIN, PRIMERS AND SEALERS

A. Sherwin Williams.

B. Dunn Edwards.

C. Alternate products may be used if approved on the basis of submittals made under the provisions of Section 01 30 00.

2.02 MATERIALS

A. Coatings: Ready mixed, except field catalysed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.

B. Coating Application Characteristics: Good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.03 EPOXY FLOOR COATING

A. Acceptable Manufacturers.
   1. ArmorPoxy.
   2. Alternate products may be used if approved on the basis of submittals made under the provisions of Section 01 30 00.

B. Product Characteristics.
   1. Product: ArmorPoxy II heavy duty two-part epoxy floor coating system.
   2. Preparation: ArmorPoxy preparation/etching solution.
   3. Top Coat: ArmorUltra Topcoat.
   4. Slip Resistant Additive: UltraWear non-skid additive.
   5. Color/Pattern: as selected by Architect from standard range.
   6. Air Quality Compliance: confirm compliance with most current California requirements.

2.04 FINISHES

A. Refer to Materials Schedules for surface finish texture locations; refer to Drawings for color locations.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that substrate conditions are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Plaster and Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
   3. Interior Located Wood: 15 percent.
   4. Exterior Located Wood: 19 percent.

D. Beginning of installation means acceptance of existing substrate.

3.02 PREPARATION

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.

B. Correct minor defects and clean surfaces which affect work of this Section.

C. Shellac and seal marks which may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Aluminum Surfaces Scheduled for Field 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.

F. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.

G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

H. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

I. Copper Surfaces Scheduled for a Paint Finish: Remove contamination by steam, high pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.

J. Copper Surfaces Scheduled for a Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.

K. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair.

L. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

M. Concrete and Unit Masonry Surfaces Scheduled to Receive Sealer or Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry. Fill cracks and voids with elastomeric patching material only where opaque painted finish will be applied.

N. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

O. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

P. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

Q. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

R. Interior Millwork and Wood Casework Scheduled to Receive Transparent Finish: Remove handling marks or effects of exposure to moisture with a thorough final sanding over all surfaces of the exposed portions, using at least 150 grit or finer sandpaper, and thoroughly clean all surfaces before applying sealer and finish.

S. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied.

T. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.03 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.04 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish.

D. Apply each coat of paint slightly darker than preceeding coat unless otherwise approved.

E. Sand lightly between coats to achieve required finish.

F. Allow applied coat to dry before next coat is applied.

G. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

H. Prime back surfaces of interior and exterior woodwork with primer paint.

I. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

J. Apply first coat of masonry sealer as a mist coat to break surface tension; apply second coat per manufacturer's recommendations, assuring a completely saturated application. Take care to thoroughly seal all sides of horizontal and vertical grout joints.

3.05 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed equipment. Paint shop prefinished items exposed to view in inhabited areas.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Prime and paint insulated and exposed-to-view pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports.

D. Replace identification markings on mechanical or electrical equipment when painted accidently.

E. Paint exposed conduit and electrical equipment occuring in finished areas.

F. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment with fire retardant coating as required by utility companies.

G. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

3.06 CLEANING

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.07 MATERIALS SCHEDULE - EXTERIOR SURFACES

A. Primed or Galvanized Metal:
1. Two coats direct to metal acrylic semi-gloss trim paint.

B. Unfinished Wood:
1. One coat stain-blocking, mildew resistant latex primer.
2. Two coats satin acrylic latex paint.

C. Previously Finished Wood:
1. One coat acrylic latex primer, pigmented.
2. One coat satin acrylic latex paint.

D. Damaged Wood:
1. Preparation, sealing per Section 06 40 00.
2. Two coats satin acrylic latex paint.

E. Pre-primed Metal Exterior Doors and Frames:
   1. Two coats satin acrylic latex paint.

F. Exterior Exposed-to-View New Concrete Unit Masonry:
   1. One coat acrylic resin block filler/surfacer.
   2. Two coats satin acrylic latex paint.

G. Previously Finished Exposed-to-View Concrete Unit Masonry:
   1. One coat acrylic latex primer.
   2. Two coats satin acrylic latex paint.

H. Exterior Plaster:
   1. One coat acrylic sealer/conditioner.
   2. Two coats satin acrylic latex paint.

3.08 MATERIALS SCHEDULE - INTERIOR SURFACES

A. Painted Interior Doors, Softwood Trim and Unfinished Casework Surfaces:
   1. One coat acrylic primer.
   2. Two coats semi-gloss acrylic paint.

B. Stained Hardwood Door Veneer:
   1. One coat oil stain.
   2. Two coats polyurethane varnish, hand rubbed satin.

C. Gypsum Board Ceilings, Cells:
   1. One coat high solids acrylic drywall primer.
   2. One coat high build, catalyzed, water-based epoxy paint.

D. Gypsum Board Walls and Ceilings, Other:
   1. One coat high solids acrylic drywall primer.
   2. Two coats semi-gloss acrylic paint.

E. Concrete Block Walls:
   1. One coat acrylic resin block filler/surfacer.
   2. One coat high build, catalyzed, water-based epoxy paint.

F. Miscellaneous Metals:
   1. One coat acrylic primer.
   2. Two coats semi-gloss acrylic paint.

G. Concrete Floors, Stained:
   (per Section 03 35 00)

H. Concrete Floors, Coated:
   1. Two coat (two-part) epoxy coating.
   2. One coat epoxy topcoat.

END OF SECTION

SECTION 10 40 00
SIGNAGE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Site signage.

B. Dimensional letters and numbers.

C. Exterior and interior door and wall mounted signage.

D. All labor and materials necessary for a complete installation of the work of this Section, whether or not specifically described.

1.02 RELATED WORK

A. Section 08 10 00 - Metal Doors and Frames

B. Section 08 20 00 - Wood Doors and Frames

C. Section 08 80 00 - Glazing

1.03 SUBMITTALS

A. Submit shop drawings, product data and materials list under provisions of Section 01 30 00. Include manufacturer's installation instructions.

B. Indicate on shop drawings all dimensions, thicknesses and mounting details, as well as copies of composited artwork for all painted, screened, or fabricated images.

C. Accompanying product data and materials list submit one letter and one numeral of each size, and a sample of each type of sign and plaque. Following approval, samples may be installed in the Work.

1.04 DELIVERY, STORAGE AND PROTECTION

A. Protect products under provisions of Section 01 60 00.

B. Protect signs and letters prior to and after installation. Repair damage at no additional cost to Owner.

PART 2 - PRODUCTS

2.01 WALL MOUNTED MONUMENT SIGNS (Main Identification Sign)

A. Manufacturer: Any

B. Characteristics:
1. Type: metal-edged metal signboard.
2. Material: composite aluminum, gauge as required to prevent oil-canning.
3. Dimensions: 32” x 240”.
4. Lettering: raised, brushed aluminum letters
5. Typeface: Gill Sans Condensed, regular and bold.
6. Mounting: non-removable studs into concrete block site wall.

2.02 DIMENSIONAL NUMBERS (Project Address)

A. Acceptable Manufacturer: Metallic Arts

B. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

C. Address Number Characteristics:
1. Type: cut-out metal letters.
2. Material: aluminum.
3. Finish/Color: brushed aluminum.
4. Typeface: Gill Sans Condensed.
5. Mounting: stud mounted to concrete block site wall.

2.03 DOOR PLAQUE SIGNS

A. Acceptable Manufacturer: Best Sign Systems (sales@bestsigns.com).

B. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

C. Characteristics:
1. Product: Best HC200 ADA System
2. Construction: Multi-layer melamine.
3. Graphics: Graphic Blast etching, image raised 1/32".
4. Typeface: Gill Sans Condensed, or approved equivalent, as selected by Architect.
5. Mounting: Vinyl adhesive tape on door or wall surface
6. Colors: White on standard background color selected by Architect.
7. Shape: square corners, 6" x 9" or 9" x 9" unless otherwise noted.
8. Copy Size/Position: per approved shop drawings.
9. Braille: Grade 2 (contracted) Braille block per CBC.
10. Location/ Copy: Per Drawings and Sign Schedule.

2.04 VINYL LETTERING

A. Acceptable Manufacturer: any

B. Vinyl Lettering Characteristics:
1. Product: vinyl letters and symbols.
2. Typeface: Gill Sans Condensed.
3. Color: white.
4. Location/Size/Copy: per Sign Schedule and Drawings.
5. Mounting: Reverse mounted to inside glass surface.

2.05 FREESTANDING SIGN

A. Acceptable Manufacturer: Lavi (www.lavi.com).

B. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

C. Freestanding Sign Characteristics:
1. Product: Directrac weighted-base display stand.
2. Material: aluminum.
3. Finish/Color: black.
4. Display: 24" x 36" frame for paper poster insert.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are suitable and installed work of other trades is complete to the point where work of this section may properly proceed.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install all material in accordance with approved shop drawings.

B. Install all exterior signage attachments in a manner resistant to tampering and vandalism.

C. Install all signage level, plumb and true to sign edges. Limit deviation from level to 1/8 inch over the length of complete image.

END OF SECTION

SECTION 10 71 13
EXTERIOR SUN CONTROL DEVICES

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Aluminum horizontal sun control device at building exterior.

1.02 RELATED WORK

A. Section 05 50 00 - Metal Fabrications.

B. Section 08 40 00 - Storefront System.

1.03 REFERENCES

A. California Building Code - Section 1609 Wind Loads.

B. ASTM B221-08 - aluminum alloy for extruding

C. AAMA 605.2 - high performance specification for organic coatings on aluminum extrusions

1.04 QUALITY ASSURANCE

A. Manufacturer's Engineer: A professional engineer who is legally qualified to practice in the project's jurisdiction and experienced with the requirements of sun control devices.

B. Manufacturer: Minimum of 5 years experience manufacturing sun control devices of the type specified.

C. Installer: Acceptable to manufacturer.

1.05 SUBMITTALS

A. Structural Calculations and Details: Show that the sun control device meets CBC dead load and wind load requirements. Such calculations and details must be approved by the Architect and (if required) the City of Manteca prior to fabrication.

B. Shop Drawings, complying with Section 01 30 00.

C. Product Data.

D. Samples: Color samples for approval of hue and sheen.

E. Test Reports:

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged products in original containers or bundles with seals unbroken and labels intact until time for use.

B. Keep materials dry. Where necessary, stack materials off ground on level flat forms, fully protected from weather.

PART 2 - PRODUCTS

2.O1 ACCEPTABLE MANUFACTURERS - SUN CONTROL DEVICES

A. Firestone Una-Clad

B. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

2.02 SUN CONTROL DEVICE PRODUCTS

A. Sun Control Device System: Firestone Una-Clad SC-1 system, with the following characteristics:
1. Material: aluminum (0.375 outriggers; 0.125 blades).
2. Dimensions: 48 inch cantilever from wall/column surface.
3. Fascia Style: rectangular tube.
4. Blade Style: airfoil.
5. Outrigger Style: rectangular tube.
6. Brackets:standard tee and ell brackets.
7. Finish: Kynar 500 fluoropolymer coating, as selected by Architect from standard range.

2.03 ACCESSORIES

A. Storefront Connectors and Stiffeners: manufacturer's standard product as approved through submittal process.

B. Anchors and Fasteners: as engineered for dead loads and wind loads.

C. Provide suspension cables or braces if determined necessary by engineers to prevent deflection.

2.03 FABRICATION

A. Fabricate sun control devices in accordance with referenced standards and good trade practice for commercial or institutional applications.

B. Provide reinforcement as required.

C. Conceal welds and fasteners wherever possible.

D. Provide permanent protection between dissimilar metals.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates to receive sun control devices and verify that surfaces are plumb, level, clean, in full accord with contract documents and provided solid anchoring surface.

B. Do not start erection until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install sun control devices in strict accordance with manufacturer's recommendations.

B. Employ only skilled workers, especially trained and experienced in this work.

C. Whenever aluminum comes into direct contact with steel, masonry, concrete, or non-compatible materials, separate them by bituminous paint, zinc chromate primer, or suitable insulating materials.

D. Erect sun control devices level, square, true, and adequately anchored to maintain positions permanently when subjected to dead loading, normal thermal and building movement and specified wind loads.

3.03 ADJUSTING AND CLEANING

A. After completion of installation, verify level and make corrections as required.

B. Clean aluminum using only products specifically recommended by the manufacturer.

3.04 PROTECTION

A. Protect work from damage to surface, profile, and shape during and after erection and until project is accepted.

END OF SECTION

SECTION 11 14 00
PEDESTRIAN CONTROL EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Post and panel system to direct pedestrian traffic, as indicated on Drawings.

1.02 RELATED WORK

A. Section 05 50 00 - Metal Fabrications.

B. Section 10 14 00 - Signage.

1.03 PERFORMANCE REQUIREMENTS

A. Provide a complete and functional system, containing all necessary accessories.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 30 00.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver pedestrian control equipment to the site in manufacturer's protective packaging.

B. Store products of this Section in a dry, weather protected location according to the manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Lavi Industries (www.lavi.com)

B. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

2.02 PEDESTRIAN CONTROL SYSTEM COMPONENTS

A. Posts:
1. Model: Lavi Beltrac 3000 "merchandiser post," with rubberized base.
2. Quantity: 8.
3. Dimensions: 48" tall.
4. Material: aluminum.
5. Color/Finish: black.

B. Panels:
1. Model: Lavi Nextrac hinged panels
2. Quantity: 9.
3. Dimensions: seven panels 30" tall x 48" long; two panels 30" tall x custom length as determined in the field.
4. Frame Material: aluminum.
5. Frame Color/Finish: matt black.
6. Panel Material: acrylic.

7. Panel Color/Finish: black.

C. Accessories:
1. Provide three tracks for attachment of panels to existing steel post and concrete block column.
2. Provide two 11” x 14” fixed mount sign frames for post-top mounting, black finish.

PART 3 - EXECUTION

3.01 INSPECTION

A. Surfaces and support to receive products of this Section shall be complete, square, and ready to receive products.

B. Bring uneven, incomplete, or inadequate substrates to the attention of the Contractor for correction before beginning installation.

C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Assemble and install pedestrian control equipment per manufacturer’s written instructions.

B. Install panel connections at existing steel post and concrete block column in a permanent and tamper-proof fashion.

END OF SECTION

SECTION 11 19 00
DETENTION EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Benches and mirrors in cells, as indicated on Drawings.

1.02 RELATED WORK

A. Section 05 50 00 - Metal Fabrications.

B. Section 22 40 00 - Plumbing Fixtures.

1.03 REFERENCES

A. California Title 24, Part I, Section 13-102 and Part 2, Section 470A.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 30 00.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver detention equipment to the site in manufacturer's protective packaging.

B. Store products of this Section in a dry, weather protected location according to the manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Barker Built division of Bob Barker Company (www.barkerbuilt.com)

B. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

2.02 PEDESTRIAN CONTROL SYSTEM COMPONENTS

A. Benches:
1. Model: BarkerBuilt SS6B, SS8B without handcuff rings.
2. Quantity/Lengths: per Drawings; custom lengths as required.
3. Depth: 12 inches.
4. Seat Material: 11 guage stainless steel, 304 grade, formed with safety edges.
5. Pedestal Base Material: Schedule 40 steel pipe, square steel base plate.
6. Base Finish: gray powder coat.
7. Mounting: expansion wedge anchors in floor with tamperproof bolts.

B. Mirrors:
1. Model: Barkerbuilt 408B.
2. Quantity: 3.
3. Dimensions: 12-1/2 inches wide x 16-1/2 inches high (overall).
4. Material: polished stainless steel.
5. Mounting: backing plate, tamperproof torx fasteners.

6. Panel Material: acrylic.
7. Panel Color/Finish: black.

PART 3 - EXECUTION

3.01 INSPECTION

A. Surfaces and support to receive products of this Section shall be complete, square, and ready to receive products.

B. Bring uneven, incomplete, or inadequate substrates to the attention of the Contractor for correction before beginning installation.

C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install detention equipment per manufacturer's written instructions.

B. Install mounting plates flush and tight against surfaces to prevent prying or tampering.

END OF SECTION

SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Grout.
6. Fire-suppression demolition.
7. Concrete bases.
8. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 21 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

G. Solvent Cements for Joining CPVC Plastic Piping: ASTM F 493.

2.3 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: **NBR** interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: **Stainless steel**. Include two for each sealing element.

D. Connecting Bolts and Nuts: **Stainless steel** of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.4 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.5 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: **Polished chrome-plated**.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: **Polished chrome-plated**.

2.6 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 FIRE-SUPPRESSION DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove fire-suppression systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

3.4 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use **3000-psi (20.7-MPa)**, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "**Cast-in-Place Concrete**."

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor fire-suppression materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.7 GROUTING

A. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 210500

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Sleeves.
4. Escutcheons.
5. Equipment installation requirements common to equipment sections.
6. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 QUALITY ASSURANCE

A. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

C. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

D. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

2.3 DIELECTRIC FITTINGS

A. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

B. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.4 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

2.5 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated, Rough brass Polished chrome-plated, and rough brass.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.

6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

H. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

I. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

J. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

K. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

B. Field Welding: Comply with AWS D1.1.

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.7 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 220500

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. See Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

C. See Division 21 Section "Water-Based Fire-Suppression Systems" for pipe hangers for fire-suppression piping.

D. See Division 22 Section "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.

E. See Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

   1. AAA Technology & Specialties Co., Inc.
   2. Bergen-Power Pipe Supports.
   3. B-Line Systems, Inc.; a division of Cooper Industries.
   4. Carpenter & Paterson, Inc.
   5. Empire Industries, Inc.
   6. ERICO/Michigan Hanger Co.
   7. Globe Pipe Hanger Products, Inc.
   8. Grinnell Corp.
   9. GS Metals Corp.
   10. National Pipe Hanger Corporation.
   11. PHD Manufacturing, Inc.
   12. PHS Industries, Inc.
   13. Piping Technology & Products, Inc.
   14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Available Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
   c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
   d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
   e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION 220529

SECTION 220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Cellular glass.
b. Flexible elastomeric.
c. Mineral fiber.
d. Polyolefin.
e. Polystyrene.

B. Related Sections include the following:

1.2 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Cell-U-Foam Corporation; Ultra-CUF.
    b. Pittsburgh Corning Corporation; Foamglas Super K.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
6. Preformed Pipe Insulation with Factory-Applied ASJ ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

H. High-Temperature, Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type V, without factory-applied jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; HTB 23 Spin-Glas.
    b. Owens Corning; High Temperature Flexible Batt Insulations.

I. High-Temperature, Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type III, without factory-applied jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Fibrex Insulations Inc.; FBX.
    b. Johns Manville; 1000 Series Spin-Glas.
    c. Owens Corning; High Temperature Industrial Board Insulations.
    d. Rock Wool Manufacturing Company; Delta Board.
    e. Roxul Inc.; Roxul RW.
    f. Thermafiber; Thermafiber Industrial Felt.

J. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Fibrex Insulations Inc.; Coreplus 1200.

b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000 Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

3. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; CrimpWrap.
b. Johns Manville; MicroFlex.
c. Knauf Insulation; Pipe and Tank Insulation.
d. Manson Insulation Inc.; AK Flex.
e. Owens Corning; Fiberglas Pipe and Tank Insulation.

K. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armacell LLC; Tubolit.
b. Nomaco Inc.; IMCOLOCK, IMCOSHEET, NOMALOCK, and NOMAPLY.
c. RBX Corporation; Therma-cell.

L. Polystyrene: Rigid, extruded cellular polystyrene intended for use as thermal insulation. Comply with ASTM C 578, Type IV or Type XIII, except thermal conductivity (k-value) shall not exceed 0.26 Btu x in./h x sq. ft. x deg F (0.038 W/m x K) after 180 days of aging. Fabricate shapes according to ASTM C 450 and ASTM C 585.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); Styrofoam.
b. Knauf Insulation; Knauf Polystyrene.

M. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

N. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

O. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-10.
   b. Foster Products Corporation, H. B. Fuller Company; 35-00.
   c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
   d. Marathon Industries, Inc.; 550.
   e. Mon-Eco Industries, Inc.; 55-50.
   f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms (2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F (Minus 29 to plus 93 deg C).
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.2 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe

diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

2.3 CELLULAR-GLASS INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

2.4 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

2.5 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

2.6 POLYOLEFIN INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

2.7 POLYSTYRENE INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation with tape or bands and tighten bands without deforming insulation materials. Orient longitudinal joints between half sections in 3 and 9 o'clock positions on the pipe.
2. For insulation with factory-applied jackets with vapor barriers, do not staple longitudinal tabs but secure tabs with additional adhesive or tape as recommended by insulation material manufacturer and seal with vapor-barrier mastic.
3. All insulation shall be tightly butted and free of voids and gaps at all joints. Vapor barrier must be continuous. Before installing jacket material, install vapor-barrier system.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

2.8 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

2.9 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water: Insulation shall be one of the following:

1. Flexible Elastomeric: 3/4 inch (19 mm) thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.
3. Polyolefin: 3/4 inch (19 mm) thick.

B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Insulation shall be one of the following:

1. Flexible Elastomeric: 3/4 inch (19 mm) thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch (13 mm) thick.
3. Polyolefin: 3/4 inch (19 mm) thick.

END OF SECTION 220700

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Above ground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Specialty valves.
3. Flexible connectors.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to SEI/ASCE 7.

1.3 SUBMITTALS

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

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) and ASTM B 88, Type M (ASTM B 88M, Type C) water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

C. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

1. Description:

a. Pressure Rating: 125 psig (860 kPa) at 73 deg F (23 deg C).
b. Stem: Stainless steel.
c. Handle: Lever.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Description:

a. Pressure Rating: 150 psig (1035 kPa) at 180 deg F (82 deg C).
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Couplings:

1. Description:

a. Galvanized-steel coupling.
b. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
c. End Connections: Female threaded.
d. Lining: Inert and noncorrosive, thermoplastic.

D. Dielectric Nipples:

1. Description:

a. Electroplated steel nipple complying with ASTM F 1545.

b. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
c. End Connections: Male threaded or grooved.
d. Lining: Inert and noncorrosive, propylene.

2.5 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated or rough-brass finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One Piece, Stamped Steel: Chrome-plated finish with setscrew or spring clips.

