

PROJECT MANUAL

For
Modernization of Classroom #5 – Bldg. ‘B’

At

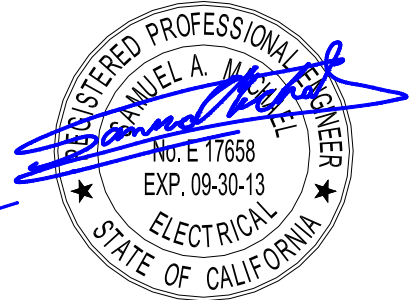
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NAC ARCHITECTURE
ARCHITECT

BUDLONG & ASSOCIATES
MECHANICAL, ELECTRICAL, PLUMBING ENGINEER

BIDDING DOCUMENTS
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SECTION 01000

ABBREVIATIONS, SYMBOLS AND ACRONYMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. List of abbreviations, symbols, and acronyms of societies, institutes, and associations generally appearing in the Contract Documents.

1.02.1 RELATED SECTIONS

- A. Division 01: General Requirements

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 ABBREVIATIONS

ac	Alternating current
amp	ampere
BTU	British thermal unit
cfh	Cubic feet per hour
cfm	Cubic feet per minute
cm	Centimeter
Co.	Company
COP	Coefficient of performance
Corp.	Corporation
d	Penny
db.	Decibel
DB	Dry bulb
dc	Direct current
EER	Energy efficiency ratio
F	Degrees Fahrenheit
fpm	Feet per minute
ft	Foot or feet
gph	Gallons per hour
gpm	Gallons per minute
HP	Horsepower
HVAC	Heating, ventilating and air conditioning
Hz	Hertz
Inc.	Incorporated
KHz	Kilohertz
Kip	thousand pounds
Ksf	Thousand pounds per square foot
Ksi	Thousand pounds per square inch
Kv	Kilovolt
KVA	Kilovolt amperes

KW	Kilowatt
KWH	Kilowatt hour
LF	Linear foot
lb	Pound
LED	Light emitting diode
MBH	1000 BTUs per hour
MHz	Mega hertz
mil	Thousandth of an inch
mm	Millimeter
mph	Miles per hour
oz.	Ounce
PCF	Pounds per cubic foot
pH	Acidity-alkalinity balance
psf	Pounds per square foot
psi	Pounds per square inch
psig	Pounds per square inch, gage
RF	Radio frequency
rpm	Revolutions per minute
SF	Square foot
SY	Square yard
V	Volt
WB	Wet bulb

3.02 SYMBOLS

#	Number or pound
'	Foot or feet
"	Inch(es)
%	Percent

3.03 ACRONYMS

AA	The Aluminum Association, Inc
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists

ABMA American Boiler Manufacturers Association

ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AGA	American Gas Association
AGCIH	American Conference of Governmental Industrial Hygienists
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute

APA	APA – The Engineered Wood Association
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATBCB	Architectural & Transportation Barriers Compliance Board
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America
CAL/OSHA	California Occupational Safety and Health Administration
CBC	California Building Code
CCR	California Code of Regulations
CEC	California Electrical Code
CFR	Code of Federal Regulations
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CMC	California Mechanical Code
CQC	California Quality Control (CMA Standards)
CPC	California Plumbing Code
CRA	California Redwood Association
CRI	Carpet and Rug Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards, U.S. Department of Commerce
CSFM	California State Fire Marshal
CSI	Construction Specifications Institute
CTIOA	Ceramic Tile Institute of America
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
DSA	Division of the State Architect
EPA	Environmental Protection Agency
ETL	ETL Testing Laboratories
FCC	Federal Communication Commission
FM	Factory Mutual
FS	Federal Specifications
GA	Gypsum Association
GANA	Glass Association of North America
HMMA	Hollow Metal Manufacturer’s Association
HPVA	Hardwood Plywood & Veneer Association