E. Split Casting, Cast Brass: Polished, chrome-plated or rough-brass finish with concealed hinge and setscrew.

F. Split Plate, Stamped Steel: Chrome-plated finish with concealed exposed-rivet hinge, setscrew or spring clips.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.6 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

E. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure-reducing valves.

G. Install domestic water piping level and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install seismic restraints on piping. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping adjacent to equipment and specialties to allow service and maintenance.

N. Install piping to permit valve servicing.

O. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

P. Install piping free of sags and bends.

Q. Install fittings for changes in direction and branch connections.

R. Install PEX piping with loop at each change of direction of more than 90 degrees.

S. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

T. Install pressure gages on suction and discharge piping from each plumbing pump and packaged booster pump. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.

U. Install thermostats in hot-water circulation piping. Comply with requirements in Division 22 Section "Domestic Water Pumps" for thermostats.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

3.4 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

3. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.

F. Install supports for vertical copper tubing every 10 feet (3 m).

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

3. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.7 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish stamped steel with set screw stamped steel with set screw or spring clips stamped steel with spring clips.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish One piece or split casting, cast brass with polished chrome-plated finish Split casting, cast brass with polished chrome-plated finish One piece, stamped steel with set screw One piece or split plate, stamped steel with set screw Split plate, stamped steel with set screw.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome-plated finish cast brass with rough-brass finish stamped steel with set screw stamped steel with spring clips stamped steel with set screw or spring clips.
5. Bare Piping in Equipment Rooms: One piece, cast brass stamped steel with set screw stamped steel with spring clips stamped steel with set screw or spring clips.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

C. e.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 PIPING SCHEDULE

A. Above ground domestic water piping, NPS 2 (DN 50) and smaller, shall be[**one of**] the following:
   1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper solder-joint fittings; and soldered joints.

3.11 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

   1. Shutoff Duty: Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
   2. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:
   1. Hose bibbs.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa), unless otherwise indicated.

1.3 SUBMITTALS

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

B. Field quality-control test reports.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. NSF Compliance:

   1. ents.
   2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 HOSE BIBBS

A. Hose Bibbs:

   1. Standard: ASME A112.18.1 for sediment faucets.
   2. Body Material: Bronze.
   3. Seat: Bronze, replaceable.
   4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
   5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
   6. Pressure Rating: 125 psig (860 kPa).

7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following soil and waste, sanitary drainage and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.3 SUBMITTALS

A. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

1. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.

B. Solid-Wall PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Special pipe fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Aboveground, soil, waste, and vent piping NPS 4 (DN 100) and smaller shall be[**any of**] the following:
   1. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
   2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

C. Underground, soil, waste, and vent piping NPS 4 (DN 100) and smaller shall be[**any of**] the following:
   1. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
   2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.2 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Division 22 Section "Facility Sanitary Sewers."

B. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

F. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

G. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

H. Install ABS soil and waste drainage and vent piping according to ASTM D 2661.

I. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

J. Install underground soil and waste drainage piping according to ASTM D 2321.

K. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

3.4 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

F. Install hangers for ABS and PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.

G. Install supports for vertical ABS and PVC piping every 48 inches (1200 mm).

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Sanitary Waste Piping Specialties."
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Sanitary Waste Piping Specialties."
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

3.6 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.

1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
2. Prepare reports for tests and required corrective action.

3.7 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.8 PROTECTION

A. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:
   1. Cleanouts.
   2. Roof flashing assemblies.
   3. Miscellaneous sanitary drainage piping specialties.
   4. Flashing materials.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

2.2 CLEANOUTS

A. Exposed Cleanouts:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2.
      1) Smith, Jay R.
      2) Josam
      3) Zurn

   3. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
   4. Size: Same as connected drainage piping
   5. Body Material: Cast-iron soil pipe T-branch Hubless as required to match connected piping.
   6. Closure: Countersunk with brass plug.
   7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

8. ASTM D2751-83A Schedule 40 ABS pipe may be used at Contractor's option to the extent that such materials and methods of installation meet the requirements of governmental agencies having jurisdiction. Pipe to have IAPMO approved listing and comply with the latest U.P.C. Standards. Cleanout tops to be installed with tamper-proof screws.

B. Floor Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

    1) Smith, Jay R.
    2) Josam
    3) Zurn

4. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
5. Size: Same as connected branch.
6. Body or Ferrule: Cast iron.
7. Closure: Brass plug with straight threads and gasket.
8. Frame and Cover Material and Finish: Rough bronze.
9. ASTM D2751-83A Schedule 40 ABS pipe may be used at Contractor's option to the extent that such materials and methods of installation meet the requirements of governmental agencies having jurisdiction. Pipe to have IAPMO approved listing and comply with the latest U.P.C. Standards. Cleanout tops to be installed with tamper-proof screws.

C. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Acorn Engineering Company; Elmdor/Stoneman Div.
    b. Thaler Metal Industries Ltd.

D. Description: Manufactured assembly made of 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch- (1.6-mm-) thick, lead flashing collar and skirt extending at least from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

2.4 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Fasteners: Metal compatible with material and substrate being fastened.

C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

D. Solder: ASTM B 32, lead-free alloy.

E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.5 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

G. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

H. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

2.6 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

2.7 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

2.8 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 223300 - ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Commercial, storage electric water heaters.
   2. Water heater accessories.

1.2 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Operation and maintenance data.

C. Warranty.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Structural failures including storage tank and supports.
      b. Faulty operation of controls.
      c. Deterioration of metals, metal finishes, and other materials beyond normal use.

   2. Warranty Period(s): From date of Substantial Completion:
      a. Commercial Electric Water Heaters: Three years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 COMMERCIAL ELECTRIC WATER HEATERS

A. Commercial Electric Booster Heaters: Comply with UL 1453 requirements for booster-type water heaters.

   1. Available Manufacturers:

      a. Bradford White Corporation.
      b. Coates Heater Co.
      c. Electric Heater Company (The); Hubbell Heaters Division.
      d. Hatco Corporation.
      e. Lochinvar Corporation.
      f. Rheem Water Heater Div.; Rheem Manufacturing Company.
      g. Ruud Water Heater Div.; Rheem Manufacturing Company.
      h. Smith, A. O. Water Products Company.
      i. Arriston

   2. Storage-Tank Construction: Corrosion-resistant metal or steel.

      a. Tappings: ASME B1.20.1 pipe thread.
      b. Pressure Rating: 150 psig (1035 kPa).
      c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

   3. Factory-Installed Storage-Tank Appurtenances:

      a. Temperature Control: Adjustable thermostat, to setting of at least 180 deg F (82 deg C).
      b. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
      c. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3, combination temperature and pressure relief valve. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
      d. Gages: Combination temperature and pressure type or separate thermometer and pressure gage.

   4. Special Requirements: NSF 5 construction with brackets for undercounter installation.
   5. Capacity and Characteristics:

2.3 WATER HEATER ACCESSORIES

A. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

B. rester.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

B. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks.

C. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.

D. Fill water heaters with water.

3.2 CONNECTIONS

A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

END OF SECTION 223300

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Faucets for lavatories, showers, and sinks.
2. Toilet seats.
3. Fixture supports.
4. Water closets.
5. Lavatories and wash sinks.
6. Individual showers.

1.2 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. FRP: Fiberglass-reinforced plastic.

D. PMMA: Polymethyl methacrylate (acrylic) plastic.

E. PVC: Polyvinyl chloride plastic.

F. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.3 SUBMITTALS

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

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" Public Law 90-480, "Architectural Barriers Act", and Public Law 101-336, "Americans with Disabilities Act" for plumbing fixtures for people with disabilities.

B. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

E. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Plastic Shower Enclosures: ANSI Z124.2.
3. Plastic Sinks: ANSI Z124.6.
4. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
5. Slip-Resistant Bathing Surfaces: ASTM F 462.
6. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
7. Vitreous-China Fixtures: ASME A112.19.2M.

F. Comply with the following applicable standards and other requirements specified for lavatory and wash sink faucets:

1. Faucets: ASME A112.18.1.
2. NSF Potable-Water Materials: NSF 61.
3. Pipe Threads: ASME B1.20.1.
4. Supply Fittings: ASME A112.18.1.
5. Brass Waste Fittings: ASME A112.18.2.

G. Comply with the following applicable standards and other requirements specified for shower faucets:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
3. Faucets: ASME A112.18.1.
4. Hand-Held Showers: ASSE 1014.
5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Manual-Control Antiscald Faucets: ASTM F 444.
8. Pipe Threads: ASME B1.20.1.
9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

H. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Plastic Tubular Fittings: ASTM F 409.
4. Brass Waste Fittings: ASME A112.18.2.

I. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Flexible Water Connectors: ASME A112.18.6.
2. Grab Bars: ASTM F 446.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Off-Floor Fixture Supports: ASME A112.6.1M.
5. Pipe Threads: ASME B1.20.1.
6. Plastic Toilet Seats: ANSI Z124.5.
7. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 LAVATORY AND SINK FAUCETS

A. Lavatory And Sink Faucets:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    1) American Standard Companies, Inc.
    2) Chicago Faucets.
    3) Delta Faucet Company.
    4) Kohler Co.
    5) Moen, Inc.
    6) Price Pfister, Inc.

2. Description: Single-control mixing valve. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
    1) Body Material: General-duty, solid brass or copper or brass underbody with brass cover plate.
    2) Finish: Polished chrome plate.
    3) Maximum Flow Rate: 0.5 gpm.
    4) Retain subparagraph above or first subparagraph below.
    5) Mounting: Deck, exposed.
    6) Valve Handle(s): Lever.
    7) Spout: Rigid type.
    8) Spout Outlet: Aerator.
    9) Operation: Manual.
    10) Drain: Grid.

2.2 SHOWER FAUCETS

A. Shower Faucets SH-1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    1) American Standard Companies, Inc.
    2) Chicago Faucets.
    3) Delta Faucet Company.
    4) Kohler Co.
    5) Moen, Inc.
    6) Price Pfister, Inc.

2. Description: Single-handle pressure balanced valve. Include hot- and cold-water indicators; check stops; and shower head, arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.
    1) Body Material: Solid brass.
    2) Finish: Polished chrome plate.
    3) Maximum Flow Rate: 2.5 gpm, unless otherwise indicated.
    4) Operation: Manual.
    5) Antiscald Device: Integral with mixing valve].
    6) Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
    7) Shower Head Material: Metallic with chrome-plated finish.
    8) Spray Pattern: Fixed.

2.3 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    1) Olsonite
    2) Bemis Manufacturing Company..
    3) Eljer.
    4) Kohler Co.
    5) Sterling

2. Description: Toilet seat for water-closet-type fixture.
    1) Material: Molded, solid plastic.
    2) Configuration: Open front without cover.
    3) Color: White.

2.4 WATER CLOSETS

A. Water Closets, WC-1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    1) American Standard Companies, Inc.
    2) Kohler

2. Description: Accessible, Floor-mounting, floor-outlet, vitreous-china fixture designed for gravity-type tank operation.

3. Style: Close coupled.
    1) Bowl Type: Elongated. Include bolt caps matching fixture.
    2) Height: Accessible.
    3) Design Consumption: 1.6 gal/flush.
    4) Tank: Gravity type with trim. Include cover.
    5) Trip Mechanism: Lever-handle actuator.
    6) Color: White.
4. Supply: NPS ½ chrome-plated brass or copper with wheel-handle stop.

2.5 LAVATORIES AND WASH SINKS

A. Lavatories and Wash Sinks, LAV-1 and WS-1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    1) Eljer.
    2) Just.

2. Description: Counter top lavatory and wash sink.

    1) Color: White.
    2) Drain: Grid.
    3) Drain Piping: Schedule 40 ABS or PVC tubular waste to wall; and wall escutcheon.

2.6 INDIVIDUAL SHOWERS

A. Individual Showers, SH-1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1) American Standard Companies, Inc.
    2) Chicago Faucets.
    3) Delta Faucet Company.
    4) Kohler Co.
    5) Moen, Inc.
    6) Price Pfister, Inc.

2. Description: Accessible shower enclosure with slip-resistant surface.
    1) Drain: Grid, NPS 2.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

C. Install fixtures level and plumb according to roughing-in drawings.

D. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

E. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

G. Install toilet seats on water closets.

H. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

I. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

J. Install shower flow-control fittings with specified maximum flow rates in shower arms.

K. Install traps on fixture outlets.

L. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

M. Set showers in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."

N. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.4 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Equipment installation requirements common to equipment sections.
   2. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 QUALITY ASSURANCE

A. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

2.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

2.3 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use [**3000-psi (20.7-MPa)**] <**Insert other**>, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "[**Cast-in-Place Concrete**] [**Miscellaneous Cast-in-Place Concrete**]."

2.4 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

2.5 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

END OF SECTION 230500

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Fastener systems.
5. Equipment supports.

B. See Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Powder-actuated fastener systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.
1. (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

F. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

G. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

H. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

C. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

D. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

E. Install lateral bracing with pipe hangers and supports to prevent swaying.

F. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

END OF SECTION 230529

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
5. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

a. Constant-volume air systems.

2. HVAC equipment quantitative-performance settings.
3. Verifying that automatic control devices are functioning properly.
4. Reporting results of activities and procedures specified in this Section.

1.2 SUBMITTALS

A. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

B. Warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by AABC or NEBB.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems." NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

1.4 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.5 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

1.6 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 01 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

L. Examine equipment for installation and for properly operating safety interlocks and controls.

M. Examine automatic temperature system components to verify the following:
   1. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
   2. Controller set points are set at indicated values.
   3. Changeover from heating to cooling mode occurs according to indicated values.

N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

   1. Permanent electrical power wiring is complete.
   2. Automatic temperature-control systems are operational.
   3. Equipment and duct access doors are securely closed.

4. Balance dampers are open.
5. Isolating and balancing valves are open and control valves are operational.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

K. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

    a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.7 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.8 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Record controller settings and note variances between set points and actual measurements.

C. Check free travel and proper operation of control devices such as damper and valve operators.

D. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

3.9 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.

2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Heating-Water Flow Rate: 0 to minus 10 percent.
4. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.10 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

a. Settings for outside-, return-, and exhaust-air dampers.
b. Conditions of filters.
c. Cooling coil, wet- and dry-bulb conditions.
d. Face and bypass damper settings at coils.
e. Fan drive settings including settings and percentage of maximum pitch diameter.
f. Inlet vane settings for variable-air-volume systems.
g. Settings for supply-air, static-pressure controller.
h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

3.11 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
   a. Mineral fiber.

B. Related Sections:
1. Division 23 Section "Metal Ducts" for duct liners.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. e.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. CertainTeed Corp.; Duct Wrap.

b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

D. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation without factory-applied jacket. For equipment applications, provide insulation..

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Commercial Board.
b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

E. FSK Tap Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.2 SECUREMENTS

A. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

C. Wire: 0.062-inch (1.6-mm) soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. C & F Wire.
b. Childers Products.
c. PABCO Metals Corporation.
d. RPR Products, Inc.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Floor Penetrations:

F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching

staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.5 BOILER BREECHING INSULATION SCHEDULE

A. Ro.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and return air.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Supply, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

END OF SECTION 230700

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-22:

1. Suction Lines for Air-Conditioning Applications: 185 psig (1276 kPa).

1.3 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.5 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 VALVES AND SPECIALTIES

A. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig (3450 kPa).

2.3 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

C. ASHRAE 34, R-22: Monochlorodifluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Suction Lines NPS 1-1/2 (DN 40) and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

R. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

U. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.

V. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.3 PIPE JOINT CONSTRUCTION

A. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

B. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
6. NPS 2 (DN 50): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
7. NPS 2-1/2 (DN 65): Maximum span, 108 inches (2700 mm); minimum rod size, 3/8 inch (9.5 mm).
8. NPS 3 (DN 80): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (9.5 mm).
9. NPS 4 (DN 100): Maximum span, 12 feet (3.7 m); minimum rod size, 1/2 inch (13 mm).

D. Support multifloor vertical runs at least at each floor.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.

b. System shall maintain test pressure at the manifold gage throughout duration of test.
c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
4. Charge system with a new filter-dryer core in charging line.

3.7 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.
6. Seismic-restraint devices.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
3. Division 23 Section "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
4. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated.

1. Static-Pressure Classes:

a. Supply Ducts: 1-inch wg (250 Pa).
b. Return Ducts (Negative Pressure): 1-inch wg (250 Pa).
c. Exhaust Ducts (Negative Pressure): 1-inch wg (250 Pa).

2. Leakage Class:

a. Round Supply-Air Duct: 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa).
b. Rectangular Supply-Air Duct: 6 cfm/100 sq. ft. at 1-inch wg (0.29 L/s per sq. m at 250 Pa).
c. Flexible Supply-Air Duct: 6 cfm/100 sq. ft. at 1-inch wg (0.29 L/s per sq. m at 250 Pa).

B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SEI/ASCE 7. SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

1.3 SUBMITTALS

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

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Perimeter moldings.

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Lindab Inc.
b. McGill AirFlow LLC.
c. SEMCO Incorporated.
d. Sheet Metal Connectors, Inc.
e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger Than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.6 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Ductmate Industries, Inc.
3. Hilti Corp.
4. Kinetics Noise Control.
5. Loos & Co.; Cableware Division.
6. Mason Industries.
7. TOLCO; a brand of NIBCO INC.
8. Unistrut Corporation; Tyco International, Ltd.

B. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

C. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 SEAM AND JOINT SEALING

A. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements," unless otherwise indicated.

B. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

1. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.

2. Brace a change of direction longer than 12 feet (3.7 m).

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

F. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 DUCT SCHEDULE

A.

B. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. Stainless-Steel Ducts: Galvanized steel.
3. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.

C. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Velocity 1000 fpm (5 m/s) or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

c. Velocity 1500 fpm (7.6 m/s) or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam.

D. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
    b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
    c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Flexible ducts.
4. Duct accessory hardware.

1.2 SUBMITTALS

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

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Exposed-Surface Finish: Mill phosphatized.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Greenheck Fan Corporation.
6. Lloyd Industries, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. Pottorff; a division of PCI Industries, Inc.
10. Ruskin Company.
11. SEMCO Incorporated.
12. Vent Products Company, Inc.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm (10 m/s).

D. Maximum System Pressure: 1-inch wg (0.25 kPa).

E. Frame: 0.063-inch- (1.6-mm-) thick extruded aluminum, with welded corners and mounting flange.

F. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Front of rear screens.
6. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.

c. Flexmaster U.S.A., Inc.
d. McGill AirFlow LLC.
e. METALAIRE, Inc.
f. Nailor Industries Inc.
g. Pottorff; a division of PCI Industries, Inc.
h. Ruskin Company.
i. Trox USA Inc.
j. Vent Products Company, Inc.

2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized-steel, 0.064 inch (1.62 mm) thick.

2.4 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

E. Vane Construction: Double wall.

F. Vane Construction: Single wall for ducts up to 48 inches (1200 mm) wide and double wall for larger dimensions.

2.5 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20 m/s).
3. Temperature Range: Minus 10 to plus 160 deg F (Minus 23 to plus 71 deg C).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

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

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.

2. Downstream from manual volume dampers, control dampers,[**turning vanes,**] and equipment.
3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
4. At each change in direction and at maximum 50-foot (15-m) spacing.
5. Upstream of turning vanes.
6. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

J. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

K. Install flexible connectors to connect ducts to equipment.

L. Connect flexible ducts to metal ducts with draw bands.

M. Install duct test holes where required for testing and balancing purposes.

N. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes ceiling- and duct-mounted diffusers, registers, and grilles.

1.2 SUBMITTALS

A. Product Data: For each product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 DIFFUSERS AND GRILLES

A. Ceiling Supply Diffusers CSD-1 through CSD-5:

1. Products:
    1) METALAIRE, Inc.
    2) Titus .
    ~~3)~~
2. Material: Steel.
3. Finish: **Baked enamel, white**.
4. Damper Type: Adjustable opposed-blade assembly.

B. Duct Supply Diffuser DSD-1 through 3:

1. Products:
    1) METALAIRE, Inc.
    2) Titus .

2. Material: **Steel**.
3. Finish: **Anodized aluminum**.
4. Pattern: **Fully adjustable**.
5. Dampers: **Radial opposed blade**.

C. Ceiling Return Grille CRG-1 through 5:

1. Products:
    1) METALAIRE, Inc.
    2) Titus .
    ~~3)~~
2. Material: Steel.
3. Finish: **Baked enamel, white**.

D. Duct Return Grille DRG-1 through 3:

1. Products:
    1) METALAIRE, Inc.
    2) Titus .
    ~~3)~~
2. Material: Steel.
3. Finish: Baked enamel, white.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow

pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 237433 - PACKAGED, OUTDOOR, HEATING AND COOLING MAKEUP AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes cooling and heating rooftop air units.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories.

B. Shop Drawings: Include details of installation and wiring diagrams.

C. Coordination Drawings: Rooftop replacement-air units to roof-curb mounting details drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Size and location of rooftop replacement-air unit mounting rails and anchor points and methods for anchoring units to roof curb.
2. Required roof penetrations for ducts, pipes, and electrical raceways, including size and location of each penetration.

D. Startup service reports.

E. Operation and maintenance data.

F. Warranty.

G. LEED Submittals:

1. Credit EA 4: Manufacturers' product data for refrigerants, including printed statement that refrigerants are free of HCFCs.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Units shall be designed to operate with HCFC-free refrigerants.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components listed below that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AAON, Inc.
2. Addison Products Company.
3. Des Champs Laboratories, Incorporated.
4. LCSystems.
5. Reznor-Thomas & Betts Corporation; Mechanical Products Division.
6. York
7. Carrier
8. Trane

2.2 CABINET

A. Construction: Single wall.

B. Exterior Casing: Galvanized steel with baked-enamel paint finish and with lifting lugs and knockouts for electrical and piping connections.

C. Interior Casing: Galvanized steel.

D. Base Rails: Galvanized-steel rails for mounting on roof curb.

E. Service Doors: Hinged access doors with neoprene gaskets.

F. Internal Insulation: Fibrous-glass duct lining complying with ASTM C 1071, Type II.

1. Thickness: 1 inch (25 mm).
2. Insulation Adhesive: Comply with ASTM C 916, Type I.
3. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to casing without damaging liner and without causing air leakage when applied as recommended by manufacturer.