IACS	International Annealed Copper Standards
IAMPO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical & Electronic Engineers, Inc.
IES	Illuminating Engineering Society
IMI	International Masonry Institute
IRI	Industrial Risk Insurers
ISO	International Organization for Standardization
MLSFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society of the Valve & Fittings Industry.
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers Association
NEC	National Electrical Code
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NOFMA	National Oak Flooring Manufacturers Association
NPCA	National Paint and Coatings Association
NPDES	National Pollutant Discharge Elimination System
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NTMA	National Terrazzo & Mosaic Association
NUSIG	National Uniform Seismic Installation Guidelines
NWMA	National Woodwork Manufacturers Association
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PS	Product Standard, U.S. Department of Commerce
RIS	Redwood Inspection Service
RFCI	Resilient Floor Covering Institute
SCAQMD	South Coast Air Quality Management District
SDEI	Steel Deck Institute
SDI	Steel Door Institute
SFM	State Fire Marshal
SFPA	Southern Forest Products Association
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association

SSPC	Steel Structures Painting Council
SWI	Steel Window Institute
TCA	Tile Council of America
UBPPA	Uni-Bell PVC Pipe Association
UCI	Uniform Construction Index
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters' Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window and Door Manufacturers Association
WIC	Woodwork Institute of California
WWPA	Western Wood Products Association

END OF SECTION

SECTION 01005

SUMMARY OF THE WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Modernization of Classroom #5 in Building 'B'. Upgrades include replacement of existing sinks, doors, signage, casework, flooring, corrugated metal façade, roofing, heat pump, HVAC System, Data & Electrical Receptacles.

1.02 RELATED SECTIONS

- A. Section 01010: Phasing of the Work
- B. Section 01100: Coordination
- C. Section 01130: Field Engineering
- D. Section 01360: Construction Schedule
- E. Section 01450: Test and Balance
- F. Section 01500: Construction Facilities and Temporary Controls

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 USE OF PREMISES

- A. CONTRACTOR shall coordinate the Work of all trades, with OWNER and/or Separate Work Contract. CONTRACTOR shall sequence, coordinate, and perform the Work to impose minimum hardship on the operation and use of the existing facilities and/or Project site. CONTRACTOR shall install all necessary protection for existing improvements, Project site, property, and new Work against dust, dirt, weather, damage, vandalism, and maintain and relocate all protection to accommodate progression of the Work.
- B. CONTRACTOR shall confine entrance and exiting to the Project site and/or facilities to routes designated by the OAR
- C. Within existing facilities, OWNER will remove portable equipment, furniture, and supplies from Work areas prior to the start of Work. CONTRACTOR shall cover and protect remaining items in areas of the Work
- D. CONTRACTOR is advised school may be in session during performance of the Work. CONTRACTOR shall utilize all available means to prevent generation of unnecessary noise and maintain noise levels to a minimum. When required by the OAR,,

CONTRACTOR shall immediately discontinue noise-generating activities and/or provide alternative methods to minimize noise generation. CONTRACTOR shall install and maintain air compressors, vehicles, and other internal combustion engine equipment with mufflers, including unloading cycle of compressors. CONTRACTOR shall discontinue operation of equipment producing objectionable noise as required by the OAR.

- E. CONTRACTOR shall furnish, install, and maintain adequate supports, shoring, and bracing to preserve structural integrity and prevent collapse of existing improvements and/or Work modified and/or altered as part of the Work.
- F. CONTRACTOR shall secure building entrances, exits, and Work areas with locking devices as required by the OAR.
- G. CONTRACTOR assumes custody and control of OWNER property, both fixed and portable, remaining in existing facilities vacated during the Work.
- H. CONTRACTOR shall cover and protect surfaces of rooms and spaces in existing facilities turned over for the Work, including OWNER property remaining within as required to prevent soiling or damage from dust, dirt, water, and/or fumes. CONTRACTOR shall protect areas adjacent to the Work in a similar manner. Prior to OWNER occupancy, CONTRACTOR shall clean all surfaces including OWNER property.
- I. CONTRACTOR shall not use or allow anyone other than OWNER employees to use facility telephones and/or other equipment, except in an emergency. CONTRACTOR shall reimburse OWNER for telephone toll charges originating from the facility except those arising from emergencies or use by OWNER employees.
- J. CONTRACTOR shall protect all surfaces, coverings, materials, and finished Work from damage. Mobile equipment shall be provided with pneumatic tires.
- K. CONTRACTOR is advised OWNER will award Separate Work Contracts at this Project site.
- L. CONTRACTOR shall not permit the use of portable and/or fixed radio's or other types of sound producing devices including walkmans and similar devices.