G. Condensate Drain Pans: Formed sections of galvanized-steel sheet designed for self-drainage. Fabricate pans with slopes to preclude buildup of microbial slime.

H. Roof Curb: Full-perimeter curb of sheet metal, minimum 12 inches (300 mm) high, with wood nailer, neoprene sealing strip, and welded Z-bar flashing.

2.3 SUPPLY-AIR FAN

A. Fan: Forward-curved centrifugal; statically and dynamically balanced, galvanized steel, mounted on solid-steel shaft with self-aligning, permanently lubricated ball bearings.

B. Motor: Open dripproof, two-speed motor.

C. Drive: V-belt drive with matching fan pulley and adjustable motor sheaves and belt assembly with minimum 1.4 service factor.

D. Mounting: Fan wheel, motor, and drives shall be mounted in fan casing with elastomeric isolators.

2.4 REFRIGERATION SYSTEM

A. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. Compressors: Reciprocating or scroll compressors with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief.

C. EER and COP: as defined by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Refrigeration System Specialties:
1. Brass service valves installed in discharge and liquid lines.
2. Operating charge of refrigerant.

E. Refrigerant Coils: Evaporator and condenser coils shall be designed, tested, fabricated, and rated according to ARI 410 and ASHRAE 33. Coils shall be leak tested under water with air at 315 psig (2170 kPa).

1. Capacity Reduction: Circuit coils for row control.
2. Tubes: Copper.
3. Fins: Aluminum with minimum fin spacing of 0.071 inch (1.81 mm).
4. Fin and Tube Joint: Mechanical bond.
5. Suction and Distributor: Seamless copper tube with brazed joints.
6. Coating: Phenolic epoxy corrosion-protection coating on both coils.
7. Source Quality Control: Test to 450 psig (3105 kPa), and to 300 psig (2070 kPa) underwater.

F. Condenser Fan: Propeller type, directly driven by motor.

G. Safety Controls:

1. Compressor motor and outside-coil fan motor low ambient lockout.
2. Overcurrent protection for compressor motor and outside-coil fan motors.

2.5 INDIRECT-FIRED GAS FURNACE

A. Description: Factory assembled, piped, and wired; complying with NFPA 54, "National Fuel Gas Code," and ANSI Z21.47, "Gas-Fired Central Furnaces."

1. AGA Approval: Designed and certified by and bearing label of AGA.

B. Burners: Aluminized steel with stainless-steel inserts with a minimum thermal efficiency of 80 percent.

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark with flame sensor.

C. Heat-Exchanger Drain Pan: Stainless steel.

D. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve.

E. Safety Controls:

1. Gas Control Valve: Single stage.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.6 OUTDOOR-AIR INTAKE AND DAMPERS

A. Dampers: Leakage rate, according to AMCA 500, shall not exceed 2 percent of air quantity at face velocity of 2000 fpm (10 m/s) through damper and pressure differential of 4-inch wg (1000 Pa).

B. Damper Operators: Electric.

C. Mixing Boxes: Parallel-blade, galvanized-steel dampers mechanically fastened to steel operating rod inside cabinet. Connect operating rods with common interconnecting linkages so dampers operate simultaneously.

D. Outdoor-Air Intake Hoods: Galvanized steel, with bird screen and finish to match cabinet.

2.7 FILTERS

A. Comply with NFPA 90A.

B. Cleanable Filters: 2-inch- (50-mm-) thick, cleanable metal mesh.

C. Disposable Panel Filters: 2-inch- (50-mm-) thick, factory-fabricated, flat-panel-type, disposable air filters with holding frames.

1. Media: Interlaced glass fibers sprayed with nonflammable adhesive.
2. Frame: Galvanized steel.

2.8 CONTROLS

A. Factory-wire connection for controls' power supply.

B. Control devices, including sensors, transmitters, relays, switches, thermostats, humidistats, detectors, operators, actuators, and valves, shall be manufacturer's standard items to accomplish indicated control functions.

C. Unit Controls: Solid-state control board and components with field-adjustable control parameters.

D. Supply-Fan Control: Units shall be electrically interlocked with corresponding exhaust fans, to operate continuously when exhaust fans are running. Time clock shall switch operation from occupied to unoccupied. Night setback thermostat shall cycle fan during unoccupied periods to maintain space temperature.

1. Timer: Seven-day electronic clock.
2. Electrically interlock kitchen hood fire-extinguishing system to de-energize replacement-air unit when fire-extinguishing system discharges.

E. Controls:
1. Remote Setback Thermostat: Adjustable room thermostat selected by timer cycles supply fan heating or cooling to maintain space temperature.

2.9 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof curb on roof structure, according to Install and secure rooftop replacement-air units on curbs and coordinate roof penetrations and flashing with roof construction.

3.2 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for visible damage to furnace combustion chamber.
2. Inspect for visible damage to compressor, air-cooled outside coil, and fans.
3. Inspect casing insulation for integrity, moisture content, and adhesion.
4. Verify that controls are connected and operable.
5. Clean outside coil and inspect for construction debris.
6. Clean furnace flue and inspect for construction debris.
7. Inspect operation of power vents.

8. Purge gas line.
9. Verify bearing lubrication.
10. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
11. Adjust fan belts to proper alignment and tension.
12. Start unit.
13. Start refrigeration system when outdoor-air temperature is within normal operating limits.
14. Inspect and record performance of interlocks and protective devices including response to smoke detectors by fan controls and fire alarm.
15. Operate unit for run-in period.
16. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency:

    a. Measure gas pressure at manifold.
    b. Measure combustion-air temperature at inlet to combustion chamber.
    c. Measure flue-gas temperature at furnace discharge.
    d. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    e. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

17. Calibrate thermostats.
18. Adjust and inspect high-temperature limits.
19. Inspect outdoor-air dampers for proper stroke[**and interlock with return-air dampers**].
20. Start refrigeration system and measure and record the following:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

21. Verify operational sequence of controls.
22. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-limit heat exchanger.
    b. Alarms.

B. After startup and performance testing, change filters, verify bearing lubrication, and adjust belt tension.

C. Remove and replace components that do not pass tests and inspections and retest as specified above.

D. Prepare written report of the results of startup services.

3.3 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 237433

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.2 SUBMITTALS

A. Product Data: For each unit indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Units shall be designed to operate with HCFC-free refrigerants.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace split-system air-conditioning units that fail in materials and workmanship within five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Air Conditioning; Div. of Carrier Corp.
2. Evcon Industries, Inc.
3. First Co.
4. Friedrich Air Conditioning Company.
5. Koldwave, Inc.
6. Lennox Industries Inc.
7. Mitsubishi Electric Sales Canada, Inc.
8. Mitsubishi Electronics America, Inc.; HVAC Division.
9. Mitsubishi Heavy Industries America, Inc.; Air-Conditioning & Refrigeration Division, Inc.
10. Sanyo Fisher (U.S.A.) Corp.
11. Tadiran Electronic Industries Inc.; Appliance Division.
12. Trane Co. (The); Unitary Products Group.
13. York International Corp.

2.2 EVAPORATOR-FAN UNIT

A. Wall Unit Cabinet: Enameled steel with removable panels on front and ends.
1. Drain Pans: Galvanized steel, with connection for drain; insulated.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Evaporator Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

D. Fan Motor: Multispeed.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER UNIT

A. Casing steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed scroll type with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor..

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240

D. Fan: Aluminum-propeller type, directly connected to motor.

E. Motor: Permanently lubricated, with integral thermal-overload protection.

F. Low Ambient Kit: Permits operation down to 45 deg F (7 deg C).

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

C. Additional Monitoring:

1. Monitor constant and variable motor loads.
2. Monitor variable frequency drive operation.
3. Monitor economizer cycle.
4. Monitor cooling load.
5. Monitor air distribution static pressure and ventilation air volumes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

B. Install roof-mounted, compressor-condenser components on equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.

C. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch (25 mm). Refer to Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Install piping adjacent to unit to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

B. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new components, and retest.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 238126

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Labor, material, equipment and services necessary to construct and install a complete electrical system as shown on the plans and as specified herein. All General Conditions and Requirements outlined elsewhere in these specifications or drawings shall be applied to this electrical section.

B. Materials and equipment shall be furnished and installed in support of electrical work described in these plans and specifications including but not limited to, raceways, boxes, enclosures, branch circuiting, supports, sleeves, lighting fixtures, controls, relays, contactors, in order to complete and make fully functional the systems described.

C. Lighting systems, both interior and exterior as shown on the plans and as specified herein, including controls, occupancy sensors, lumen sensors, photocell controls, lamps, supports, fasteners, straps, and miscellaneous mounting hardware and support structures for such equipment.

D. HVAC electrical: Conduit, conductors and terminations for all line voltage power, line voltage controls and fusible and/or non-fusible safety disconnect switches for HVAC equipment, including but not limited to air conditioners, furnaces, fans, heat pumps, condensing units. Provide protective equipment unless otherwise noted, etc. including protective devices.

E. Power and Lighting Distribution: Furnish and install power and lighting distribution systems including but not limited to branch circuits, devices, fixtures, disconnect switches, controls, etc. for a complete working system.

F. Data systems infrastructure including all boxes, raceways, sleeves and penetrations, etc. as described and as shown in plans, risers, specifications, EIA/TIA standards and/or required for a complete and operating system.

G. Lighting acceptance testing, documentation and completion of required forms as specified in Section 26 56 70, LIGHTING ACCEPTANCE TESTING.

H. Allocation of time to adequately train the Owner on the use and operation of all systems installed within the facility or on the property. Minimum two week advance notice shall be coordinated with the Owner and his representatives. Training shall be as outlined in individual system specifications identified to follow.

1.02 RELATED SECTIONS UNDER OTHER DIVISIONS

A. Mechanical Wiring: Control circuit wiring, energy management controls and interlocks for mechanical equipment shall be installed by Mechanical Contractor.

B. Painting of electrical equipment where exposed and required by the Architect to be painted as described elsewhere in the specification.

C. HVAC Control Raceway: Raceways, boxes, and control wiring for thermostats, temperature sensors and control components specified within the mechanical specifications, shall be furnished and installed as required by Division 25 and installed in accordance with the minimum wiring methods allowed for branch circuit wiring in Division 26.

D. Security System: Shall be installed by Owner's vendor. Contractor shall provide conduits, boxes, stubs to accessible ceilings, access control system (key pads, electric locks), etc. as shown and/or required by the Owner's vendor.

1.03 SYSTEM DESCRIPTION

A. The electrical plans indicate the general layout and arrangement; the architectural drawings and field conditions shall determine exact locations. Field verify all conditions and modify as required to satisfy design requirements as well as code minimums. Maintain all required working clearances as described in CEC Article 110 as well as other applicable articles.

B. Discrepancies shall be brought immediately to the attention of the Architect for clarification. The Architect shall approve any changes. Prior to rough-in, refer to architectural plans that shall take precedence over electrical plans with respect to locations.

1.04 SUBMITTALS AND SHOP DRAWINGS

A. Before construction, submit in accordance with the General Conditions of this Specification: A complete list of all materials proposed to be furnished and installed under this section.

B. Manufacturers' specifications, catalog cuts and shop drawings as required to demonstrate compliance with the specifications. Identify specific intended use for each component where submittal may be ambiguous. Submit entire bound submittal at one time; partial submittals will not be accepted. At a minimum, submittals will be required for the following:
   1. Electrical equipment including disconnects, fuses, raceways, straps and racks, fittings, conductors, boxes, devices, plates, etc.
   2. Lighting equipment including fixtures, ballasts, lamps, mounting accessories, color charts (where required), etc.
   3. Lighting control equipment including occupancy sensing equipment, time clocks, contactors, photocells, lumen sensors, etc.
   4. Constructability review letter/comments for lighting acceptance testing as required by Section 26 56 70, LIGHTING ACCEPTANCE TESTING.
   5. Conduit including all fittings, etc.
   6. Wiring and cable, terminations, etc.
   7. Fire rating penetration materials, details, etc.

C. The intent of these specifications is to establish a standard of quality for materials and equipment. Therefore, some items are identified by manufacturer or trade name designation. Substitutions shall be subject to the Architect's approval. Samples of the proposed and substitute materials may be required for inspection prior to approval. Costs, if any, for evaluation of substitutions shall be the Contractor's responsibility. The decision of the Architect shall be final. Where the substitution will affect other trades, coordinate all changes with those trades concerned and pay any additional costs incurred by them as a result of this substitution. Approval of substitutions shall not relieve the Contractor from providing an operational system in accordance with all applicable codes and ordinances.

1.05 DELIVERY, STORAGE AND HANDLING

A. Storage of equipment for the job is the responsibility of the Electrical Contractor and shall be scheduled for delivery to the site, as the equipment is required. Damage to the equipment delivered to the site or in transport to the job shall be the responsibility of the Electrical Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall be new and bear the label of or be listed by a nationally recognized testing laboratory. The quality and suitability of all materials shall conform to the standards and practices of this trade.

B. Supplied materials shall be of a current manufactured product line. Discontinued products are not acceptable. Where products are identified on the contract documents by part number, supply the current product model or series which meets the specification and intended use of the specified component.

2.02 SUPPORTING DEVICES

A. Hangers: Kindorf B-905-2A Channel, H-119-D washer, C105 strap, 3/8” rod with ceiling flange.

B. Concrete Inserts: Kindorf D-255, cast in concrete for support fasteners for loads up to 800 lbs.

C. Pipe Straps: Two-hole galvanized or malleable iron.

D. Luminaire Chain: Campbell Chain 75031, 90-lb. test with steel hooks.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Professionalism and appearance of installations shall be in accordance with accepted practices of this trade. Installation methods shall conform to manufacturers' specifications and recommendations. The Contractor shall man the job with qualified journeymen and helpers in this trade for the duration of the job. It is the Contractor's responsibility to communicate with and keep the job superintendent appraised of changes or clarifications, etc.

B. Employment of any person on any job in the capacity of an electrician is not permitted unless such person has qualified for and holds a valid Journeyman Electrician Pocket Card or General Journeyman Electrician Certificate issued by the State of California Division of Apprenticeship Standards except, Contractor may employ electrical helpers or apprentices on any job of electrical construction, new or existing, when the work of such helpers or apprentices is performed under the direct and constant personal supervision of a journeyman electrician holding a valid Pocket Card accepted by the State of California Division of Apprenticeship Standards.

1. Each Pocket Card carrying journeyman electrician will be permitted to be responsible for the quality of workmanship for a maximum of one helper or apprentice during any same time period, provided the nature of work is such that good supervision can be maintained and the quality of workmanship is the best, as expected by Owner and implied by the latest edition of the National Electrical Code.
2. Before each journeyman electrician commences work, deliver to Owner at the project site, a photocopy of the journeyman's valid Pocket Card.

C. Materials shall be installed in accordance with the manufacturers' specification and recommendations. They must conform to the approval AHJ adopted codes and standards, but not less than the 2007 CEC and all applicable codes and standards, including but not necessarily limited to California Code of Regulations Title 24, NFPA, National Electrical Manufacturers Association, ANSI, CBC, and any other adopted ordinances of applicable agencies having jurisdiction. Refer to general conditions of specifications.

D. Electrical Contractor shall lay work out in advance in order to avoid unnecessary cutting, chasing, and drilling of floors, walls, ceilings and other surfaces. Work of this nature shall be carefully done so as not to damage work already performed by other trades. Any damage which results must be properly repaired at no extra cost to the Owner. Such alterations shall not depreciate the integrity of the structure. Approval for cuts or penetrations in structural members shall be by the Architect.

E. Supporting Devices:
1. Verify mounting height of all luminaires or items prior to installation when heights are not detailed.
2. Install vertical support members for equipment and luminaires, straight and parallel to building walls. Provide independent supports to structural member for electrical luminaires, materials, or equipment installed in or on ceiling, walls or in void spaces or over furred or suspended ceilings.
3. Do not use other trade's fastening devices as supporting means for electrical equipment, materials or luminaires. Do not use supports or fastening devices to support other than one particular item.
4. Support conduits within 18" of outlets, boxes, panels, cabinets and deflections. Maximum distance between supports not to exceed 8' spacing.
5. Securely suspend all junction boxes, pull boxes or other conduit terminating housings located above suspended ceiling from the floor above or roof structure to prevent sagging and swaying.
6. Provide seismic bracing per UBC requirements for this building location.
7. Supporting Devices: Safety factor of 4 required for every fastening device or support for electrical equipment installed. Support to withstand four times weight of equipment it supports.

F. Coordinate work with other trades as required to eliminate any delays during construction. Coordinate changes with other prime contractors to avoid construction conflicts.

G. Engineer's Field Observation: When Electrical Engineering representative performs a field observation, the Electrical Contractor shall be present and available to remove equipment covers as needed.

H. Drawings of Record: Provide a full and accurate set of field record drawings marked up in a neat and understandable manner submitted to the Owner Representative, Construction Manager, or Architect upon completion of the work and prior to issuance of a certificate of completion. The drawings shall dimension all electrical facilities including but not limited to underground conduit, vaults, boxes as well as conduit routing scaled to within 12" of actual field

conditions and shall be kept up to date on a daily basis reflecting changes or deviations. Electrical facilities shall be accurately drawn on the plan to scale. Refer to the general conditions of these specifications for additional requirements. Record drawings shall be required to identify both horizontal and vertical dimensions to visible and fixed points such as concrete, asphalt, buildings, sidewalks, etc.

I. Identification: Provide engraved laminated plastic nameplates for all switchboards, panelboards, fire alarm terminal cabinets, telephone and cable television backboards, main devices, control panels, time clocks, contactors and safety disconnect switches accurately identifying each device. Labels shall be attached to the equipment by means of screws or rivets. Self-adhering labels will not be acceptable.

J. Safety: The Electrical Contractor is responsible to maintain equipment in a safe and responsible manner. Keep dead front equipment in place while equipment is energized. Conduct construction operations in a safe manner for employees as well as other work persons or anyone visiting the job site. Provide barriers, trench plates, flags, tape, etc. The Contractor shall hold all parties harmless of negligent safety practices that may cause injury to others on or near the job site.

K. Guarantees: Equipment and labor shall be guaranteed and warranted free of defects, unless otherwise stated to be more restrictive, for a period of one year from the date of final acceptance by the Owner. A written warranty shall be presented to the Architect at the time of completion prior to final acceptance. Equipment deemed to be damaged, broken or failed should be repaired or replaced at no additional cost to the Owner. Materials or system requiring longer than a one-year warranty as described herein shall be separately warranted in separate letters of guarantee stating the duration of warranty.

L. Operating and Installation Manuals: Provide two copies each of manuals, operating and installation instructions for equipment indicated in submittal packages. Instruct the Owner's representative as to the operation and location of equipment necessary to allow them to operate the facility upon final acceptance. This instruction period shall be prearranged with the Owner's representative prior to occupancy of the facility and the weeks prior to training scheduled.

M. Lighting Acceptance Testing: Provide two copies of lighting acceptance testing results and equipment operating manuals as specified in Section 26 56 70, LIGHTING ACCEPTANCE TESTING. Instruct the Owner on operation of control systems as noted in Paragraph J above.

END OF SECTION

SECTION 26 05 01
SELECTIVE ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work shall be as specified in individual sections.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor to walk job to observe existing conditions and account for variance as needed.

B. Verify field measurements and circuiting arrangements as shown on drawings.

C. Verify that abandoned wiring and equipment serve only abandoned facilities.

D. Demolition Drawings are based on limited field observation and existing record documents. Report discrepancies to Owner/Architect before disturbing existing installation.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with Owner.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, observe provisions of NFPA 70E and CALOSHA, use personnel experienced in such operations.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of this section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Allow the owner first right to retain ownership of salvaged materials, otherwise the Electrical Contractor is responsible for its removal from the site and proper disposal or recycling.

D. Remove abandoned wiring to source of supply.

E. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Discarded electrical components and lamps containing hazardous waste (i.e., mercury in fluorescent lamps) shall be disposed of as required by the State Laws and Local Ordnances regarding hazardous materials.

J. Repair adjacent construction and finishes damaged during demolition and extension work.

K. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

L. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

3.05 INSTALLATION

A. Install relocated materials and equipment as shown and/or as required.

END OF SECTION

SECTION 26 05 19
LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Wires and cables.
   2. Connectors.
   3. Lugs and pads.

1.02 SYSTEM DESCRIPTION

A. Provide wires, cables, connectors, lugs, strain reliefs, racking insulators for a complete and operational electrical system.

1.03 SUBMITTALS

A. Provide product data for the following equipment:
   1. Wires.
   2. Cables.
   3. Connectors.
   4. Lugs.
   5. Splice Kits.

B. Provide the insulation cable testing report in the project closeout documentation, refer to Closeout Requirements in the General Conditions portion of this specification.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of the CEC, latest adopted version with amendments by local Authority Having Jurisdiction (AHJ).

B. Furnish products listed by UL or other testing firm acceptable to AHJ.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wires and Cables: Carol, General Cable, Okonite, Rome, Southwire, or approved equal.

B. Connectors: Burndy, Ilsco, Thomas & Betts, or approved equal.

C. Wire connectors shall be minimum 75 degree centigrade rated and properly sized for the number of conductors being connected, terminated, spliced etc. All above grade connectors

shall be solderless lug or plastic wire nut type, screw on, pressure cable type (wire nut or spring nut type), 600 volt, 105 degree C, with skirt to cover all portions of stripped wires. Connector shall be U.L. rated for number and size of conductors being joined together as a splice.

D. Splices:
1. Branch Circuit Splices: Ideal, Scotch-Lock, 3M, or approved.
2. Feeder Splices: Compression barrel splice with two layers Scotch 23 and four layers of Scotch 33+ as vapor barrier.
3. Screw Terminal Lugs.
4. Kearney Split Bolt.

2.02 WIRES AND CABLES FOR LINE VOLTAGE SYSTEM AND CONTROLS. WIRE AND CABLE SHALL BE:

A. Copper, 600 volt rated throughout. Conductors 14AWG to 10AWG, solid or stranded. Conductors 8AWG and larger, stranded.