3.02 PROPERTY INVENTORY

- A. Property, OWNER intends to remove, will be removed by OWNER before a room or space is vacated for the Work. Before performing Work in each room or space, OAR and CONTRACTOR shall prepare a detailed initial written inventory of OWNER property remaining within, including equipment and telephone instruments and the condition thereof. OAR and CONTRACTOR shall retain a signed copy of the inventory dated and signed by both parties. Prior to subsequent OWNER occupancy of each such room or space, OAR and CONTRACTOR shall perform a final inventory of OWNER property and all discrepancies between the initial inventory and final inventory shall be the responsibility of CONTRACTOR.

3.03 FURNITURE, FIXTURES, AND EQUIPMENT

- A. Certain furniture, fixtures, and equipment identified in the Contract Documents may be furnished and delivered to the Project site by OWNER and installed by the CONTRACTOR.
- B. If designated in the Contract Documents to be OWNER furnished CONTRACTOR installed (OFICI), CONTRACTOR shall unload, store, uncrate, assemble, install, and connect OWNER supplied furniture, fixtures, and equipment.
- C. Ninety (90) days prior to Substantial Completion, CONTRACTOR shall notify OAR of the scheduled date for installation of furniture, fixtures, and equipment. Upon delivery to the Project site, CONTRACTOR shall store furniture, fixtures, and equipment inside rooms and/or protected spaces. OAR will sign receipt or bill of lading as applicable.
- D. CONTRACTOR shall, within ten (10) days after delivery, uncrate and/or unpack furniture, fixtures, and equipment in presence of IOR who shall inspect the delivered items. IOR shall prepare an inspection report listing damaged or missing parts and accessories. IOR shall transmit one copy of the report to OAR and CONTRACTOR. OWNER will procure and/or replace missing and or damaged furniture, fixtures, and equipment.
- E. CONTRACTOR shall install furniture, fixtures, and equipment in the locations and orientation. CONTRACTOR shall verify exact locations with OAR prior to final installation of furniture, fixtures, and equipment.
- F. If required, OAR will furnish setting and or placement drawings for furniture, fixtures, and equipment.
- G. CONTRACTOR shall install furniture, fixtures, and equipment by proper means and methods to ensure an installation as recommended by the manufacturer. CONTRACTOR shall furnish and install all necessary fasteners and required blocking to properly install furniture, fixtures, and equipment.
- H. CONTRACTOR shall install furniture, fixtures, and equipment with manufacturer recommended fasteners for the type of construction the furniture, fixtures, and equipment is being fastened and/or anchored to.
- I. CONTRACTOR shall provide final connections of any electrical, signal, gas, water, waste, venting and/or similar items to furniture, fixtures, and equipment. CONTRACTOR shall, prior to final connection, verify the operating characteristics of furniture, fixtures, and equipment are consistent with the designated supply.

END OF SECTION

SECTION 01025

ALLOWANCES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies administrative and procedural requirements governing Contract allowances.
 - 1 Allowances as set forth in the Specifications are to be used as compensation for items as set forth in this Section. The amounts listed in the schedule and/or Specifications are to be included in the base bid and shall be listed separately in the Schedule of Values and Application for Payment.
- B. Type of allowances includes the following:
 - 1. Sewer assessment facility fee as per Supplementary Conditions, Section 00800, 6.32.1, 2
 - 2. Field Office Supplies as per Division 01 Section 01500, 3.11

1.02 RELATED SECTIONS

- A. Section 01020: Project Forms
- B. Section 01050: Schedule of Values
- C. Section 01080: Application for Payment
- D. Section 01360: Construction Schedule
- E. Section 01500: Construction Facilities and Temporary Controls
- F. Divisions 2-16: Specifications

1.03 ALLOWANCES

- A. Use the allowances only as authorized for OWNER purposes and only by an approved allowance disbursement form that indicate the amounts to be charged to the respective allowance amount.
- B. At Substantial Completion of the Work or at any time designated by the OAR, credit unused amounts remaining in the allowances to the OWNER by Change Order.