B. Color Code Conductors as Follows:

2.03

PHASE	208 VOLT
A	Black
B.	Red
C.	Blue
Neutral	White
Ground	Green
Isolated Ground	Green w/yellow trace

A. All conductors shall be copper unless otherwise noted. Minimum size for individual conductors shall be #12 AWG unless otherwise noted. Sizes #8 AWG and larger shall be stranded conductor. Individual conductors shall be insulated with type, XHHW, THW, THHN/THWN 600-volt insulation unless otherwise noted. Control, signal, communication conductors shall be as dictated by the vendor of that equipment or as specified here-in. Proper insulation type shall be used for the proper environmental application (i.e., waterproof, wet location, plenum, temperature rated). If a condition exists where the application is uncertain, contact the Engineer for direction. Contractor is responsible to follow specific cabling requirements described in other sections of this specification relative to various communications and controls systems as well as the respective riser diagrams shown on plans. If a discrepancy occurs, communicate such discrepancy to the Architect and Engineer immediately for resolution.

B. Insulation types THWN, THHN or XHHW. Minimum insulation rating of 90C for branch circuits.

C. Refer to signal and communications specification sections for cable requirements.

2.04 CONNECTORS

A. Copper Pads: Drilled and tapped for multiple conductor terminals.

B. Lugs: Indent/compression type for use with stranded branch circuit or control conductors.

C. Solid Conductor Branch Circuits: Spring connectors, wire nuts, for conductors 18 through 8AWG.

2.05 LUGS AND PADS

A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation: Conductors shall not be installed until after conduit systems are permanently in place. Use an approved non hardening type wire pulling lubricant if lubricant is to be used. Maintain all conduits and wire pulls free from foreign material. If due to field conditions, more than a total of 300 degrees of bend are required; a pull box shall be furnished and installed for ease of installation. Said pull boxes must be sized and rated for the appropriate application and must remain easily accessible upon completion of the project (approval of the location shall be obtained from the Architect prior to installation). Show these pullboxes on the field record drawings. Conductors installed in underground raceways on site shall be duct sealed and taped where they exit the raceway to prevent the entrance of foreign material and moisture after the conductors are installed. Proper drainage shall be proved for underground pull and splice boxes.

B. Insulation: Use proper insulation types where temperature and environment are a factor.

C. Splices at or below grade level shall be made with wet location rated and approved mechanical connectors and shall be encapsulated in epoxy or plastic molded poured kits. The connections must be assured to be watertight. Splices at or below grade shall always be avoided and minimized. Prior approval is required for feeder splices below grade. Submit proposed materials and exhibit showing location of intended splices for Engineer's review and approval if granted.

D. Labeling: All conductors in panels and junction boxes shall be labeled with tape number markers indicating circuit number and identifying system. All labeling shall be permanent.

E. All conductors, wiring, cable where installed below floor, slab or underground shall be considered wet locations, and shall be rated accordingly. Non waterproof cabling is not allowed in any below grade or wet application.

F. Cables routed together in cable tray shall be stacked, organized and tie wrapped together in a neat and workman like manner. Random cable routing is not acceptable.

G. Cable and conductors routed through pull boxes and vaults shall be properly supported on porcelain or equal insulators mounted on steel rack inserts. Bend radius of cable or conductor shall not be less than six times the overall cable diameter.

H. Wires and Cables:
1. Conductor Installation:

a. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
b. Install conductors with care to avoid damage to insulation.
c. Do not apply greater tension on conductors than recommended by manufacturer during installation.
d. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation.

2. Conductor Size and Quantity:
   a. Install no conductors smaller than 12AWG unless otherwise shown.
   b. Provide all required conductors for a fully operable system.
3. Provide dedicated neutrals (one neutral conductor for each phase conductor) in the following single phase circuits:
   a. Dimmer controlled circuits.
   b. Ground fault and arc fault protected circuits where a GFI and arc fault breakers are used in panelboards.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies general grounding and bonding requirements of electrical installations for personnel safety and to provide a low impedance path for possible ground fault currents as described in CEC Article 250.

B. “Grounding electrode system” refers to all electrodes required by CEC, as well as including made, supplementary, lightning protection system and telecommunications system grounding electrodes.

C. The terms “connect” and “bond” are used interchangeably in this specification and have the same meaning.

1.02 RELATED WORK

A. Section 26 05 00, COMMON WORK RESULTS FOR ELECTRICAL.

B. Section 26 05 19, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

PART 2 - PRODUCTS

2.01 GROUNDING AND BONDING CONDUCTORS

A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be permitted to be identified per CEC.

B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes No. 10 AWG and smaller shall be ASTM B1 solid bare copper wire.

C. Conductor sizes shall not be less than what is shown on the drawings and not less than required by the CEC, whichever is greater.

2.02 SPLICES AND TERMINATION COMPONENTS

A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

PART 3 - EXECUTION

3.01 GENERAL

A. Ground in accordance with the CEC, as shown on drawings, and as hereinafter specified.

3.02 INACCESSIBLE GROUNDING CONNECTIONS

A. Make grounding connections which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

3.03 SECONDARY EQUIPMENT AND CIRCUITS

A. Conduit Systems:
   1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor sized per CEC.
   2. Non metallic conduit systems shall contain an equipment grounding conductor.
   3. Metal conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.

B. Branch Circuits: Install equipment grounding conductors with all power and lighting branch circuits.

C. Boxes, Cabinets and Enclosures:
   1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
   2. Provide lugs in each box and enclosure for equipment grounding conductor termination.

D. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.

E. Ground lighting fixtures to the equipment grounding conductor of the wiring system when the green ground is provided; otherwise, ground the fixtures through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.

END OF SECTION

SECTION 26 05 33
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Outlet boxes.
2. Weatherproof outlet boxes.
3. Junction and pull boxes.
4. Floor boxes and poke-through.
5. Cabinets, termination cabinets.
6. Gutters.
7. Concrete boxes and vaults.
8. Fiberglass or composite boxes and vaults.

1.02 WORK INCLUDED

A. Installation of all wire, cable, conductor, boxes/gutters, pull ropes, fiber optic cable raceway, conduit, innerduct, cable sleeve and duct as described on the plans and/or as specified here-in. This scope shall include pathways to be installed underground on site and offsite, underslab, above grade, both concealed and exposed, overhead concealed and exposed as appropriately applied. Raceways/boxes shall be installed in accordance with their intended and allowed uses and as specified here-in whichever is more restrictive. Size and capacity of all raceway/boxes shall be as specified here-in or as depicted on the drawings, but shall not be less than that required by code. Larger raceway sizes may be specified than code would permit. The specifications shall govern.

B. Listed products for termination, coupling, extending, benching supports of raceways shall be used.

C. Raceways/boxes described by this section shall include, but not be limited to, power for site utilities and lighting, site and building communications, controls, fire alarm, security, access control, sound systems, data system, energy management systems, power distribution, lighting, lighting controls, video, CATV, voice communications, intercom, nurse call, HVAC and other building low voltage/communications systems controls as may be required. Raceways, boxes and duct paths required for utility companies shall be installed per plans unless utility company requirements are more restrictive at which time those requirements shall take precedence.

D. Protection of and cleanliness of pathways and raceways must be assured during the construction process in order to eliminate the possibility of debris entering the conduit, duct, pathway resulting in decreased wire capacity and potential damage to installed conductors and cables.

E. Pathways are shown in a diagrammatic way and are generally accurate as to routing, however, it is the Contractor’s responsibility as a means and methods process to coordinate with all other trades that require space within a building. The Contractor shall obtain approval for installation of raceways routing through structural footings, retaining walls, columns, beams, perlins, grade beams, etc.

F. It is the Contractor's responsibility to insure that all raceway and boxes systems penetrate fire assemblies and sound rated assemblies in an approved manner using the appropriate and listed products for the purpose.

G. Trenching and backfilling for all underground conduit systems installed by the Electrical Contractor shall be the responsibility of the Contractor. Conduits shall have minimum cover requirement of 36" below finish grade with the exception of site lighting conduits which may be 24" below finish grade minimum. More stringent depth requirements may be imposed by the local agency and utility company and shall be adhered to, and / or this specification or as detailed on the plans. Joint trenching may be utilized where practicable and where permitted by this specification. Concrete, native material and sand shall be used as backfill material and shall be compacted in accordance with and coordinated with the grading and site preparation requirements. Conduits shall rest in a minimum of 4" bed of sand prior to backfill and compaction. Locations of existing underground (UG) utility systems shall be determined by calling Underground Service Alert (USA) at least 48 hours prior to any excavation. Also refer to Section 26 05 46.13, ELECTRIC UTILITY SYSTEMS.

H. Minimum conduit size shall be 1/2" except if plan shows or code requires larger size. Exception: Use minimum 3/4" for underslab and below grade applications outside of building exterior walls.

I. All electrical, control, communications systems shall be installed in [metallic] conduit system. This shall include but not be limited to all systems described in Section C above except for voice and data systems which shall be installed as described on these plans and as specified here-in but shall not be less than the recommendations of EIA/TIA standards.

J. All line voltage wiring within the building shall be installed in metallic conduit.

K. All conduit, concrete pads, underground concrete or fiberglass substructures shall be furnished and installed with the approved materials and type for the application. Provide proper traffic control during construction as well as barriers and protection of all excavations and trenching.

L. Empty or future conduits shall be properly plugged with plastic caps or inserts with a 3/8" polyethylene pull rope. Plastic or "duct" tape will not be acceptable.

M. Exterior installations: After conductors are installed, seal conduit ends to prevent entrance of foreign material using pliable duct seal, caps or waterproof expanding foam.

N. All low voltage systems including intercom, fire alarm, public address, etc. shall be in dedicated conduit systems. Voice / Data and Direct Digital Control (DDC) systems for HVAC cabling shall be routed as specified in Section 27 13 00, INTERCOMMUNICATIONS SYSTEMS BACKBONE CABLING and Section 27 15 00, INTERCOMMUNICATIONS SYSTEMS HORIZONTAL CABLING and as recommended by EIA/TIA standards. It shall be the contractor's responsibility to provide raceway down walls to outlet boxes and to provide sleeves across inaccessible ceiling spaces.

O. Underground conduits entering building shall have the open end of conduit within building above the elevation of the conduit outside the building such that water cannot enter building through conduit. If such a condition exists, a pull box outside of building footprint shall be installed in conduit route before conduit enters building whereby top of pull box is below finish floor of building and moisture may exit box before entering building.

P. No single conduit run of any type shall exceed 300 degrees of radius bend from termination box to termination box.

Q. Separate Raceway System: Provide a separate dedicated raceway system for each system installed, do not combine different systems into a raceway or cable tray system, unless otherwise noted or allowed.

R. Spare, Future Conduits: Conduits labeled conduit only, spare, or for future use, shall be provided with a pullrope, capped at each end, labeled as spare with destination marked, and turned over to the Owner in an unused state. Contractor shall not utilize these conduits for the installation of cabling or conductors as part of this scope of work. Contractor to verify and install at no additional cost to the Owner, additional conduits as required for the installation of the systems being installed.

S. Outlet System: Provide electrical boxes and fittings as required for a complete installation. Including but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts, covers and all other necessary components.

T. Code Compliance: Comply with CEC as applicable to construction and installation of electrical boxes and fittings and size boxes according to CEC 312, 314 and 366 except as noted otherwise.

U. Outlets to be flush mounted: Maintain integrity of insulation and vapor barrier. Unless otherwise noted, flush mount all outlet boxes.

V. Provide putty pads of proper type around outlet boxes and/or as detailed on plan to meet sound transmission restrictions and fire ratings of walls.

1.03 SUBMITTALS

A. Provide Shop Drawings and Product Data for the Following Equipment:
1. Outlet boxes.
2. Weatherproof outlet boxes.
3. Junction and pull boxes.
4. Floor boxes and poke-through.
5. Cabinets, termination cabinets.
6. Gutters.
7. Concrete boxes and vaults.
8. Fiberglass or composite boxes and vaults.
9. Putty pads.
10. Raceways

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of the CEC, latest adopted version with amendments by local AHJs.

B. Furnish products listed by UL or other independent and nationally recognized testing firm.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Heavy wall Rigid Non-Metallic Conduit, shall be PVC schedule 40 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.

B. Extra heavy wall non-metallic conduit, shall be PVC schedule 80 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.

C. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.

D. [Aluminum Rigid Metal (RMC) Conduit shall be manufactured of 6063 alloy in temper designation t-1 and shall comply with Underwriters Laboratories UL-6A 'Standard for Electrical Rigid Metal Conduit - Aluminum, Red Brass and Stainless Steel', ANSI Specification C-80.5 and Federal Specification WW-C-540C.]

E. [Aluminum Electrical Metallic Tubing metal (EMT) conduit shall be manufactured of 6005 alloy, 98.5% purity aluminum and shall comply with Underwriters Laboratories UL-797A 'Standard for Electrical Metallic Tubing - Aluminum' and Federal Specification WW-C-563A.]

F. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.

G. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of U.L. 1653, in accordance with CEC Article 362, and meet requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-U.L. 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistance non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet U.L. and ICC building codes.

H. Flexible Metal Conduit (FMC) shall be continuous wound reduced wall galvanized steel produced to UL standards.

I. Liquid tight flexible metal conduit shall have a thermoplastic cover over a galvanized steel core containing an integral copper ground in sizes to 1 1/4" and shall be in compliance with UL standards and CEC Article 350.

J. Surface mount raceway shall only be used where shown on the plans. The raceway and cover shall be ["Ivory"] colored by Wiremold but be capable of being over-painted in the field if required. The raceway and fittings shall meet all requirements of CEC Article 386 and be U.L. listed. Raceway shall be mechanically connected to structure with backing and anchor bolts.

K. Wire basket tray shall be [6", 9", 12"] wide with [2", 3", 4"] side rails unless otherwise noted. It shall be U.L. listed and use listed connectors, elbows, tees, etc. and be cut and installed using listed equipment. Material shall be zinc electroplated steel.

L. Cable runway tray shall be 12" wide with 4" side rails unless otherwise noted. It shall be U.L. listed and use listed connectors, elbows, tees, etc. Material shall be hollow steel with gray painted finish.

M. Manufacturers:
1. Outlet Boxes: Bowers, Raco, Steel City or equal.
2. Weatherproof Outlet Boxes: Bell, Red Dot, [Carlon] or equal.
3. Floor Boxes: Wiremold/Walker, Hubbell, Steel City, or equal.
4. Junction and Pull Boxes: Circle AW, Hoffman, Wireguard or equal.
5. Box Extension Adapter: Bell, Red Dot, [Carlon] or equal.
6. Conduit Fittings: O-Z Gedney, Thomas & Betts, or equal.
7. Vaults: Christy, Brooks, Utility Vault or equal.
8. Putty pads: 3M, Hilti, or equal.
9. Heavy wall rigid non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
10. Extra heavy wall non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
11. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.
12. [Aluminum Rigid Metal (RMC) Conduit shall be manufactured of 6063 alloy in temper designation t-1 and shall comply with Underwriters Laboratories UL-6A 'Standard for Electrical Rigid Metal Conduit - Aluminum, Red Brass and Stainless Steel', ANSI Specification C-80.5 and Federal Specification WW-C-540C.]
13. [Aluminum Electrical Metallic Tubing metal (EMT) conduit shall be manufactured of 6005 alloy, 98.5% purity aluminum and shall comply with Underwriters Laboratories UL-797A 'Standard for Electrical Metallic Tubing - Aluminum' and Federal Specification WW-C-563A.]
14. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.
15. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of U.L. 1653, in accordance with CEC Article 362, and meet requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-U.L. 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistance non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet U.L. and ICC building codes.
16. Flexible Metal Conduit (FMC), Alflex, American Flexible Conduit or equal.
17. Liquid tight flexible metal conduit, Anacanda (type UA), Electri-flex Liquatite or equal.
18. Surface mount raceway, Wiremold, Three Compartment Series 5500 or equal
19. Wire basket tray, B-line, GS Metals, Cablofil or equal.
20. Cable runway tray, B-line, CPI, Homaco or equal.
21. Floor Boxes, Single Gang, Walker/Wiremold 880 CS Series or approved equal.
22. Floor Boxes, Multiple Gang, Walker/Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/or water resistant device covers.
23. Masonry Boxes, outlets in concrete, Raco Series 690 or equal.
24. Floor Boxes, Poke-Thru, Hubbell PT7 Series, Walker/Wiremold RC4 Series, or approved equal unless otherwise noted.
25. Floor Boxes, Poke-Thru, Furniture Feed, Walker/Wiremold RC9 Series or approved equal.
26. Exterior In-Grade Boxes for Non-Utility Company, Precast concrete or polymer concrete, Utility Vault and Christy.

2.02 OUTLET BOXES

A. NEMA 1 gutter, junction and pull boxes shall be fabricated from code gage steel finished in grey enamel with screw cover fronts and concentric knockouts in all sides.

B. NEMA 3R gutter, junction and pull boxes shall be fabricated from code gage galvanized steel with screw cover fronts and concentric knockouts in the bottom only. Any penetrations to the side, top or back shall be weatherproofed in an approved manner such as “MYERS” gasketed type hub or equal.

C. Steel outlet boxes and plaster rings shall be galvanized rigid assemblies, either one piece pressed or factory welded construction containing the size and number of knockouts required. Steel outlet boxes shall be manufactured, sized and installed in accordance with CEC Article 314. Device Outlet: Installation of one or two devices at common location, minimum 4” square, minimum 1 1/2" deep. Single or 2 gang flush device plaster ring. Raco Series 681 and 686 or equal.

D. Luminaire Outlet: minimum 4” square with correct plaster ring depth, minimum 1 1/2” deep with 3/8” luminaire stud if required. Provide proper depth plaster ring on bracket outlets and on ceiling outlets.

E. Multiple Devices: Three or more devices at common location. Install 1 piece gang boxes with 1 piece device plastering. Install one device per gang unless otherwise allowed.

F. Construction: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. Boxes shall be properly secured to the structure such that they are flush with the finish surface. Boxes shall be made structurally secure by means of the proper fastening devices.

G. Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, plaster rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.03 WEATHERPROOF OUTLET BOXES

A. [Construction: Provide corrosion-resistant cast iron, with zinc finish, weatherproof outlet wiring boxes, of the type, shape and size, including depth of box, with threaded conduit ends, cast metal face plate with spring-hinged waterproof cap suitably configured for each application, including face plate gasket, blank plugs and corrosion proof fasteners. Weatherproof boxes to be constructed to have smooth sides, zinc, galvanized finish.]

B. [Surface mounted die cast aluminum device boxes shall be provided with screw holes to accommodate cast device covers.]

2.04 JUNCTION AND PULL BOXES

A. Construction: Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.

B. Location:
1. Install junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
2. Install junction boxes and pull boxes as required to facilitate the installation of conductors and limiting the accumulated angular sum of bends between boxes, cabinets and appliances to 300 degrees.
3. Locations: Junction boxes shall be located only where necessary and only in equipment rooms, closets, and accessible attic and underfloor spaces. A horizontal distance of 24" shall separate outlet boxes on opposite sides of occupancy separation walls, fire-rated walls or partitions.
4. Labeling: Junction box covers shall be marked with indelible ink indicated the circuit numbers passing through the box.

2.05 BOX EXTENSION ADAPTER

A. Construction: [Diecast aluminum] or [cast iron with gasket].

B. Location: Install over flush wall outlet boxes to permit flexible raceway extension from flush outlet to fixed or movable equipment.

2.06 CONDUIT FITTINGS

A. Requirements: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and plastic conduit bushings of the type and size to suit each respective use and installation.

B. Steel boxes may allow for field knock-out modifications, but shall in all other ways conform to code requirements.

2.07 FLOOR BOXES - SINGLE GANG

A. [Construction: Deep cast iron fully adjustable before and after concrete pour with all required components for complete activation. Verify required components for application of service fittings, covers, monuments, and the like, attached to floor boxes.

B. [Activations:
1. Flush: Provide brass duplex or single signal cover, hinged with set screw lock. Carpet or tile finish ring.
2. Monuments: Provide stainless steel monuments with power receptacle or data grommet as noted.
3. Coordinate specific application of systems as noted on Drawings.]

C. [Plastic floor boxes which glue together will not be considered. Plastic mechanically assembled floor boxes may be considered with prior approval.]

D. [Location: Concrete floor. Use poke-thru of same construction in non-concrete structure. Verify exact locations. Ensure flush with finish surface.]

E. [Steel floor box construction will be allowed only at upper levels of buildings not at slab on grade level.]

2.08 FLOOR BOXES - MULTIPLE GANG

A. Construction: Deep cast iron, fully adjustable before and after pour. Equal to Walker/Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/or water resistant device covers. Verify color. Partition for different power or signal applications. Provide required power receptacle devices and signal grommets or receptacles as noted. Flange type shall be compatible with floor covering for either carpet or vinyl as required and shall be brass type not polycarbonate.

B. Floor mounted boxes shall be water tight and cast iron when installed in grade level concrete slab floor, fully adjustable with interior and exterior leveling screws. Receptacle flange shall be brass with a duplex lift lid. Flange type shall be compatible with floor type. Before installation, coordinate exact location with Architect.

2.09 FLOOR BOXES - POKE-THRU

A. Fire rated for 4 hour, dual service, flush brass cover and service fitting prewired specification grade receptacle, voice/data jacks, as specified.

B. Furniture Feed: Fire rated per floor assembly rating, finish flange and service head assembly.

2.10 EXTERIOR IN-GRADE BOXES FOR NON-UTILITY COMPANY USE SHALL BE:

A. Precast concrete or polymer concrete type with full bottoms and draining into gravel drywell. . Open bottom splice/pull boxes 24” x 36” and smaller shall be open bottom, with minimum 12” of gravel below for drainage.

B. Flushmount in hardscape and 1” above grade in softscape.

C. Provided with correct traffic type lid, i.e., full vehicular, intermediate incidental vehicular or pedestrian-rated as applicable stamped with “ELECTRIC”, “LIGHTING”, COMMUNICATIONS”, etc. cover identification as shown on the drawings or as applicable. All boxes or vaults located in streets, driveways, sidewalks wider than 8’, and turf areas where mowing takes place shall be traffic rated.

D. Provided with brass hold-down bolts in cover.

E. Provided with necessary box extensions to gain proper depth.

F. Seal all conduit in underground boxes with duct seal after conductors have been installed.

2.11 IN-GRADE UTILITY COMPANY BOXES AND VAULTS

A. In-grade boxes and pads for utility company, shall be as specified by the respective utility company with all of the company's requirements and construction methods met.