1.04 ALLOWANCE DISBURSEMENT

- A. CONTRACTOR shall submit a request for allowance disbursement on an allowance disbursement form. Include all substantiating and/or required data along with the request. Utilize the allowance disbursement authorization form as set forth in the Project Forms Section 01020.
- B. The request shall have the requested amount listed as an allowance disbursement without CONTRACTOR overhead and markup.
- C. Once the OAR has accepted the disbursement, ARCHITECT and OAR will sign the allowance disbursement form.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 SCHEDULE OF ALLOWANCES

- A. Include in the base bid the following allowances in the following amounts:

<u>Section</u>	<u>Description</u>	<u>Amount</u>
SECTION 02806	B-PERMIT	{\$_____}
SECTION 00800, 6.32.1,2	SEWER CONNECTION FEES	{\$_____}
SECTION 01500, 3.11	OFFICE SUPPLIES	{\$_____}

END OF SECTION

SECTION 01050
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedure for submission of a certified Schedule of Values for review and approval by the OAR.

1.02 RELATED SECTIONS

- A. Section 01080: Application for Payment
- B. Section 01300: Submittals
- C. Section 01360: Construction Schedule

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 PREPARATION

- A. Upon receipt of the Notice of Intent to Award, CONTRACTOR shall commence preparation of a certified Schedule of Values in accordance with the form included in Section 01020.
- B. CONTRACTOR shall coordinate the preparation of a certified Schedule of Values with preparation of the Construction Schedule as set forth in Section 01360.
- C. CONTRACTOR shall follow the table of contents as a Project specific guide to establish the format for a certified Schedule of Values. Provide at least one (1) line item for each Division and/or Specification Section item. Provide separate line items for labor and material when required by the OAR.
- D. Include the following Project school(s) identification on each certified Schedule of Values:
 - 1. Project name and location
 - 2. Project Number
 - 3. ARCHITECT name
 - 4. CONTRACTOR name
 - 5. Date of Submittal
- E. Round amounts to the nearest whole dollar; the total shall equal the Contract Amount.
- F. An approved certified Schedule of Values shall serve as the basis for the monthly certified Application for Payment.

3.02 90 DAY INTERIM SCHEDULE OF VALUES

- A. CONTRACTOR may prepare and submit, in accordance with sub-section 3.03, a 90 day interim Schedule of Values denoting Work to be completed during the first 90 days following the date established in the Notice to Proceed.
- B. CONTRACTOR shall coordinate the preparation of the 90 day interim Schedule of Values with preparation of the Construction Schedule as set forth in Section 01360.
- C. The 90 day interim Schedule of Values is subject to the same terms and conditions as set forth in sub-section 3.03.
- D. The 90 day interim Schedule of Values shall be incorporated into a final Schedule of Values.
- E. The OAR has the right to require subsequent revisions to an approved 90 day interim and/or a final Schedule of Values.

3.03 SUBMITTAL

- A. Within ten (10) days after the date established in the Notice to Proceed, CONTRACTOR shall submit five (5) certified copies of an interim and/or final Schedule of Values for review and approval by the OAR.
- B. OAR will review and if necessary, return the submitted Schedule of Values with summary comments noting items not in compliance with the requirements of the Contract Documents. CONTRACTOR shall revise the submitted Schedule of Values and return five (5) copies within three (3) days of receipt of summary comments.
- C. Signature by OAR shall constitute acceptance of the submitted Schedule of Values.
- D. A copy of the approved Schedule of Values will be transmitted to CONTRACTOR, IOR, and ARCHITECT.
- E. CONTRACTOR shall obtain OAR approval of a 90 day interim Schedule of Values prior to submittal of the first certified Application for Payment.
- F. CONTRACTOR shall obtain OAR approval of the final Schedule of Values prior to submittal of the fourth certified Application for Payment.