2.12 PUTTY PADS

A. Intumescent moldable firestop putty designed to protect electrical outlet boxes.

B. Designed to install around outside of outlet boxes.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Conduit systems listed below are for use in installations where they are permitted to be used by CEC and/or other occupancy restrictions. The below installation methods do not intend to suggest that these materials be installed in conflict with any applicable code. Special attention to applications shall be made in building types such as Educational, Health Care, wet location, hazardous locations, assembly occupancy and multi-story, but not limited to these. Requirements which are more restrictive than the CEC may be called for by the drawings and / or these specifications. These requirements must be adhered to. The Electrical Contractor shall be responsible to use the proper conduit system for the application. Exposed conduit is not allowed below ceilings or above slab of floor, without the permission and approval of the Architect. All conduits shall be concealed except in electrical and telecommunication rooms or where shown to be surface mounted. Exposed conduit (where allowed) shall be run square and plumb with building lines in an approved manner. Support roofmount conduits, where allowed, with minimum 12" wide redwood blocks set in mastic unless otherwise detailed in roof requirements or as specified in roofing specification, by the Architect. Strap conduits to blocks with proper sized conduit straps. Spacing of support shall be a minimum as provided for in the CEC. All exposed conduit mounted below 8' above finished grade shall be strapped at a minimum of 5' spacing.

B. Non-Metallic Rigid Conduit shall be used in concrete slabs, below concrete slabs on grade, or underground outside of a building slab or foundation. Maintain minimum depth requirements and cover with appropriate fill material. Minimum 4" of bedding and cover of backfill material 1/4" size grain and smaller maximum. Conduit shall be heavy wall Schedule 40 or 80, rigid PVC only. Rigid utility P&C duct shall not be used in any application. Properly sized grounding conductors shall be installed per CEC article 250, in all non-metallic conduit branch circuit and feeder runs. PVC conduit shall be formed or field bent only with the use of properly approved bending tools such as to not decrease the internal bore of the conduit. All conduits shall be cut square and reamed of burrs. Approved and compatible glue shall be used on all PVC fittings to attain watertight joints. All non-metallic conduit runs over 150' in length and over 1 1/4" trade size conduit shall utilize galvanized rigid steel elbows.

C. Galvanized Rigid Steel (GRS) conduit shall be used where exposed less than 8'–0" above finished grade to 18" below finished grade and where subject to physical damage. Conduits shall be cut square and reamed to remove burrs and sharp edges. Strap conduit below 8' above grade at 5' intervals. Unless otherwise noted, threadless setscrew and threadless weathertight fittings may be used in lieu of threaded fittings. All threaded ends entering a

junction box of any type shall require one locknut on the inside and one on the outside of the enclosure and be provided with a plastic bushing or grounding bushing where necessary for proper grounding. Where exposed to moisture, a watertight hub or other approved method shall be required. All conduits shall be stubbed up straight and uniform into junction boxes, panels, cabinets, etc., and shall be (GRS) properly supported and strapped. All GRS conduit located below grade, shall be tape wrapped.

D. Electrical Metallic Tubing (EMT) shall be used as allowed by code and as permitted by this specification. It shall not be in contact with soil or the concrete slab on the ground floor of any structure. Connectors and couplings shall be [steel or diecast] [insulated/non-insulated] set screw type where installed in indoor dry locations not subject to moisture. Where the potential for moisture is present, compression type weathertight fittings are required. One hole conduit straps are permitted from 1/2" to 1" and two hole conduit straps are required for size 1 1/4" and larger. EMT shall not be allowed in areas subject to severe physical damage. Install copper ground wire sized per CEC 250-122 in all EMT conduits.

E. [Electrical Non-Metallic Tubing (ENT) shall be installed in accordance with its listed application. Only listed cement shall be used for connectors, coupling, fittings requiring cement. Unless otherwise noted, ENT systems shall be color coded: Blue for branch and/or feeder power wiring, yellow for communications systems, and red for fire alarm and emergency power systems. Use only approved and listed accessories.
   1. Electrical Nonmetallic Tubing (ENT) is designed to replace EMT, flexible metal conduit or other raceway or cable systems, for installation in accordance with Article 362 of the National Electrical Code, Section 12-1500 of the CEC, other applicable sections of the Code, and local codes.
   2. Any ENT used shall be listed to the requirements of UL Standard UL 1653 in accordance with Article 362 of the NEC and Section 12-1500 of the CEC.
   3. Any ENT used shall meet the requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-UL1653 and shall be Listed/Certified in accordance to the Electrical Codes.
   4. Carlon's ENT shall be installed per the technical assessment prepared by fire cause analysis for use in 1hour and 2-hour rated construction.
   5. Penetration of fire rated walls, floors or ceilings shall use Classified Through-Penetration Firestop Systems described in the current Underwriters Laboratories Fire Resistance Directory.
   6. Fittings and outlet boxes shall be designed for use with ENT shall be listed. All fittings, boxes and accessories shall be from one manufacturer.
   7. Only Carlon ENT Blue cement recommended specifically for use with ENT and rigid nonmetallic fittings shall be used.
   8. Unless indicated differently on drawings, ENT systems shall be color coded: BLUE for branch and feeder circuit wiring, YELLOW for communications, and RED for fire alarm and emergency systems, or colors can designate different voltages.
   9. ENT, fittings, and accessories shall be manufactured by Carlon.
   10. ENT shall not be used or allowed in any application where not allowed by CEC Article 362.]

F. [Aluminum rigid metal conduit and / or aluminum electrical metallic tubing shall be installed within indoor Wet or Damp Locations (I.E. facility processing areas, barrel storage, wash down, bottling areas, etc.). The installation shall be in accord with CEC Articles 344 and 358 respectively. The conduit type used shall meet the application for installation as indicated within this Section for non aluminum conduit. Aluminum boxes, fittings and enclosures shall be used with aluminum conduit at locations subject to corrosive influences. Avoid the use of dissimilar metals to prevent galvanic action. Aluminum rigid conduit shall employ threaded couplings. Aluminum metallic tubing shall employ either threaded couplings or use aluminum compression couplings.]

G. Flexible conduit may be used where concealed in building construction or above dropped ceilings, but shall meet the following criteria: No individual circuit path from distribution panel to last device shall exceed a cumulative length of 30' of flexible conduit from start to end. Flexible conduit shall not exceed a total directional change of 270 bending degrees in any one run between conduit terminations. Squeeze type or Jake type steel flex fittings of a grounding type are required. Flexible conduit must be supported in accordance with CEC. Where exposed to the weather, moisture, or spray down flexible conduit shall be of the liquidtight type. Fittings shall be manufactured for use with liquidtight flexible conduit. All motor connections shall be made with liquidtight flex. Flexible conduit may not be used where exposed except for last 2' of equipment connection and unless otherwise noted or approved. A copper ground wire sized per CEC 250-122 shall be installed in all flexible conduit runs. Flexible conduit may not be used exposed. Weatherproof liquid tight conduit shall not be used at roof level for equipment connections with lengths exceeding 24" nor shall it be used to circumvent a rigid conduit system in a horizontal direction. Connect recessed lighting fixtures to conduit runs with a maximum of 6' of flexible metal conduit extending from junction box to fixture. "Master" "Slave" fixtures are permitted to use manufactured flexible cable of longer dimension up to 12' between "Master" and "Slave" only and only as a U.L. listed system component.

H. Underground conduits and transition to above grade/slab shall be as follows:
1. PVC elbows allowed if top of elbow is minimum 18" BFG or below top of slab, otherwise GRS elbows are required.
2. GRS elbows are required if conduit run is 150' or greater.
3. GRS risers are required from elbow below grade to equipment (device, outlet, panel, cabinet, etc.) above grade.
4. GRS elbows/risers to be PVC coated or 10 MIL taped wrapped (1/2" lapped) to 3" above finish grade or top of slab.

I. Conduit Supports: Conduit runs may be supported by one-hole and two-hole straps or supports as manufactured by Unistrut, Minerallac, Caddy or equals. Supports may be fastened by means of anchors, shields, beam clamps, toggle bolts, or other approved methods appropriate for the application and size of conduit. Pipe nailers (J-hooks) may only be used for 1" conduit and smaller and only in wood frame construction. Conduit support methods are subject to review by the engineer and authority having jurisdiction for adequacy. Installations deemed inadequate shall be corrected by the contractor at no cost to the Owner.

J. Bends and offsets shall be made with approved tools for the type of conduit being utilized. Bends shall be made without kinking or destroying the smooth bore of the conduit. Parallel conduits shall be run straight and true with bends uniform and symmetrical. Minimum radii shall be per CEC 344-24.

K. Conduit Stub-outs below grade shall be capped with plastic cap, and identified by placing a pull box marked with correctly identified utility such as "Elec", "Tel", etc. Dimension for exact location on field record drawings. Provide lids for proper field application (i.e. traffic, incidental, pedestrian).

L. Conduit Seals: Where below grade conduits enter structure through slab or retaining wall of building or basement, seal the inside of each conduit as follows:
1. Provide damming material around conductors 3" into conduit.
2. Fill 3" of conduit with 3M #2123 sealing compound.
3. Wrap conductors where they exit the conduit with 3M #2229 "Scotch Seal" mastic tape. Lap tape to approximate diameter of the raceway and wrap outside of conduit opening with (minimum) one turn.
4. Use conduit sealing bushings type CSB (O-Z/Gedney) or equal.

5. Empty conduits shall be sealed with standard non-hardening duct seal compound and then capped to prevent entrance of moisture and gases and to meet fire resistance requirements.
6. Provide cable drip loop minimum 12" high.

M. Marker tape: Place plastic yellow marker tape at 12" below finish grade along and above buried conduits. Label tape "CAUTION: ELECTRICAL LINES BELOW" or similar wording.

N. Conduits for high voltage (12kv) systems shall be separated from all other conduits by a minimum of 12". All power system conduits shall be separated from low voltage systems by a minimum of 12" when running parallel to each other and no less than 6" when running perpendicular to each other at conduit crossings.

O. Medium voltage system conduits including 4,000 volt and above, shall be installed in conduit systems or duct banks that are concrete encased by a minimum of 3" of concrete. Depth of conduits shall remain as specified elsewhere in this specification or as required by the CEC.

P. Electrical and communications systems raceways routed underground shall not occupy the same trench as plumbing utilities such as sewer, water, storm drain, gas or other wet or dry gaseous utility system. A minimum of 12" of undisturbed earth is required. Where utilities must cross in closer proximity to each other due to physical constraints, 6" minimum crossing distances are allowed, however 18" on all sides of a utility crossing must be concrete encased.

Q. Duct bank defined here-in shall be four or more conduits in a common trench, conduit spacers and saddles shall be required in all trenches where more than two conduits over 2" in diameter travel in the same trench. Proper spacing between systems as outlined above shall be required and spacers shall be located each 5' (maximum) along trench route from point to point.

R. Conduits, routed below footings, slabs, grade beams, columns, and other structural elements shall be installed in strict compliance with structural details and criteria shown on structural plans. Clearances below structural elements and sleeves through structural elements must be carefully planned to avoid conflict and must be approved by the structural engineer if conflict arises.

S. All conduit or raceways passing through fire rated walls, floors, or ceilings shall be installed with a listed penetration method which protects the opening to the same rating as the assembly and is non hardening.

T. Expansion Joints
1. Conduits 3" and larger, that are secured to the building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.
2. Provide conduits smaller than 3" with junction boxes on both sides of the expansion joint. Connect conduits to junction boxes with sufficient slack of flexible conduit to produce 5" vertical drop midway between the end. All conduit shall have a copper green grounding bonding conductor installed.

U. Seismic Joints
1. At seismic joints, provide conduits rigidly secured to the building structure on opposite sides of a building expansion joint with junction boxes or approved fittings, on both sides of the joint. Connect conduits to junction boxes with sufficient slack flexible conduit such that these slack conduits are 1 1/2 times the distance between conduit ends. Flexible conduit shall have a copper green ground bonding jumper installed.

V. Ladder tray shall be used in equipment rooms where shown on the plans. Ladder tray installations shall conform to the requirements of CEC Article 318. The contractor shall provide all mounting hardware, connectors and bracing as required and as recommended by the manufacturer for a complete system installation.

W. Wire basket tray shall be used in all concealed spaces (above ceiling spaces, under buildings in access tunnels, below raised floors, etc.) unless otherwise noted. Wire basket tray installations shall conform to the requirements of CEC Article 318. The contractor shall provide all mounting hardware, connectors and bracing as required and as recommended by the manufacturer for a complete system installation. All cutting of wire basket tray shall be per the manufacturer's recommendation using tools designed for that purpose. Cable loading shall not exceed the listing of the system and its support.

X. Location: Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.

Y. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.

Z. Special Application: Provide weatherproof outlets for locations exposed to weather or moisture.

AA. Knockout Closures: Provide knockout closures to cap unused knockout holes where blanks have been removed.

BB. Mount Center of Outlet Boxes, unless Otherwise Required by ADA, or Noted on Drawings, the Following Distances above the Floor:
1. Control Switches: 48".
2. Receptacles: 18".
3. Telecom Outlets: 18".
4. Other Outlets: As indicated in other sections of specifications or as detailed on drawings.

CC. Coordinate all electrical device locations with the architectural floor plan and interior and exterior elevations to prevent mounting devices within elements that they may conflict such as cabinetry, mirrors, planters, etc.

DD. Size outlet and junction boxes to minimum wire fill space requirements. Upsize box as required to allow ease of wire installation and device installation.

EE. Outlet and junction boxes in fire rated walls shall be gauged and spaced so as not to exceed the maximum penetration allowed by the assembly without compromising the fire rating. If a conflict arises relative to a specific condition, the contractor shall follow the requirements of the fire authority and ask for guidance from the design team. At no time should a larger box be installed prior to resolution of conflict.

END OF SECTION

SECTION 26 09 23
OCCUPANCY SENSORS

PART 1 - GENERAL

1.01 SUMMARY

1.02 RELATED WORK

A. Section 26 05 00, COMMON WORK RESULTS FOR ELECTRICAL.

B. Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.

C. Section 26 05 19, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

D. Section 26 27 26, WIRING DEVICES.

E. Section 26 56 70, LIGHTING ACCEPTANCE TESTING.

1.03 SYSTEM DESCRIPTION

A. The occupancy sensors shall sense the presence of human activity within the desired space and enable or disable the on/off manual lighting control function provided by local switches.

B. Upon detection of human activity by the detector, initiate a time delay to maintain the lights on for a preset period of time. Field adjustable time delay setting from 30 seconds to 15 minutes.

C. Sensors shall have factory set PIR sensing sensitivity for maximum sensitivity. Provide time delay at 10 minutes.

D. Install system in accordance with manufacturer's recommendations and instructions.

E. All line voltage sensors, control units, and relays UL listed

1.04 SUBMITTALS

A. Provide wiring diagrams indicating low voltage and line voltage wiring requirements.

PART 2 - PRODUCTS

2.01 PASSIVE INFRARED SENSORS - GENERAL

A. The passive infrared sensors shall detect presence, in the floor area being controlled, by detecting changes in the Infrared energy. Detect small movements, i.e., when a person is writing while seated at a desk.

B. Provide a temperature compensated dual element sensor and a multi element fresnel lens.

C. The sensor shall utilize DIP switch adjustments for "on" mode operation, time delay, and sensitivity.

D. Provide a daylight filter which ensures that the sensor is insensitive to short-wavelength infrared waves, i.e., those emitted by the sun.

E. The sensors not to protrude more than 1 1/2" from the wall or ceiling and should blend in aesthetically.

F. Conceal adjustments and mounting hardware under a removable cover to prevent tampering with adjustments and hardware.

G. Low Voltage Sensors:
1. Sensor shall provide complete coverage of the controlled area.
2. Sensors shall operate on 24VDC power.
3. Sensors shall operate remote power switch packs.
4. Sensors can be wired in parallel to allow coverage of large areas.
5. Manufacturers: The Watt Stopper CI Series, Leviton OSC Series, or approved.

H. Wall Switch Sensors:
1. 300 sq. ft. area coverage, with a field of view of 180 degrees.
2. Completely self-contained sensor system that fits into a standard single gang box. Internal transformer power supply, a latching dry contact relay switching mechanism compatible with electronic ballasts, compact fluorescent, and inductive loads. Triac and other harmonic generating devices are not allowed.
3. Rated to switch loads from 0 to 800 watt incandescent or fluorescent 120 volt and 0 to 1000 watts for 277 volt.
4. Provide adjustable daylight feature that holds lighting "off" when a desired footcandle level is present.
5. Provide integral off override switch with no leakage current to the load or ground.
6. Provide hard 1mm poly IR2 lens, soft lens is not acceptable.
7. Manufacturers: The Watt Stopper PW Series, Leviton ODS Series or approved.
8. Dual Relay: Watt Stopper DW-200, Leviton ODS0D Series, or approved.

2.02 DUAL TECHNOLOGY SENSORS

A. Utilize same technologies as passive infrared and ultrasonic.

B. Upon a person entering a space, motion from both technologies must be sensed before lighting will be turned on. After this has occurred, detection by either technology will hold lighting on for the set time period. Sensor shall have a retrigger time delay where only one motion is necessary to turn on the lights within 5 seconds after turning off.

C. Manufacturers: The Watt Stopper DT Series, Leviton OSC or OSW Series, or approved.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install occupancy sensors as directed by manufacturer's instructions. Complete all electrical connections to all control circuits, occupancy sensors, power supply pack and low voltage wiring.

B. Verify with manufacturer's representative that the sensors are laid out in compliance to manufacturers published sensing distribution. Provide additional sensors for complete coverage of the space being sensed.

3.02 QUALITY CONTROL

A. Use manufacturer's published testing and adjusting procedures to adjust sensors time delay, daylight sensitivity, and passive infrared sensitivity to satisfaction of the Owner.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies the furnishing, installation and connection of wiring devices.

1.02 RELATED WORK

A. Section 26 05 00, COMMON WORK RESULTS FOR ELECTRICAL.

B. Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.

C. Section 26 05 19, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

PART 2 - PRODUCTS

2.01 RECEPTACLES

A. General: All receptacles shall be listed by Underwriters Laboratories, Inc.
   1. Mounting straps shall be plated steel, with break-off plaster ears and shall include a self-grounding feature (this feature does not substitute for a grounding conductor terminated on grounding strap of device). Terminal screws shall be brass, brass plated or a copper alloy metal.
   2. Receptacles shall be of a screw terminal type, “pressure type quick wire” terminations are not allowed.

B. Duplex receptacles shall be premium specification grade single phase, 20 ampere, 120 volts, 2-pole, 3-wire, and conform to the NEMA 5-20R configuration in NEMA WD 6. The duplex type shall have bussing break-off feature for two-circuit operation. The ungrounded pole of each receptacle shall be provided with a separate terminal.
   1. Wiring device color selection to be provided by Architect. Contractor to verify device color with Architect prior to procurement.

C. Receptacles; 20, 30 and 50 ampere, 250 volts: Shall be complete and match with appropriate cord grip plug. Devices shall meet UL 231.

D. Weatherproof Receptacles: Shall consist of a duplex receptacle, mounted in box with a gasketed, weatherproof, cast metal cover plate and cap over each receptacle opening. The cap shall be permanently attached to the cover plate by a spring-hinged flap. Cover plates on outlet boxes mounted flush in the wall shall be gasketed to the wall in a watertight manner.

2.02 SWITCHES AND DIMMERS

A. Toggle switches shall be totally enclosed tumbler type with bodies of phenolic compound. Toggle handles color to match receptacle device color unless otherwise specified.
   1. Switches installed in hazardous areas shall be explosion proof type in accordance with the CEC and as shown on the drawings.
   2. Shall be single unit toggle, butt contact, quiet AC type, heavy-duty general-purpose use with an integral self grounding mounting strap with break-off plasters ears and be of a screw terminal type.
   3. Shall be color coded for current rating, listed by Underwriters Laboratories, Inc., and meet the requirements of NEMA WD 1, Heavy-Duty and UL 20.
   4. Ratings:
      a. 120 volt circuits: 20 amperes at 120-277 volts AC.
      b. 277 volt circuits: 20 amperes at 277 volts AC.
   5. The switches shall be mounted on the strike plate side of doors.
   6. Incorporate barriers between switches with multi-gang outlet boxes where required by the CEC.
   7. All toggle switches shall be of the same manufacturer.

2.03 WALL PLATES

A. Wall plates for switches and receptacles shall match the existing building wall plates.

B. Standard NEMA design, so that products of different manufacturers will be interchangeable. Dimensions for openings in wall plates shall be accordance with NEMA WD1.

C. For receptacles or switches ganged together, wall plates shall be a single ganged plate.

D. Surface mounted boxes, NEMA1, shall be industrial grade raised galvanized steel covers. In shop areas all receptacles shall be dust proof and or waterproof where applicable.

E. Waterproof device covers shall be cast iron, 4-corner screw type, for FS and FD type mounting. Device covers shall be zinc galvanized finish. Weatherproof covers shall be lockable.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in accordance with the CEC, NECA “Standard of Installation”, and as shown as on the drawings.

B. Ground terminal of each receptacle shall be bonded to the outlet box with an approved green bonding jumper, and also be connected to the green equipment grounding conductor.

C. General: Devices shall be of the type specified herein. All devices shall be installed with “pigtailed” leads from the outlet box. No device shall be used in the “feed through” application. Screw terminals shall be used to connect all devices to the circuit and shall be grounded by means of a ground wire where grounding terminals are provided in the device.

D. Installation: Devices and plates shall be installed in a “plumb” condition and must be flush with the finish surface of the wall where boxes are recessed.

E. Mounting heights: All control and convenience devices shall comply with California Code of Regulations Title 24 and ADA with respect to accessibility requirements. Mounting heights indicated on plans shall have precedence.

F. Install switches with the off position down.

G. Clean debris from outlet boxes.

H. Provide extension rings as required to bring outlet boxes flush with finished surface or casework.

I. Test each receptacle device for proper polarity.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies the furnishing, installation and connection of the interior lighting systems, including luminaires, ballasts, lamps and emergency lighting equipment.

PART 2 - PRODUCTS

2.01 EMERGENCY FLUORESCENT LAMP POWER SUPPLY

A. Self-contained battery-operated power supply for operating one T8 or compact fluorescent lamp for a minimum output of 90 minutes.

B. The power supply shall be installed within the luminaire ballast compartment or wireway. Provide with test switch and charge indicator installed integral to the luminaire. The test switch and charge indictor may be installed in a remote ceiling mounted flush J-box for recessed downlights which cannot accept integral components.

C. Performance: Emergency operation lumen output for linear fluorescent lamps shall be a minimum of 1100 lumens. Emergency operation lumen output for compact fluorescent lamps shall be a minimum of 640 lumens. Unless specifically noted otherwise on the associated electrical drawings.

D. Provide access hatches, for emergency battery backup ballasts, adjacent to recessed 6-inch or less diameter downlights installed in inaccessible ceilings.

E. Manufacturers: Bodine, Iota, or approved. Emergency fluorescent lamp power supplies may be provided as factory installed by the luminaire manufacturer provided the product meets the above specification criteria.

2.02 LIGHTING FIXTURES (LUMINAIRES)

A. Shall be in accordance with NFPA 70, UL 1598 and shall be as shown on drawings and as specified. All luminaires shall have been certified to the California Energy Commission by its manufacturer to comply with the efficiency standards as per California Code of Regulations Title 24, Part 6, Section 111 referencing the Appliance Efficiency Regulations in Title 20. Post certification with building permit.

B. Sheet Metal:
   1. Shall be formed to prevent warping and sagging. Housing, trim and lens frame shall be true, straight (unless intentionally curved) and parallel to each other as designed.
   2. Wireways and fittings shall be free of burrs and sharp edges and shall accommodate internal and branch circuit wiring without damage to the wiring.

3. When installed, any exposed fixture housing surface, trim frame, door frame and lens frame shall be free of light leaks; lens doors shall close in a light tight manner.
   a. Hinged door closure frames shall operate smoothly without binding when the fixture is in the installed position, and latches shall function easily by finger action without the use of tools.
   b. Luminaires installed under canopies, roof or open porches and similar damp or wet location shall be U.L. labeled as suitable for damp or wet location.

C. Ballasts shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers unless so specified.

D. Lamp Sockets:
1. Fluorescent: Lampholder contacts shall be the biting edge type or phosphorous bronze with silver flash contact surface type and shall conform to the applicable requirements of UL 542. Contacts for recessed double contact lampholders and for slimline lampholders shall be silver plated. Lampholders for bi pin lamps, with the exception of those for "U" type lamps, shall be of the telescoping compression type, or of the single slot entry type requiring a one quarter turn of the lamp after insertion.
2. Incandescent: Shall have porcelain enclosures and conform to the applicable requirements of UL 496.
3. High Intensity Discharge (H.I.D.): Shall have porcelain enclosures.

E. Recessed fixtures shall be of the type approved for the ceiling and insulation conditions and appropriate for the installation location. Insulation must be held back from the fixture to provide manufacturers' recommended clearances for proper operation. Thermal tripping shall be the installer's responsibility to correct. Where installed in fire rated ceilings, coordinate installation of fire rated enclosures around the ceiling penetrations. Fixtures shall contain the proper through wiring capacity for that which is shown on the plans.

F. Recessed fixtures shall be provided with the appropriate trims and hardware compatible with the ceiling type shown. Plaster frames are required where plaster or gypsum board ceilings are encountered.

G. Fluorescent fixtures with louvers or light transmitting panels shall have hinges, latches and safety catches to facilitate safe, convenient cleaning and relamping. Vapor tight fixtures shall have pressure clamping devices in lieu of the latches.

H. Mechanical Safety: Lighting fixture closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, captive hinges or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.

I. Metal Finishes:
1. The manufacturer shall apply standard finish (unless otherwise specified) over a corrosion resistant primer, after cleaning to free the metal surfaces of rust, grease, dirt and other deposits. Edges of pre-finished sheet metal exposed during forming, stamping or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or evidence of rusting, blistering, or flaking.
2. Interior light reflecting finishes shall be white with not less than 85 percent reflectances, except where otherwise specified on the drawing.
3. Exterior finishes shall be as shown on the drawings.

J. Provide all lighting fixtures with a specific means for grounding metallic wireways and housings to an equipment grounding conductor.

K. Light Transmitting Components for Fluorescent Fixtures:
1. Shall be 100 percent virgin acrylic plastic or water white, annealed, crystal glass.
2. Flat lens panels shall have not less than 1/8 inch of average thickness. The average thickness shall be determined by adding the maximum thickness to the minimum unpenetrated thickness and dividing the sum by 2.
3. Unless otherwise specified, lenses, diffusers and louvers shall be retained firmly in a metal frame by clips or clamping ring in such a manner as to allow expansion and contraction of the lens without distortion or cracking.

L. Lighting Fixtures in Hazardous Areas: Fixtures shall be suitable for installation in flammable atmospheres (Class and Group) as defined in NFPA 70 and shall comply with UL 844.

M. Compact fluorescent fixtures shall be manufactured specifically for compact fluorescent lamps with ballasts integral to the fixture. Assemblies designed to retrofit incandescent fixtures are prohibited except when described in this fashion. Fixtures shall be designed for lamps as specified.

2.03 BALLASTS

A. Ballasts, General:
1. Provide programmed rapid start ballasts rated for specified lamps, i.e., T-8 rated ballasts where T-8 lamps specified.
2. Thermal Protection: Internal UL Class P with automatic reset.
3. Power Factors: Not less than 90 percent unless otherwise indicated.
4. Sound Ratings: Rating A, except where not available as standard products from any manufacturer. Provide quietest ratings available.
5. Input Voltage: Match branch circuit supply voltage; refer to drawings.
6. Provide number of ballasts in luminaires to provide multilevel switching as indicated on drawings.

B. Fluorescent Electronic Ballasts:
1. Provide ballasts which meet requirements of UL 935 listed Class P Type 1, UL Type CC anti-arc rated, thermally protected and recognized by Certified Ballast Manufacturer (CBM) and bear the appropriate UL label.
2. Electrical Characteristics:
a. Provide electronic ballasts which withstand input power line transients as defined in ANSI C62.41, Category-A and IEEE 587. Multi-voltage control capabilities from 108 volt to 305 volt.
b. Power Factor: 95 percent or higher.
c. 0.71 to 0.77 ballast factor rating.
d. Total Harmonic Distortion: Not to exceed 10 percent of the input current.
e. Comply with FCC rules and regulations Part 18, Class A concerning generation of both electromagnetic interference and radio frequency interference.
f. Provide rated initial and mean lumen output with system configuration provided.

C. Performance Characteristics:
   1. Input Wattage: Maximum input shall not exceed 25 watts per (1) lamp ballasts, 48 watts per (2) two lamp ballasts, 72 watts per (3) three lamp ballast and 96 watts per (4) four lamp ballast.
   2. Start and operate lamps at 50ºF and energy savings lamps at 60ºF. Ballast case temperature is 25ºC rise above a 40ºC ambient.
   3. Provide constant light output throughout minimum input voltage variations of plus or minus 20 percent from nominal 120 volt or 277 volt.

D. Manufacturer: GE Ultramax/L Series, Advance Optanium “LW” Series, Sylvania Octron “XTREME” Series, Universal Triad “EL” Series.

E. All ballasts shall have been certified to the California Energy Commission by its manufacturer to comply with the efficiency standards as per California Code or Regulation Title 24, Part 6, Section 111 referencing the Appliance Efficiency Regulations in Title 20. Post certification with building permit.

F. Performance: Ballasts shall carry a minimum full 5 year warranty. All ballasts shall have a Class A sound rating. Any ballast deemed noisy by the Architect shall be replaced at no charge to the Owner.

G. Shielding: All lens material shall be 100% virgin acrylic, .125” minimum thickness, unless otherwise indicated in the fixture schedule. Diffusers shall comply with UBC 5209. Furnish Owner with spare 2’ x 4’ lenses (equal to 5% of that installed) upon completion of project.

H. Slimline and magnetic ballasts shall not be allowed.

I. Maintain accessibility of all ballast locations.

J. Fluorescent Dimming Ballasts:
   1. Dimming range 100 percent to 10 percent.
   2. Power factor greater than 95 percent.
   3. THD less than 10 percent.
   4. No visible lamp flicker.
   5. Manufacturer: Lutron ECO-10 Series.

K. HID Ballasts:
   1. Provide ballasts for luminaires installed indoors, and where otherwise indicated, encapsulated core and coil type or otherwise specifically designed by manufacturer for quiet operation.

2.04 LAMPS

A. Provide lamps for all luminaires.

B. Fluorescent Lamps:
   1. All fluorescent lamps shall be second generation T8 lamps rated at minimum 3100 lumen output, 4100K minimum CRI 85, length and wattage as noted in luminaire schedule. GE F32T8/XL/SPX41/HL/ECO, OSRAM/Sylvania F032/84XPS/ECO, Phillips F32T8/ADV841/ALTO, 24,000 hour rated minimum lamp life.

2. Compact Fluorescent Lamps: Quad Tube, 4100K minimum CRI 85 unless otherwise noted. General Electric, Osram/Sylvania, Philips, 10,000 hour life minimum.
3. Provide fluorescent lamps by same manufacturer General Electric, Osram/Sylvania, Philips.

C. Incandescent: 130 volt rated. General Electric, Osram/Sylvania, Philips.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation and furnishing of lighting fixtures shall be in accordance with the CEC, manufacturer's instructions and as shown on the drawings or specified. Fixtures damaged in transit and storage prior to completion shall be replaced at Contractor's expense.

B. Align, mount and level the lighting fixtures uniformly.

C. Avoid interference with and provide clearance for equipment. Where the indicated locations for the lighting fixtures conflict with the locations for equipment, change the locations for the lighting fixtures by the minimum distances necessary as approved by the Architect. The Architectural reflected ceiling plan will take precedence over electrical plans.

D. For suspended lighting fixtures, the mounting heights shall provide the clearances between the bottoms of the fixtures and the finished floors as shown on the drawings.

E. Lighting Fixture Supports:
1. Contractor shall provide support for all of the fixtures independent of suspended ceilings. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
2. Shall maintain the fixture positions after cleaning and relamping.
3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
4. Hardware for recessed fluorescent fixtures:
5. Fixtures shall be supported as detailed on drawings and as required by DSA standards.
6. Installation: Fixtures shall be securely mounted on ceilings and walls with appropriate fastening devices. "Drop-in" type T-bar fixtures shall be secured with #12 gauge safety "earthquake wires" as described by California Code of Regulations Title 24 Part 2, Chapter 47. "Earthquake clips" will be required for fastening to the T-bar system in addition to safety wire. Surface mounted fluorescent fixtures shall be solidly screwed or clipped into framing above drywall with 4-#10 sheet metal screws into each fixture. Provide blocking for screw supports behind all surface mounted lighting fixtures weighing more than 15 lbs.
7. Surface mounted lighting fixtures:
   a. Fixtures shall be bolted against the ceiling independent of the outlet box at four points spaced near the corners of each unit. The bolts shall be minimum ¼-20 bolt, secured to structural ceiling. Non-turning studs may be attached to the building structure by 12 gauge safety hangers.
8. Fixtures mounted in open construction shall be secured directly to the building structure with approved bolting and clamping devices.
9. Single or double pendent mounted lighting fixtures:

a. Each stem shall be supported by an approved outlet box, mounted swivel joint and canopy which holds the stem captive and provides spring load (or approved equivalent) dampening of fixture oscillations. Outlet box shall be supported vertically from the building structure and be allowed to swing to a 45 degree angle.

10. Outlet boxes for support of lighting fixtures (where permitted) shall be secured directly to the building structure with approved devices or supported vertically in a hung ceiling from the building structure with a nine gauge wire hanger, and be secured by an approved device to a main ceiling runner or cross runner to prevent any horizontal movement relative to the ceiling.

F. Furnish and install the specified lamps for all lighting fixtures as part of this project.

G. Coordinate between the electrical and ceiling trades to ascertain that approved lighting fixtures are furnished in the proper sizes and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.

H. Bond lighting fixtures and metal accessories to the grounding system as specified in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

I. At completion of project, relamp all fixtures which have failed/burned-out lamps. Clean all fixtures, lenses, diffusers and louvers that have accumulated dust/dirt during construction.

J. Provide unswitched leg of interior lighting branch circuit to integral emergency battery pack light fixtures, exit signs and night lights as applicable per lighting plans.

K. Wallmount fixtures in walkway areas shall not project more than 4 inches from wall when projection occurs lower than 80 inches.

END OF SECTION

SECTION 26 5670
LIGHTING ACCEPTANCE TESTING

PART 1 - GENERAL

1.01 SUMMARY

A. A Certificate of Acceptance will be required to be filed (by the Contractor) with and approved by the enforcement agency prior to receiving a final occupancy permit. The Certificate of Acceptance will indicate that the Contractor has demonstrated acceptance requirements of the plans and specifications, that current requirements for installation certificates are met, and that currently required operating and maintenance information (as well as the Certificate of Acceptance) were provided to the building Owner.

1.02 SECTION INCLUDES

A. Testing, evaluation and calibration of lighting controls equipment provided, installed and connected in Division 26.

B. Documentation of test results, completion of “Certificate of Acceptance” forms (included herein) and filing with the enforcement agency for approval.

C. Specific Jobsite Conditions:
   1. Acceptance testing must be tailored for each specific design, job site, and climactic conditions. While the steps for conducting each test remain consistent, the application of the tests to a particular site may vary. The Contractor shall review the construction documents and include all required time, material, testing equipment, etc. as required to complete the requirements of this section.

1.03 RELATED SECTIONS

A. Section 26 05 00, COMMON WORK RESULTS FOR ELECTRICAL.

B. Section 26 51 00, INTERIOR LIGHTING.

C. Section 26 56 00, EXTERIOR LIGHTING.

D. Section 26 09 26, LIGHTING CONTROL SYSTEM.

E. Section 26 09 00, CONTROLS AND INSTRUMENTATION.

F. Section 26 09 23, OCCUPANCY SENSORS.

1.04 REFERENCES

A. Acceptance Testing Criteria: 2008 Building Energy Efficiency Standards Non-Residential Compliance Manual (October 2009).

1.05 SYSTEM DESCRIPTION

A. Performance Requirements:
1. All material, equipment, labor and technical supervision to perform tests, calibrations and documentation specified herein.

B. Scope of Testing, Evaluation and Calibration (as applicable):
1. Automatic (master) time switches.
2. Occupancy sensors.
3. Automatic daylighting controls.
4. Photo electric sensors.
5. Daylighting controls.
6. Outdoor astronomical time switches.
7. Area controls.

1.06 SUBMITTALS

A. Test Reports:
1. Written record of all tests and completion of forms included in this section.
2. At completion of project, assemble a final test report. Submit report to the enforcement agency and the Owner prior to final occupancy to include:
a. Summary of project.
b. Description of systems and equipment tested.
c. Visual inspection report.
d. Description of tests.
e. Test results.
f. Conclusions and recommendations.
3. Report shall be bound in booklet form, include on the Contractor's letterhead the title of the report and the systems tested.

B. Constructability Plan Review

The Contractor shall review the construction drawings and specifications to understand the scope of the acceptance tests and raise critical issues that might affect the success of the acceptance tests prior to starting construction. Any constructability issues associated with the lighting system should be forwarded to the design team for review/modifications prior to equipment procurement and installation. The Contractor shall submit on company letterhead, with the lighting control equipment required by Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL, 1.4B, a letter confirming that the constructability review has been completed and their company has reviewed and is prepared to complete the lighting acceptance testing required by this section. The lighting acceptance testing shall be included in this letter at the time of equipment submittals.

PART 2 - PRODUCTS

2.01 FORMS

Lighting acceptance testing forms and verification procedures for lighting systems that require acceptance testing are listed below and included as part of this section and can be downloaded from the following website: http://www.energy.ca.gov/title24/2008standards/nonresidential_manual.html

1. Form LTG-2-A Certificate of Acceptance (1 of 3)
2. Form LTG-2-A Certificate of Acceptance (2 of 3)
3. Form LTG-2-A Certificate of Acceptance (3 of 3)
4. Form OLTG-2-A Certificate of Acceptance (1 of 3)
5. Form OLTG-2-A Certificate of Acceptance (2 of 3)
6. Form OLTG-3-A Certificate of Acceptance (3 of 3)

These completed forms will be the deliverable product to the enforcement agency and Owner as described in 1.4 of this section.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

A. Tests:
   1. Contractor's Responsibilities:
      a. Perform all required tests required by this section.
      b. Schedule testing with building Owner.
      c. Provide window/skylight masking material required to simulate dark conditions of test during evening hours.
      d. Calibration of equipment such as light meters, photo electric controls, etc.
      e. Programming of time switches (interior/exterior lighting) for operations as directed by the Owner.

3.02 ADJUSTING

A. Final Settings: The Contractor shall be responsible for implementing all final settings and adjustments on controls equipment as required for a complete and operating system.

CERTIFICATE OF ACCEPTANCE	LTG-2A
Lighting Control Acceptance Document	**(Page 1 of 3)**
Project Name/Address:	
System Name or Identification/Tag:	System Location or Area Served:

Enforcement Agency:	Permit Number:
Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.	Enforcement Agency Use: Checked by/Date

FIELD TECHNICIAN'S DECLARATION STATEMENT

- I certify under penalty of perjury, under the laws of the State of California, the information provided on this form is true and correct.
- I am the person who performed the acceptance requirements verification reported on this Certificate of Acceptance (Field Technician).
- I certify that the construction/installation identified on this form complies with the acceptance requirements indicated in the plans and specifications approved by the enforcement agency, and conforms to the applicable acceptance requirements and procedures specified in Reference Nonresidential Appendix NA7.
- I have confirmed that the Installation Certificate(s) for the construction/installation identified on this form has been completed and is posted or made available with the building permit(s) issued for the building.

Company Name:		
Field Technician's Name:		Field Technician's Signature:
	Date Signed:	Position With Company (Title):

RESPONSIBLE PERSON'S DECLARATION STATEMENT

- I certify under penalty of perjury, under the laws of the State of California, that I am the Field Technician, or the Field Technician is acting on my behalf as my employee or my agent and I have reviewed the information provided on this form.
- I am a licensed contractor, architect, or engineer, who is eligible under Division 3 of the Business and Professions Code, in the applicable classification, to take responsibility for the scope of work specified on this document and attest to the declarations in this statement (responsible person).
- I certify that the information provided on this form substantiates that the construction/installation identified on this form complies with the acceptance requirements indicated in the plans and specifications approved by the enforcement agency, and conforms to the applicable acceptance requirements and procedures specified in Reference Nonresidential Appendix NA7.
- I have confirmed that the Installation Certificate(s) for the construction/installation identified on this form has been completed and is posted or made available with the building permit(s) issued for the building.
- I will ensure that a completed, signed copy of this Certificate of Acceptance shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a signed copy of this Certificate of Acceptance is required to be included with the documentation the builder provides to the building owner at occupancy.

Company Name:		Phone:
Responsible Person's Name:	Responsible Person's Signature:	
License: / Date Signed:	Position With Company (Title):	

Occupant Sensor, Manual Daylighting Control, and Automatic Time Switch Control		
Intent:	Lights are turned off when not needed per Section 119(d) & 131(d).	
Construction Inspection		
1	Instrumentation to perform test includes, but not limited to:	
	a.	Hand-held amperage and voltage meter
	b.	Power meter

continued on next page

CERTIFICATE OF ACCEPTANCE	**LTG-2A**
Lighting Control Acceptance Document	**(Page 2 of 3)**
Project Name/Address:	
System Name or Identification/Tag:	System Location or Area Served:

2	Occupancy Sensor Construction Inspection		
	☐	Occupancy sensor has been located to minimize false signals	
	☐	Light meter	
	☐	Ultrasonic occupancy sensors do not emit audible sound (119a) 5 feet from source	
3	Manual Daylighting Controls Construction Inspection		
	☐	If dimming ballasts are specified for light fixtures within the daylit area, make sure they meet all the Standards requirements, including "reduced flicker operation" for manual dimming control systems	
4	Automatic Time Switch Controls Construction Inspection		
	a.	Automatic time switch control is programmed for (check all):	
		☐	Weekdays
		☐	Weekend
		☐	Holidays
	b.	Document for the owner automatic time switch programming (check all):	
		☐	Weekdays settings
		☐	Weekend settings
		☐	Holidays settings
		☐	Set-up settings
		☐	Preference program setting
	☐	Verify the correct time and date is properly set in the time switch	
	☐	Verify the battery is installed and energized	
	☐	Override time limit is no more than 2 hours	
	☐	Occupant Sensors and Automatic Time Switch Controls have been certified to the Energy Commission in accordance with the applicable provision in Section 119 of the Standards, and model numbers for all such controls are listed on the Commission database as Certified Appliance and Control Devices	

A.	**Select Acceptance Test** (Indicate lighting control systems Names/Designations by the applicable tests below)	
☐	1	Occupancy Sensor
☐	2	Manual Daylighting Controls
☐	3	Automatic Time Switch Controls

B.	**Equipment Testing Requirements** Check and verify those items applicable to selected system:	Applicable Lighting Control Systems		
Occupancy Sensor - Step 1: Simulate an unoccupied condition		1	2	3
a.	Lights controlled by occupancy sensors turn off within a maximum of 30 minutes from start of an unoccupied condition per Standard Section 119(d)	Y / N	Y / N	Y / N
b.	The occupant sensor does not trigger a false "on" from movement in an area adjacent to the controlled space or from HVAC operation	Y / N	Y / N	Y / N
c.	Signal sensitivity is adequate to achieve desired control	Y / N	Y / N	Y / N
Occupant Sensor - Step 2: Simulate an occupied condition				
a.	Status indicator or annunciator operates correctly	Y / N	Y / N	Y / N
b.	Lights controlled by occupancy sensors turn on when Immediately upon an occupied condition *OR* (this requirement is mutually exclusive with Step 2.c.)	Y / N	Y / N	Y / N
c.	Sensor indicates space is "occupied" and lights turn on manually	Y / N	Y / N	Y / N

continued on next page

CERTIFICATE OF ACCEPTANCE				**LTG-2A**
Lighting Control Acceptance Document				**(Page 3 of 3)**
Project Name/Address:				
System Name or Identification/Tag:		System Location or Area Served:		

Occupant Sensor - Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N
Occupant Sensor - Step 4 - Sensor is also a multi-Level Occupant Sensor used to qualify for a Power Adjustment Factor in Section 146(a)2D of the Standards. If yes, then 'a,' 'b,' and 'c' must also be yes.		Y / N	Y / N	Y / N
a.	The first stage activates between 30 to 70% of the lighting either manually or automatically.	Y / N	Y / N	Y / N
b.	A reasonably uniform level of illuminance is achieved by dimming of all lamps or luminaires; or by switching alternate lamps in luminaires, alternate luminaires, or alternate rows of luminaires.	Y / N	Y / N	Y / N
c.	After the first stage occurs, manual switches have been provided to activate the alternate set of lights, activate 100% of the lighting power, and manually deactivate all of the lights.	Y / N	Y / N	Y / N
Manual Daylighting Controls - Step 1: Manual switching control				
a.	At least 50% of lighting power in daylit areas is separately controlled from other lights	Y / N	Y / N	Y / N
b.	The amount of light delivered to the space is uniformly reduced	Y / N	Y / N	Y / N
Manual Daylighting Controls - Step 2: System returned to initial operating conditions		Y / N	Y / N	Y / N
Automatic Time Switch Controls - Step 1: Simulate occupied condition				
a.	All lights can be turned on and off by their respective area control switch	Y / N	Y / N	Y / N
b.	Verify the switch only operates lighting in the ceiling-height partitioned area in which the switch is located	Y / N	Y / N	Y / N
Automatic Time Switch Controls - Step 2: Simulate unoccupied condition				
a.	All non-exempt lighting turn off per Section 131(d)1	Y / N	Y / N	Y / N
b.	Manual override switch allows only the lights in the selected ceiling height partitioned space where the override switch is located, to turn on or remain on until the next scheduled shut off occurs	Y / N	Y / N	Y / N
c.	All non-exempt lighting turns off	Y / N	Y / N	Y / N
Automatic Time Switch Controls - Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N
Note: Shaded areas do not apply for particular test procedure				

C.	**PASS / FAIL Evaluation (check one):**
☐	PASS: All applicable **Construction Inspection** responses are complete and all applicable **Equipment Testing Requirements** responses are positive (Y - yes)
☐	FAIL: Any applicable **Construction Inspection** responses are incomplete *OR* there is one or more negative (N - no) responses in any applicable **Equipment Testing Requirements** section. Provide explanation below. Use and attach additional pages if necessary.