END OF SECTION

SECTION 01080

APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. This Section specifies administrative and procedural requirements relative to a certified Application for Payment.
 - 1. Coordinate the certified Schedule of Values and certified Application for Payment with, but not limited to, the Construction Schedule, submittal log, and list of Subcontractors.

1.02 RELATED SECTIONS:

- 1. Section 01050: Schedule of Values
- 2. Section 01360: Construction Schedule
- 3. Section 01700: Contract Closeout

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 APPLICATION FOR PAYMENT

- A. Each certified Application for Payment shall be consistent with previous applications and payments as reviewed by ARCHITECT and/or OAR, paid for by OWNER, and:
 - 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
- B. Payment Application Times: The period of Work covered by each Application for Payment is the payment date for each progress payment as specified in the General Conditions. The period covered by each Application for Payment is the previous month.
- C. Payment Application Forms: Use OWNER provided forms for the Application for Payment.

- D. Application Preparation: Complete every entry on the form. Include execution by a person authorized to sign legal documents on behalf of CONTRACTOR. ARCHITECT will return incomplete applications without action.
- E. Transmittal: Submit a minimum of four (4) signed and original copies of each certified Application for Payment to the ARCHITECT. All copies shall be complete, including releases and similar attachments.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to ARCHITECT.
- F. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal for the first certified Application for Payment include, but are not limited to, the following:
1. Certified Schedule of Values
 2. Performance and payment bonds. List of principal suppliers and fabricators.
 3. Worker Compensation certificates, if applicable.
 4. Auto Insurance, if applicable.
 5. Hazardous Material Insurance Certificates, if applicable.
 6. Construction Schedule
 7. Submittal Schedule
 8. Emergency Contact List
 9. Copies of authorizations and licenses from governing authorities for performance of the Work
- G. Application for Payment at Substantial Completion: Following OAR issuance of the certificate of Substantial Completion, submit an Application for Payment:
1. Administrative actions, submittals and/or Work that shall precede or coincide with this application include:
 - a. Occupancy permits and similar approvals by authorities having legal jurisdiction over the Work.
 - b. Removal of temporary facilities and services.
 - c. Testing, adjusting and balance records.
 - d. Removal of surplus materials, rubbish, and similar elements.
 - e. Meter readings.
 - f. Start-up performance reports.
 - g. OWNER training and orientations.
 - h. Change over information related to OWNER occupancy, use, operation, and maintenance.
 - i. Final cleaning.
 - j. Ensure that incomplete Work is not accepted and will be completed without undue delay.

- k. Advice on shifting insurance coverage.
 - l. List of defective Work, recognized as exceptions to certificate of Substantial Completion.
 - m. Change of door locks to OWNER system.
- H. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include, but are not limited to, the following:
- 1. Completion of Contract Closeout requirements.
 - 2. Project record documents.
 - 3. Completion of final punch list items.
 - 4. Delivery of extra materials, products and or stock.
 - 5. Identification of unsettled claims.
 - 6. Proof that taxes, fees, and similar obligations are paid.
 - 7. Operating and maintenance instruction manuals.
 - 8. Consent of surety to final payment.
 - 9. Waivers and releases.
 - 10. Warranties, guarantees and maintenance agreements.

END OF SECTION

SECTION 01100

COORDINATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This Section specifies administrative and procedural requirements necessary for coordinating Work operations including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.