CERTIFICATE OF ACCEPTANCE	OLTG-2A
NA7.7 Outdoor Lighting Acceptance Tests	**(Page 1 of 3)**
Project Name/Address:	
System Name or Identification/Tag:	System Location or Area Served:

Enforcement Agency:	Permit Number:
Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.	Enforcement Agency Use: Checked by/Date

FIELD TECHNICIAN'S DECLARATION STATEMENT

- I certify under penalty of perjury, under the laws of the State of California, the information provided on this form is true and correct.
- I am the person who performed the acceptance requirements verification reported on this Certificate of Acceptance (Field Technician).
- I certify that the construction/installation identified on this form complies with the acceptance requirements indicated in the plans and specifications approved by the enforcement agency, and conforms to the applicable acceptance requirements and procedures specified in Reference Nonresidential Appendix NA7.
- I have confirmed that the Installation Certificate(s) for the construction/installation identified on this form has been completed and is posted or made available with the building permit(s) issued for the building.

Company Name:		
Field Technician's Name:		Field Technician's Signature:
	Date Signed:	Position With Company (Title):

RESPONSIBLE PERSON'S DECLARATION STATEMENT

- I certify under penalty of perjury, under the laws of the State of California, that I am the Field Technician, or the Field Technician is acting on my behalf as my employee or my agent and I have reviewed the information provided on this form.
- I am a licensed contractor, architect, or engineer, who is eligible under Division 3 of the Business and Professions Code, in the applicable classification, to take responsibility for the scope of work specified on this document and attest to the declarations in this statement (responsible person).
- I certify that the information provided on this form substantiates that the construction/installation identified on this form complies with the acceptance requirements indicated in the plans and specifications approved by the enforcement agency, and conforms to the applicable acceptance requirements and procedures specified in Reference Nonresidential Appendix NA7.
- I have confirmed that the Installation Certificate(s) for the construction/installation identified on this form has been completed and is posted or made available with the building permit(s) issued for the building.
- I will ensure that a completed, signed copy of this Certificate of Acceptance shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a signed copy of this Certificate of Acceptance is required to be included with the documentation the builder provides to the building owner at occupancy.

Company Name:		Phone:
Responsible Person's Name:	Responsible Person's Signature:	
License: / Date Signed:	Position With Company (Title):	

CERTIFICATE OF ACCEPTANCE		OLTG-2A
NA7.7 Outdoor Lighting Acceptance Tests		**(Page 2 of 3)**
Project Name/Address:		
System Name or Identification/Tag:	System Location or Area Served:	

NA7.7.1 Outdoor Motion Sensor Acceptance		
Intent:	Lights are turned off when not needed per Section 119(d) & 132.	
Construction Inspection		
1.	Motion Sensor Construction Inspection	
	☐	Motion sensor has been located to minimize false signals
	☐	Sensor is not triggered by motion outside of adjacent area
	☐	Desired motion sensor coverage is not blocked by obstruction that could adversely affect performance
Functional testing		
1.	Simulate motion in area under lights controlled by the motion sensor. Verify and document the following:	
	☐	Status indicator operates correctly.
	☐	Lights controlled by motion sensors turn on immediately upon entry into the area lit by the controlled lights near the motion sensor
	☐	Signal sensitivity is adequate to achieve desired control
2.	Simulate no motion in area with lighting controlled by the sensor but with motion adjacent to this area. Verify and document the following:	
	☐	Lights controlled by motion sensors turn off within a maximum of 30 minutes from the start of an unoccupied condition per Standard Section 119(d).
	☐	The occupant sensor does not trigger a false "on" from movement outside of the controlled area
	☐	Signal sensitivity is adequate to achieve desired control.

NA7.7.2 Outdoor Lighting Shut-off Controls		
Construction Inspection		
1.	Outdoor Lighting Shut-off Controls Construction Inspection	
	☐	Astronomical time switch controls and automatic time switch controls have been certified to the Energy Commission in accordance with the applicable provision in Standards Section 119. Verify that model numbers of all such controls are listed on the Energy Commission database as "Certified Appliances & Control Devices."
	☐	Controls to turn off lights during daytime hours are installed
	☐	Astronomical and standard time switch control is programmed with acceptable weekday, weekend, and holiday (if applicable) schedules
	☐	Demonstrate and document for the owner time switch programming including weekday, weekend, holiday schedules as well as all set-up and preference program settings
2.	Lighting systems that meet the criteria of Section 132(c)2 of the Standards shall have a scheduling control (time switch) installed which is able to schedule separately:	
	☐	A reduction in outdoor lighting power by 50 to 80%
	☐	Turning off all outdoor lighting covered by Section 132(c)2 of the Standards
	☐	Verify that the correct time and date is properly set in the standard and astronomical time switch.
	☐	Verify that the correct latitude, longitude and time zone are set in the astronomical time switch.
	☐	Verify the battery back-up (if applicable) is installed and energized in the standard and astronomical time switch.

CERTIFICATE OF ACCEPTANCE	OLTG-2A
NA7.7 Outdoor Lighting Acceptance Tests	**(Page 3 of 3)**
Project Name/Address:	
System Name or Identification/Tag:	System Location or Area Served:

NA7.7.2.2 Outdoor Photocontrol Functional testing		
Note photocontrol must be used in conjunction with time switch or motion sensor to meet the requirements of Section 132(c)2 of the Standards.		
1.	Nighttime test. Simulate or provide conditions without daylight. Verify and document:	
	☐	Controlled lights turn on
2.	Sunrise test: Provide between 10 and 30 horizontal footcandles (fc) to photosensor. Verify and document the following	
	☐	Controlled lights turn off

NA7.7.2.3 Astronomical Time Switch Functional testing		
1.	Power off test. Program control with location information, local date and time, and schedules. Disconnect control from power source for at least 1 hour. Verify and document:	
	☐	Control retains all programmed settings and local date and time
2.	Night schedule ON test. Simulate or provide times when the sun has set and lights are scheduled to be ON. Verify and document:	
	☐	Controlled lights turn on
3.	Night schedule OFF test. Simulate or provide times when the sun has set and lights are scheduled to be OFF. Verify and document:	
	☐	Controlled lights turn off
4.	Sunrise test: Simulate or provide the programmed offset time after the time of local sunrise	
	☐	Controlled lights turn off

NA7.7.2.4 Standard (non-astronomical) Time Switch Functional Testing		
Note: this control must be used in conjunction with a photocontrol to meet requirements of Section 132(c) of the Standards.		
1.	Power off test. Program control with local date and time and schedules. Disconnect control from power source for at least 1 hour. Verify and document:	
	☐	Control retains all programmed schedules and local date and time
2.	On schedule test. Simulate or provide times when lights are scheduled to be ON. Verify and document:	
	☐	Controlled lights turn on
3.	Schedule test. Simulate or provide times when the sun has set and lights are scheduled to be OFF. Verify and document:	
	☐	Controlled lights turn off

SECTION 31 00 00
EARTHWORK

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Excavation and scarification.

B. Rough grading, cutting, and filling.

C. Compaction of subgrade.

1.02 RELATED WORK DESCRIBED ELSEWHERE

A. Division 1 – General Requirements

B Section 02 41 00 - Demolition

C. Section 32 10 13 - Asphaltic Concrete Paving

D. Section 32 10 15 - Concrete Paving and Sitework

E. Section 03 30 00 - Cast-in-Place Concrete

F. Division 15 - Plumbing

1.03 REFERENCES

A. Soils Engineering and Geological Hazards Report No. SL-16437-SA, prepared by Earth Systems Inc, March 31, 2011.

B. California Department of Transportation "Standard Specifications," referenced sections, State of California.

1.04 PROJECT/SITE CONDITIONS

A. Use all means necessary to control dust on or near the site resulting from the performance of the work. Thoroughly moisten all surfaces to prevent dust being a nuisance to the public, adjacent uses, and concurrent work on site.

B. Verify existing grades and dimensions before starting any grading operations. If any discrepancy exists with information shown on the drawings, notify the Architect or Civil Engineer immediately.

C. Use all means necessary to protect items designated to remain and all work of this Section.

D. All existing benchmarks shall be protected and maintained throughout the course of the work. Monuments or stakes disturbed or destroyed during the course of the work shall be re-established.

E. Earthwork shall be conducted as to avoid injury to persons and damage to adjacent property. Provide appropriate shoring, bracing and barriers, including light when necessary.

F. Earthwork operations shall comply with all safety requirements of the California Industrial Accident Commission and Division of Industrial Safety and the Federal Occupational Safety and Health Act (OSHA).

1.05 SUBMITTALS

A. In the event an alternate method of soil conditioning is proposed to the methods specified herein, submit under the provisions of Section 01 33 00, a complete written program for alternative soil conditioning methods. Prior to preparing an alternate proposal, confirm the Owner's willingness to entertain alternative proposals.

1.06 QUALITY ASSURANCE

A. The Owner will retain and pay a qualified Soils Engineer to take all field samples and do all laboratory testing necessary to insure compliance of the work to these Specifications. The Owner's Soils Engineer shall submit results of all testing done during the course of the work to the Owner' Representative and Architect.

B. Should testing indicate work that does not satisfy these Specifications, the Contractor shall pay, through the Owner, for all additional tests required to determine the extent of work that is not satisfactory and for all additional tests necessary to demonstrate compliance with these Specifications.

C. The Contractor shall provide 48 hours notice prior to commencing the following operations to permit the Owner's Soils Engineer to observe the work:
1. Over excavation for subgrade preparation.
2. Recompaction of scarified soils.
3. Placement and compaction of fill.
4. Footing excavation.

PART 2 - PRODUCTS

2.01 FILL MATERIAL FOR SUB-GRADE PREPARATION

A. Site Materials: All on-site fill materials shall be non clay-bearing, free of organic or deleterious products and shall be a soil/soil-rock product containing lumps or rock no greater than 3 inches in the greatest dimension. Moisture content of existing soils may require adjustment for approval. All on-site fill material shall be subject to approval by the Soils Engineer.

B. Import Materials: All import material shall meet the content requirements of 2.01/A above, be granular in nature per ASTM D 2488-00, readily compacted without excessive voids, and have an expansion index not greater than 10 per ASTM D 4829-08a. Imported material shall have enough binder to allow foundation excavations and utility trenches to stand without caving. All imported fill material shall be subject to approval by the Soils Engineer.

2.02 PAVING BASE

A. Class II aggregate base conforming to, mixed, spread and compacted to the requirements of Section 26 of the Standard Specifications, placed over approved compacted fill material per the requirements of 3.07 below.

PART 3 - EXECUTION

3.01 GENERAL

A. Soils in the area of existing irrigation pipes to be removed shall be excavated and backfilled with moisture conditioned compacted structural fill, in a stepped configuration.

B. Soils in the area of new concrete building footings and slabs shall be over-excavated and backfilled with moisture conditioned compacted structural fill.

C. Soils in the area of paving and concrete flatwork shall be scarified, moisture conditioned and compacted.

3.02 SITE PREPARATION

A. Clear the site of all large roots, abandoned pipes, undocumented fills, existing foundations, paving, debris, and other deleterious materials and dispose of off site.

B. Excavate and remove existing 36-inch diameter irrigation pipes crossing the site, permanently sealing the exposed ends of the pipes at the property lines to the satisfaction of the San Joaquin Irrigation District.

C. Strip any surface vegetation and organic topsoil to a depth of at least 4 inches as adjusted in the field by the Soils Engineer. Organic topsoil may be stockpiled for use in landscaping and non-structural fill areas if acceptable to the Landscape Architect.

D. Immediately upon discovery of any subsurface tanks, leach fields or utilities in areas subject to grading operations, contact the Soils Engineer to observe the void resulting from removal and the underlying surface. Following the Soils Engineer's observation and approval, immediately fill the void and compact in accordance with the Soils Engineer's recommendations.

3.03 EXCAVATION, BACKFILLING AND COMPACTION

A. After removal of irrigation pipes, proceed as follows:
   1. Cut trench bottom to a uniform grade.
   2. Scarify soils in trench bottom and recompact.
   3. Backfill trench with only non-expansive materials.

B. During cutting operations, proceed as follows:
   1. Make all cuts in long uniform passes.
   2. Bench edges of cut areas so that the resulting overall slope, toe to toe, does not exceed 2 horizontal to 1 vertical; limit maximum height of benches to not more than 2 feet.
   3. Stockpile removed soils for reuse as appropriate; stripped topsoil or clay bearing materials may only be used in landscape or non-structural fill.
   4. Remove from the site excess soil not being reused.
   5. Extend over-excavation at least 5 feet beyond the edge of footings.

C. During scarification operations, backfill and recompact all voids created by dislodging cobbles, roots, or debris and remove the dislodged cobbles, roots, or debris from the subgrade.

D. During compaction operations, moisten or dry all on-site or imported structural fill material to a level that is within + or - 2% of optimum moisture.

E. During fill operations, proceed as follows:

1. Obtain the approval of the Owner's Soils Engineer for all imported fill material. Use only material which meets the requirements of 2.01/B above.
2. Where the slope of the subgrade surface on which fill is to be placed is 15:1 or steeper, bench the subgrade in flat benches at least 10 feet wide prior to filling.
3. Allow material containing excess moisture to dry to acceptable moisture content per 3.03 C above prior to compacting, spreading fill for air drying as required.
4. Do not compact fill by jetting under any circumstances.
5. Fill layers shall not exceed 8 inches compacted thickness.

F. Grading tolerances:
1. Top Surface of Subgrade: Plus or minus 1/10 foot.
2. Top Surface of Backfilling: Plus or minus 1/10 foot.

G. Bring to the immediate attention of the Architect or the Owner's Soils Engineer all wet, pumping, contaminated, or unstable areas encountered during excavation. The Soils Engineer will review such conditions and recommend remedial actions.

3.04 COMPACTION TESTING

A. Relative density laboratory tests shall be performed in accordance with ASTM D1557-09, Method A, B, or C; field tests performed in accordance with ASTM D-2922-05, and ASTM D-3017-05, using the Modified AASHO Test for Compaction. Modifications to these methods shall only be made as directed by the Soils Engineer.

3.05 PREPARATION OF SUBGRADE

A. Adjust subgrade by cutting or filling as required to accommodate finish grades shown for footings, floor slabs, and paving, including thickness of any base course. Where not specified otherwise in 3.07 below, allow for 4 inches of finish grade fill above compacted subgrade. Roll the surface to a smooth and uniform texture free from lumps, rock pockets, soft spots, and spongy areas.

3.06 FINISH SITE GRADING

A. Adjust finish grade to elevations shown on the Drawings. Firmly hand tamp or compact by vibra-plate.

B. Slope grade away from buildings and walls a minimum of 2% slope for 5 feet.

C. Remove surplus fill materials from site, unless the Owner specifically identifies or approves another means of disposal.

3.07 SCHEDULE OF LOCATIONS

A. Condition building area soils as follows:
1. In areas below and 5 feet beyond the perimeter of all building footings, remove soils to a level plane at a minimum depth of 24 inches below bottom of footings, with an intermediate overexcavation depth half-way to the bottom of the pipe removal trench as described in the Soils Engineering Report.
2. Scarify the resulting surface to a depth of 12 inches and recompact as required for structural fill.
3. Structural fill shall be placed in level lifts not exceeding 8 inches, brought to within + or - 2% of optimum moisture content and compacted to a minimum of 90% of maximum dry density as determined by test method ASTM D 1557-09. Fill and compact to top of subgrade.

4. Subgrade below the building floor slab is the bottom of the capillary break/cushion beneath the slab, which shall be a minimum of 4" of clean sand.

B. Condition paving area soils as follows:
   1. In areas below and 5 feet beyond the perimeter of all asphaltic or cast-in-place concrete paving, remove soil to a uniform plane below the level of disturbance from demolition.
   2. Scarify the exposed surface to 12" min., moisture condition and recompact to 95% maximum dry density.

C. Condition site retaining wall soils as follows:
   1. Remove soil to the bottom of retaining wall footings.
   2. Moisture condition exposed soils and recompact to 95% maximum dry density.

D. Condition concrete walk and flatwork soils as follows:
   1. In areas below and 12 inches beyond the perimeter of all walks and flatwork compact subgrade per paragraph 3.06 A. 3 above.

E. Condition landscape area soils as follows:
   1. Compact all fill material per paragraph 3.06 A. 3 above, to 12 inches below finish grade.
   2. Remove native soils as necessary to provide for 12 inches of top soil at finish grade. Compact the resulting surface by vibra-plate. Stockpile sufficient material for landscape contractor's use in finish grading at planted areas.

F. Condition utility trenches as follows:
   1. Trench bottoms shall receive bedding of free draining sand up to 12 inches above utility pipes compacted to 90%.
   2. Trench backfill above bedding shall be approved on-site inorganic material or non-expansive import per 2.01, placed in 8 inch lifts, conditioned to between +2% and -2% of optimum moisture and compacted to 90%. The top 12 inches below vehicle parking or walks/flatwork shall be compacted to 95%. Trench walls shall be kept moist during backfill placement.
   3. Trenches or excavations greater than 5 feet in depth shall be shored or sloped back in compliance with OSHA regulations prior to entry.

END OF SECTION

SECTION 32 10 13
ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Asphaltic concrete paving at parking and driveway areas.

B. Paint striping and marking at parking spaces, crosswalks, and basketball court.

1.02 RELATED WORK

A. Section 31 00 00 - Earthwork

B. Section 32 10 15 - Concrete Paving and Sitework

1.03 REFERENCES

A. Referenced portions of "Standard Specifications" of State of California Department of Transportation.

B. Manteca City Engineering Standards.

PART 2 - PRODUCTS

2.01 ASPHALTIC CONCRETE

A. Binder:
Paving asphalt (as described in Section 92 of referenced standards), with a viscosity grade of AR4000.

B. Asphaltic Concrete:
Type B asphaltic concrete (as described in Section 39 of referenced standards), with aggregate type B, 3/4" diameter maximum size, medium graded.

2.03 TACK COAT

A. For application to all vertical asphaltic concrete or cast-in-place concrete surfaces to be paved against: SS-1h emulsified asphalt (as described in Section 37 of referenced standards)

2.04 SEAL COAT

A. Fog type, SS-1h emulsified asphalt (as described in Section 37 of referenced standards).

2.05 STRIPING PAINT

A. White traffic paint complying with Federal Specification TT-P-115E; Dunn-Edwards W801 "Vin-L-Stripe" epoxy modified acrylic latex or equivalent.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that compacted base is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Soils Engineer will review actual R value test results taken in connection with on-site subgrade preparation and make a final determination of required asphaltic concrete thickness.

D. Beginning of installation means acceptance of existing conditions.

3.02 PLACEMENT OF ASPHALTIC CONCRETE SURFACING

A. Repair any voids occurring after completion of grading operations.

B. Place asphaltic concrete in strict accordance with the provisions of Section 39 of the referenced standards.

C. Roll surface until smooth and dense texture is obtained, using equipment and placement methods allowed by referenced standards.

D. Asphaltic concrete thickness at on-site paving areas shall be no less than 6-1/2 full inches after compaction over 4 inches of base (traffic index of 6).

E. Asphaltic concrete thickness at any repairs to the public street shall be as indicated in Civil Engineering Drawings or directed by Manteca City Engineer.

3.03 PLACEMENT OF SEAL COAT

A. Apply seal coat a minimum of 7 days after placement of asphaltic concrete, in accordance with Section 37 of the referenced standards.

B. Apply seal coat at the rate of .07 gallons per square yard over the entire paved area.

C. Carefully remove all seal coat from concrete and other adjacent surfaces.

3.04 ADJUSTMENTS

A. Finish all asphaltic concrete surfaces to meet the tolerances described in Section 39, Article 39-6.03 of the referenced standards.

B. Upon direction of the Architect, cut out and/or rework all surfaces which pond or do not meet these tolerances.

3.05 PAINTING

A. Thoroughly clean areas to receive paint striping and marking.

B. Apply striping paint in strict accordance with the Drawings, Santa Maria City standards, and the manufacturer's recommendations, protecting painted surfaces until dry.

3.06 CLEANUP

A. Clean up and remove all debris related to paving operations from site.

B. Clean any asphalt products splattered on adjacent surfaces with an appropriate cleaner.

END OF SECTION

SECTION 32 10 15
CONCRETE PAVING AND SITEWORK

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Non pigmented concrete walks, steps, sidewalks, curbs, gutters, drainage structures, driveway and parking lot paving, and related concrete site improvements as shown on drawings.

1.02 RELATED WORK

A. Section 31 00 00 - Earthwork

B. Section 32 10 13 - Asphaltic Concrete Paving

C. Section 03 30 00 - Cast-in-Place Concrete

1.03 REFERENCES

A. Manteca City Engineering Standards, current edition.

B. ACI 301 - Specifications for Structural Concrete for Buildings.

C. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

D. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

E. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

F. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

G. ASTM C33 - Concrete Aggregates.

H. ASTM C94 - Ready Mixed Concrete.

I. ASTM C150 - Portland Cement.

J. ASTM C979 - Concrete Color Additives.

K. Referenced portions of "Standard Specifications" of State of California Department of Transportation.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain materials for similar installations from same source throughout.

1.05 REGULATORY REQUIREMENTS

A. Conform to California Administrative Code Title 24 for slopes and surface treatments of public walk and ramp surfaces.

1.06 TESTS

A. Concrete slump and strength testing and analysis will be performed under provisions of Section 01 40 00.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150 Normal-Type I or II.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Clean and not detrimental to concrete.

2.02 FORM MATERIALS

A. Conform to ACI 301 and Section 03300 of these specifications.

B. Joint Filler: per ASTM D1751; Burke No. 236 or approved equivalent, 1/4 inch thick.

2.03 REINFORCEMENT

A. Reinforcing Steel: Conform to Section 03300.

B. Welded Steel Wire Fabric: Plain type, ASTM A185, uncoated finish.

C. Tie Wire: Annealed steel, minimum 16 gage.

D. Dowels: ASTM A615; 40 ksi yield grade, plain steel, uncoated finish.

2.04 ACCESSORIES

A. Curing Compound: Conform to ASTM C309; any Burke product compatible with concrete additives.

B. Form Release: Burke Release #1 form release agent or equivalent non-oil type form coating.

C. Preformed Joint: Burke No. 237 Plastic Zip Strip joint former or approved equivalent.

2.05 ADDITIVES

A. Chemical Admixtures: Admixtures for water reduction, acceleration, retardation, air entrainment, or high early strength shall conform to appropriate ASTM designations and shall be used only if approved in advance by Architect on the basis of submittals under provisions of Section 01300.

2.07 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Provide concrete mixes according to the following schedule:
   1. Walks: 2,000 psi 28-day compressive strength, Class B concrete.
   2. Curbs and Gutters: 2,500 psi 28-day compressive strength, Class B concrete.
   3. Vehicle Paving: 3,000 psi 28-day compressive strength, Class B concrete.

C. Use accelerating admixtures in cold weather, set-retarding admixtures during hot weather, or air entraining agent to concrete mix for concrete work subject to freeze/thaw cycling only when approved by Architect.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify compacted base is ready to support concrete paving, walks, flatwork and imposed loads.

B. Verify gradients and elevations of subgrade are correct.

C. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Moisten substrate to minimize absorption of water from fresh concrete.

3.03 FORMING

A. Place and secure forms to correct location, dimension, and profile, and in compliance with Section 03 30 00.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

D. Unless otherwise noted on drawings, form walks and plazas at 4 full inches thickness and vehicle paving at 6 full inches thickness.

3.04 REINFORCEMENT

A. Place reinforcement as indicated in details on drawings, and in compliance with Section 03 30 00.

B. Interrupt reinforcement at expansion joints.

C. Provide dowelled joints at interruptions of concrete with one end of dowel treated to allow longitudinal movement.

D. Concrete vehicle paving shall be reinforced with a minimum of #3 bars at 24" o.c. both directions; cold joints shall be reinforced with #4 smooth dowels at 36" o.c.

E. Unless noted otherwise, walks and miscellaneous flatwork shall be reinforced with 6” X 6” 10/10 expanded wire mesh.

3.05 FORMED JOINTS

A. Place joints at locations indicated on drawings or as directed by Architect, to correct elevation and profile. Align curb, gutter, and sidewalk joints.

B. Determine which joints shall be expansion joints and which joints shall be contraction crack control (weakened plane) joints based on referenced standards (Caltrans Standard Specifications, Chapter 40). In no case shall a concrete paving surface extend more than twelve (12) feet unbroken by a joint.

C. Tool joints with a metal joint tool. Sawcut joints may only be used if approved in advance by the Architect. Sawcut joints in exposed to view locations shall be cut against a straightedge guide to assure a straight line.

3.06 PLACING CONCRETE - GENERAL

A. Place concrete in accordance with ACI 301.

B. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.

C. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that unplanned cold joints occur.

3.07 FINISHING

A. Finish concrete paving and related flatwork according to the following schedule:
1. Curbs and Gutters: Smooth Sacked.
2. Sidewalks: Light Broom, conforming to Manteca City standards.
3. Internal Project Walks, Steps and Plazas: Light Broom, perpendicular to length.
4. Vehicle Surfaces: Medium Broom.

B. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.09 PROTECTION

A. Immediately after placement, protect concrete from premature drying, rain pitting, excessive hot or cold temperatures, and mechanical injury.

B. Do not allow spotting, ponding or uneven accumulation of moisture during cure period.

END OF SECTION

SECTION 32 30 00
SITE IMPROVEMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Bench and waste receptacle at building entry, as indicated on Drawings.

1.02 RELATED SECTIONS

A. Section 03 30 00 – Cast-in-Place Concrete

B. Section 32 10 15 – Concrete Paving and Sitework

1.03 SUBMITTALS

A. Submit product data under provisions of Section 01300.

B. Submit shop drawings, describing fence and gate layout, elevations, dimensions, details, and accessories, under provisions of Section 01 30 00.

PART 2 - PRODUCTS

2.01 BENCH

A. Acceptable Manufacturer:

1. Wausau Tile.

2. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

B. Precast Concrete Bench.

1. Wausau Tile Model TF5030 reinforced concrete bench, 96”L x 20”W x 18”H, in color and texture selected by Architect from standard range.

2.02 WASTE RECEPTACLE

A. Acceptable Manufacturer:

1. Wausau Tile.

2. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

B. Precast Concrete Waste Receptacle.

1. Wausau Tile Model TF1031 reinforced concrete receptacle with metal top, 24” x 24” x 36”H, in color and texture selected by Architect from standard range.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper fence, gate, and gate operator installation, shall be new, of first quality, and subject to the architect's approval.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation of site improvements, carefully inspect the area of work, and related work of other trades to verify that such work is complete, accurate, and ready to receive the work of this Section.

B. Beginning of installation means acceptance of existing conditions.

3.02 FABRICATION AND DELIVERY

A. Fabricate site improvements in accordance with approved submittals.

B. Deliver products of this Section to the jobsite and protection from damage under provisions of Section 01 60 00 of these Specifications.

3.03 INSTALLATION

A. Permanently anchor site improvement items in compliance with manufacturers' recommendations.

B. Install all components plumb, level, and accurately fitted.

3.04 CLEAN-UP

A. Remove any debris related to the work of this Section from the project site.

B. Touch up any surfaces damaged during installation with manufacturer's recommended touch-up material to the Architect's approval.

END OF SECTION

SECTION 33 10 00
WATER UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes: Completion of water piping and valves as indicated on the drawings and specified herein to completely interconnect all equipment with piping for complete and operable systems, including equipment drains.

1. Pipe materials
2. Trenching and backfilling - compaction
3. Laying pipe

B. Related sections:

1. Compaction for backfilling: Section 31 00 00 - Excavation and Backfill for Utilities.
2. Reinforcing Steel, Section 03 30 00.

1.02 REFERENCE STANDARDS

A. The work specified in this section shall be performed in accordance with the City of Manteca Engineering Department standards for the installation of potable waterlines.
B. Construction shall be in conformance with the applicable sections of the Standard Specifications for Public Works Construction.
C. Open Trench Operations: Trench excavations and backfill necessary for the installation of the water piping and valves and appurtenances shall be done in accordance with Section 306 of the Standard Specifications and as noted in the Special Provisions.

1.03 SUBMITTALS

A. Submit the following under the product information category:

1. Pipe, fittings and accessories.
2. Valves and accessories

1.04 PERFORMANCE REQUIREMENTS

A. An encroachment permit will be required for the work in this section. All work onsite and offsite encompassed in the section must be in accordance with the requirements of the City of Manteca Engineering Standards and Specifications.

1.05 QUALITY ASSURANCE

A. General: Perform leakage testing on all pipe installed on this project. Furnish all equipment, material, personnel and supplies to perform all tests and make all taps and other necessary temporary connections. Test pressure shall be measured at the highest point on the line unless specifically noted otherwise. Leakage tests shall be performed after all connections to the existing piping, and at a time agreed upon and

in the presence of the engineer. The test pressure, allowable leakage shall be as herein specified.

1. Buried Piping: The leakage test for buried piping shall be made after all pipe is installed and backfilled. However, the contractor may elect to conduct preliminary tests prior to backfill. Final test shall be after trenches have been backfilled and compacted.
2. Exposed Piping: All supports, anchors and blocks shall be installed prior to leakage testing. No temporary supports or blocking shall be installed for final test.
3. Encased Piping: The leakage tests for encased piping shall be made after all pipe is installed and encased, and before any structures are installed above it.
4. Testing Apparatus: Contractor shall provide all equipment and appurtenances as required to complete pressure testing.
5. Reports: The contractor shall keep records of each piping test, including:
    a. description and identification of piping tested
    b. test pressure
    c. date of test
    d. witnessing by contractor and engineer
    e. test evaluation
    f. remarks, to include such items as leaks (type, location), and repairs made on leaks
6. Allowable leakage is “none”.

B. DISINFECTION OF POTABLE WATER SYSTEMS

1. Contractor shall clean and disinfect potable water system in accordance with the procedures utilized by the City of Manteca Engineering Department and the San Joaquin County Health Department.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Solvent Welded Polyvinyl Chloride (PVC) Water Pipe

1. PVC water pipe, 2 inch diameter and smaller shall be Schedule 40 PVC.
2. Solvent Weld Joints: Make pipe joints in accordance with ASTM D2855. Handle solvent cements and primers in accordance with ASTM F402.
3. Cut pipes squarely, ream and debur inside and out.
4. Threaded joints: Threaded connections shall use a short nipple, threaded at one end, socket at the other. Provide thread sealant in accordance with pipe manufacturer’s recommendations.Take care not to over tighten the joint.

B. PVC Valves

1. Valves 2 inches and smaller shall be Schedule 40 PVC Ball Valves installed in a pre-cast concrete valve box with cast iron cover flush with finish grade.
2. Install a union at each threaded connection of valves to facilitate removal.
3. Connections between ferrous and non-ferrous, piping, valves accessories or supports shall be made using a dielectric coupling, union, or flange.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

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

3.02 EXCAVATING, TRENCHING, AND BEDDING

A. Excavate, trench, and bed for site drains in accordance with pertinent provisions of Section 02200, and the following.

B. Movement of construction machinery:
1. Use means necessary to avoid displacement of, and injury to, pipe while compacting by rolling or operating equipment next to the pipe.
2. Movement of construction machinery over a storm drain at any stage of construction is solely at the Contractor's risk.

C. Bedding:
1. Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.
2. Bed the pipe carefully in a soil foundation accurately shaped and rounded to conform to the lower 1/4 of the outside perimeter of circular pipe, or set the pipe in a bed of sand.
3. Tamp bedding where necessary.
4. Provide bell holes and depressions for pipe joints of only the length, depth, and width required for making the particular pipe joint properly.
5. Where plastic pipe is used, provide a minimum of 4" of sand bedding over the top and under the pipe.

3.03 INSTALLING PIPE

A. General:
1. Carefully examine each pipe prior to placing.
   a. Promptly set aside defective pipe and damaged pipe.
   b. Clearly identify defects.
   c. Do not install defective pipe or damaged pipe.
2. Place pipe to the grades and alignment indicated, with a tolerance of one in 1000 vertical and one in 500 horizontal, unless otherwise directed by the Engineer.
3. Provide adequate facilities for lowering pipe safely into the trenches.
4. Do not place pipe in water, nor place pipe when trench or weather is unsuitable for such work.

B. Polyvinyl chloride pipe joints: Install with the specified materials and in accordance with the manufacturers' recommendations as approved by the Engineer.

C. Joining pipe of different materials: Provide fittings or couplings made for the pipe material jointing, or provide a concrete collar as approved by the Engineer.

D. Joining pipe of different sizes:
   1. Provide reducer fittings to the larger pipe.
   2. Where pipes are different materials as well as different sizes, use the same material for reducer fitting as in the larger pipe.
   3. Use saddle connection when branch lines join a main or collector main.
   4. Use eccentric collar joint when the slope of the pipe is less than 1%.

3.04 BACKFILLING

A. Backfill and compact in accordance with pertinent provisions of Section 02200.

3.05 TESTING AND INSPECTING

A. Provide personnel and equipment necessary, and perform tests required to demonstrate that the work of this Section has been completed in accordance with the specified requirements.

B. Hydrostatic test on watertight joints:
   1. Make a hydrostatic test on each watertight joint. Test one sample of each type watertight joint used. If one sample fails because of faulty workmanship, test an additional joint.
   2. Only joints within the building area and outside the building area but within ten feet of exterior walls or faces of the buildings need be tested.
   3. Replace or repair joints found to be faulty. Repeat the test and repair cycle until joints are demonstrated to meet the specified requirements.

END OF SECTION

SECTION 33 30 00
SITE SEWERAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Provide materials, labor and equipment necessary for the completion of a complete sewer piping system, including tie-ins to existing sewer piping and structures. Provide sewer pipe and appurtenances based on materials and products scheduled in these specifications and on the drawings. If not otherwise specified, provide sewer installation in accordance with the City of Manteca Engineering standards and specifications.

1. Pipe materials
2. Trenching and backfilling - compaction
3. Laying pipe

B. Related sections:

1. Compaction for backfilling: Section 31 00 00 - Excavation and Backfill for Utilities.

1.02 REFERENCE STANDARDS

A. The work specified in this section shall be performed in accordance with the City of Manteca Engineering Department standards for the installation of sanitary sewer facilities.
B. Construction shall be in conformance with the applicable sections of the Standard Specifications for Public Works Construction.
C. Open Trench Operations: Trench excavations and backfill necessary for the installation of the sanitary sewer piping and appurtenances shall be done in accordance with the Standard Specifications and as noted in the Special Provisions.

1.03 SUBMITTALS

A. Submit the following under the product information category:

1. Pipe, fittings and accessories.
2. Pre-cast concrete manhole components

1.03 PERFORMANCE REQUIREMENTS

A. No encroachment permit will be required for the work in this section. All work encompassed in the section is contained onsite.

1.04 QUALITY ASSURANCE

A. General: Perform leakage testing on all pipe installed on this project. Furnish all equipment, material, personnel and supplies to perform all tests and make all taps and other necessary temporary connections. Leakage tests shall be performed after all connections to the existing piping, and at a time agreed upon and in the presence of the engineer. The test pressure, allowable leakage shall be as herein specified.

1. Buried Piping: The leakage test for buried piping shall be made after all pipe is installed and backfilled. However, the contractor may elect to conduct preliminary tests prior to backfill. Final test shall be after trenches have been backfilled and compacted.
2. Encased Piping: The leakage tests for encased piping shall be made after all pipe is installed and encased, and before any structures are installed above it.
3. Testing Apparatus: Contractor shall provide all equipment and appurtenances as required to complete testing.
4. Reports: The contractor shall keep records of each piping test, including:
    a. description and identification of piping tested
    b. test pressure
    c. date of test
    d. witnessing by contractor and engineer
    e. test evaluation
    f. remarks, to include such items as leaks (type, location), and repairs made on leaks

B. Allowable leakage is in accordance with the City of Manteca Standards.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Polyvinyl Chloride (PVC) Sewer Pipe

1. PVC sewer pipe, 8-inch diameter and smaller shall be SDR 35 PVC in accordance with ASTM 3034.
2. Integral socket end for gasketed joint assembly: Make pipe joints in accordance with ASTM 3034.
3. Cut pipes squarely, ream and deburr inside and out.

B. PVC Connections

1. Sanitary sewer laterals and saddles 4 inches and smaller shall be PVC installed per manufacturers recommendations.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

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

3.02 EXCAVATING, TRENCHING, AND BEDDING

A. Excavate, trench, and bed for site drains in accordance with pertinent provisions of Section 02200, and the following.

B. Movement of construction machinery:

1. Use means necessary to avoid displacement of, and injury to, pipe while compacting by rolling or operating equipment next to the pipe.
2. Movement of construction machinery over a storm drain at any stage of construction is solely at the Contractor's risk.

C. Bedding:
1. Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.
2. Bed the pipe carefully in a soil foundation accurately shaped and rounded to conform to the lower 1/4 of the outside perimeter of circular pipe, or set the pipe in a bed of sand.
3. Tamp bedding where necessary.
4. Provide bell holes and depressions for pipe joints of only the length, depth, and width required for making the particular pipe joint properly.
5. Where plastic pipe is used, provide a minimum of 4" of sand bedding over the top and under the pipe.

3.03 INSTALLING PIPE

A. General:
1. Carefully examine each pipe prior to placing.
a. Promptly set aside defective pipe and damaged pipe.
b. Clearly identify defects.
c. Do not install defective pipe or damaged pipe.
2. Place pipe to the grades and alignment indicated, with a tolerance of one in 1000 vertical and one in 500 horizontal, unless otherwise directed by the Engineer.
3. Provide adequate facilities for lowering pipe safely into the trenches.
4. Do not place pipe in water, nor place pipe when trench or weather is unsuitable for such work.

B. Polyvinyl chloride pipe joints: Install with the specified materials and in accordance with the manufacturers' recommendations as approved by the Engineer.

C. Joining pipe of different materials: Provide fittings or couplings made for the pipe material jointing, or provide a concrete collar as approved by the Engineer.

D. Joining pipe of different sizes:
1. Provide reducer fittings to the larger pipe.
2. Where pipes are different materials as well as different sizes, use the same material for reducer fitting as in the larger pipe.
3. Use saddle connection when branch lines join a main or collector main.
4. Use eccentric collar joint when the slope of the pipe is less than 1%.

3.05 BACKFILLING

A. Backfill and compact in accordance with pertinent provisions of Section 31 00 00.

3.06 TESTING AND INSPECTING

A. Provide personnel and equipment necessary, and perform tests required to demonstrate that the work of this Section has been completed in accordance with the specified requirements.

B. Hydrostatic test on watertight joints:
   1. Make a hydrostatic test on each watertight joint. Test one sample of each type watertight joint used. If one sample fails because of faulty workmanship, test an additional joint.
   2. Only joints within the building area and outside the building area but within ten feet of exterior walls or faces of the buildings need be tested.
   3. Replace or repair joints found to be faulty. Repeat the test and repair cycle until joints are demonstrated to meet the specified requirements.

END OF SECTION

SECTION 33 40 00
SITE DRAINAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Building and site drainage system outside the building perimeter line, excluding sanitary sewer system.

B. All labor and materials required for a complete and operational site drainage system, including all necessary components not specifically described.

1.02 RELATED SECTIONS

A. Section 31 00 00 - Earthwork.

B. Division 15 - Plumbing.

1.03 REFERENCES

A. ASTM D2729 - Polyvinyl Chloride (PVC) Pipe and Fittings.

B. ASTM A74-75 - Soil Pipe Classification

C. ASTM F-405 - Polyethylene Pipe and Fittings

D. ASTM A48-3 - Gray Cast Iron

E. Manteca City Engineering Standards

1.04 SUBMITTALS

A. Submit product data under provisions of Section 01 30 00.

B. Submit product data on catch basins, pipe, and pipe accessories.

1.05 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01 70 00.

B. Accurately record location of pipe runs, connections, cleanouts and invert elevations.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

A. Polyvinyl Chloride Pipe (PVC): ASTM D2729, Schedule 40 size as indicated in the Drawings, with required fittings.

B. High Density Polyethylene Pipe (HDPE): AASHTO 252-294 size as indicated in the Drawings, with required fittings.

C. Cast Iron Pipe: ASTM A74-75, soil pipe classification, size as indicated in the Drawings, with required fittings.

2.02 CATCH BASINS

A. Acceptable Manufacturers:

1. Mid-State Concrete

2. Christy

3. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

B. Catch Basins: precast concrete drain boxes, as indicated on Civil Engineering Drawings with extension rings as required.

C. Grate: heavy duty cast iron traffic grate where subject to, or potentially subject to vehicular traffic; solid plastic grate elsewhere.

D. Contaminant Filters: Fossil Filters by Kristar, as indicated on Civil Engineering Drawings.

2.03 LINEAR DRAINS

A. Acceptable Manufacturers:

1. ACO Drain

2. NDS

3. Alternate products may be used if approved on the basis of submittals made under provisions of Section 01 30 00.

B. Linear Deck Drains: polymer concrete drain with stainless steel edge rail and Class A “heelguard” stainless steel grate, cast into deck slab as indicated on Drawings; ACO KS100S or equivalent.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that trench cut and excavation base is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fill material or fine aggregate.

B. Remove large stones or other hard matter which could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION - PIPING SYSTEM

A. Install and join pipe and pipe fittings in accordance with manufacturers' instructions.

B. Place drainage pipe on sand and bed per Section 31 00 00.

C. Lay pipe to slope gradients noted on Drawings, with maximum variation from true slope of 1/8 inch in 10 feet.

D. Extend pipe laterals to waterproofing system drainage connectors as required at retaining walls and foundation walls.

E. Extend pipe laterals to rainwater leaders as required at downspouts.

3.04 INSTALLATION - CATCH BASINS AND LINEAR DRAINS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for drain pipe and sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount grate/cover level at the elevation indicated, flush and level.

3.05 FIELD TESTS

A. Before backfilling, test all drain lines with water and a 1-inch diameter cork. The cork shall flow freely from test point to test point. Remove obstacles and repeat test until the system drains satisfactorily. Retest again immediately after backfilling. Make corrections and repairs as necessary until a successful retest is completed.

3.07 PROTECTION

A. Protect finished installation under provisions of Section 01 50 00.

B. Protect pipe and fittings until backfilling operation begins.

END OF SECTION