1.2 RELATED SECTIONS

- A. Section 01300: Submittals
- B. Section 01360: Construction Schedule
- C. Section 01420: Testing and Inspection
- D. Section 01450: Test and Balance
- E. Section 01700: Contract Closeout

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 COORDINATION

- A. CONTRACTOR shall coordinate operations included in various sections of the Contract Documents to assure efficient and orderly installation of each part of the Work. Coordinate Work operations included under related sections of the Contract Documents that depend on each other for proper installation, connection, and operation of the Work, including but not limited to:
 - 1. Schedule construction operations in the sequence required where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
 - 3. Provide provisions to accommodate items scheduled for later installation.
 - 4. Prepare and administer provisions for coordination drawings.

- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required in notices, reports, attendance at meetings, and:
 - 1. Prepare similar memoranda for OAR and Separate Work Contract where coordination of their Work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation, relocation, and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project closeout activities.

- D. Conservation: Coordinate Work operations to assure operations are carried out with consideration given to conservation of energy, water, materials, and:
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into the Work.

3.02 SUBMITTALS

- A. Coordination Drawings: CONTRACTOR shall prepare coordination drawings for coordination of installation of products and materials fabricated by separate entities. Prepare coordination drawings for those areas where limited space availability necessitates maximum utilization of space for efficient installation of different components.

- B. Prepare coordination drawings in the following manner:
 - 1. Mechanical, electrical, and plumbing Subcontractors are to first submit their respective Shop Drawings for review in order to make any necessary changes prior to going through the coordination process.

 - 2. Plumbing Subcontractor is to locate the plumbing lines on mylar in blue pencil lines. Fire sprinkler Subcontractor is to locate all piping on mylar in red pencil lines and forward drawing to electrical Subcontractor.

 - 3. Electrical Subcontractor to indicate service and feeder conduit runs in green pencil lines and forward to CONTRACTOR.

4. CONTRACTOR will perform the last coordination review. As each coordination drawing is completed, CONTRACTOR will meet with ARCHITECT and OAR to review and resolve all conflicts on the coordination drawings.
5. All coordination meetings will be held in the Project field office of CONTRACTOR. CONTRACTOR is required to distribute Shop Drawings, cut sheets and submittals to Subcontractors where appropriate. Reviewed coordination drawings will be maintained in the Project field office of CONTRACTOR.

END OF SECTION

SECTION 01120

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies administrative and procedural requirements for cutting and patching.

1.02 RELATED SECTIONS

- A. Section 01050: Schedule of Values
- B. Section 01100: Coordination
- C. Section 01130: Field Engineering
- D. Section 01200: Project Meetings
- E. Section 01300: Submittals
- F. Section 01360: Construction Schedule
- G. Section 01450: Testing and Inspection
- H. Section 01740: Warranties

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 SUBMITTALS

- A. The word “cutting” as used in the Contract Documents includes, but is not limited to, cutting, drilling, chopping, and other similar operations and the word “patching” includes, but is not limited to, patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing, or other similar operations.
- B. Cutting and Patching Proposal: CONTRACTOR shall submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Contract Documents requires approval of these procedures before proceeding. Include the following information, as applicable, in the proposal:
 - 1. Describe the extent of cutting and patching required. Denote how it will be performed and indicate why it cannot be avoided.
 - 2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building’s appearance or other significant visual elements.

3. List products to be used and firms or entities that will perform this Work.
4. Indicate dates when cutting and patching will be performed.
5. Utilities: List utilities that cutting and patching operations will disturb or affect. List utilities to be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
7. Review by ARCHITECT and DSA prior to proceeding with cutting and patching does not waive ARCHITECT right to later require complete removal and replacement of defective Work.

3.02 QUALITY ASSURANCE

- A. Requirements for structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
 1. Obtain approval from ARCHITECT and DSA of the cutting and patching proposal before cutting and patching the following structural elements:
 - a. Foundation construction
 - b. Bearing walls
 - c. Structural concrete
 - d. Structural steel
 - e. Lintels
 - f. Timber and primary wood framing
 - g. Structural decking
 - h. Miscellaneous structural metals
 - i. Equipment supports
 - j. Piping, ductwork, vessels, and equipment
- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.
 1. Obtain review of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment
 - b. Water, moisture, or vapor barriers
 - c. Membranes and flashings
 - d. Fire protection systems

- e. Noise and vibration control elements and systems
- f. Control systems
- g. Communication and/or data systems
- h. Electrical wiring systems

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the opinion of ARCHITECT, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

- 1. If possible, retain the original installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Firestopping
 - b. Acoustical ceilings
 - c. Acoustical panels
 - d. Carpeting
 - e. Ceramic tile
 - f. Gypsum board
 - g. Masonry (exterior and interior where exposed)
 - h. Tack boards
 - i. Casework
 - j. Finish carpentry

3.03 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

3.04 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

- 1. Before proceeding, meet at the Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.05 PREPARATION

A. Temporary support: Provide adequate temporary support of existing improvements or Work to be cut.

- B. Protection: Protect existing improvements and Work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of existing improvements or Work that might be exposed during cutting and patching operations.
- C. Avoid interference with operation of adjoining areas or interruption of free passage to adjoining areas.
- D. Where the Work requires sandblasting of existing surfaces in order to receive new materials secured by cementitious, adhesive or chemical bond, completely remove existing finishes, stains, oil, grease, bitumen, mastic and adhesives or other substances deleterious to the new bonding and/or fastening of new Work. Utilize wet sand blasting for interior surfaces and for exterior surfaces where necessary to prevent objectionable production of dust.

3.06 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Carefully remove existing Work to be salvaged and/or reinstalled. Protect and store for reuse into the Work. Verify compatibility and suitability of existing substrates before starting the Work.
- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining Work. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.
 1. In general, where cutting, provide hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or a diamond-core drill. Saw cut reinforcing bars and paint ends with bituminous paint except where bonded into new concrete or masonry.
 4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating, backfill, or re-compaction.
 5. Woodwork: Cut and or remove to a panel or joint line.

6. Sheet Metal: Remove back to joint, lap, or connection. Secure loose or unfastened ends or edges and seal watertight.
 7. Glass: Remove cracked, broken, or damaged glass and clean rebates and stops of setting materials.
 8. Plaster: Cut back to sound plaster on straight lines, and back bevel edges of remaining plaster. Trim existing lath and prepare for new lath.
 9. Gypsum Wallboard: Cut back on straight lines to undamaged surfaces with at least two opposite cut edges centered on supports.
 10. Acoustical ceilings: Remove hanger wires and related appurtenances where ceilings are not scheduled to be installed.
 11. Tile: Cut back to sound tile and backing on joint lines.
 12. Flooring: Completely remove flooring and clean backing of prior adhesive. Carefully remove wood flooring for patching and repairing of existing wood flooring scheduled to remain.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with required tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation. Verify conditions of existing substrates prior to executing Work.
 2. Restore exposed finishes of patched areas and extend finish restoration into retaining adjoining construction in a manner that will eliminate all evidence of patching and refinishing.
 3. Concrete: Maintain cut edges in a moist condition for twenty four (24) hours prior to the placement of new concrete. In lieu of this an epoxy adhesive may be provided. Finish placed concrete to match existing unless noted otherwise. Concrete shall provide a compressive strength 3,000 psi where installed to repair and/or match existing improvements, unless noted otherwise.
 4. Metal Fabrications: Items to remain exposed shall have their edges cut and ground smooth and rounded.
 5. Sheet Metal: Replace removed and/or damaged sheet metal items as required for new Work.
 6. Glass: Install matching glass and re-seal exterior window assemblies.

7. Lath and Plaster: Install new lath materials to match existing and fasten to supports at 6”centers. Provide a 6” lap where new lath to adjoins existing lath. Fasten new lath as required for new Work. Restore paper backings as required. Apply a bonding agent on cut edges of existing plaster. Apply three coat plaster of the type, thickness, finish, texture, and color to match existing.
8. Gypsum Wallboard: Fasten cut edges of wallboard. Install patches with at least two opposite edges centered on supports and secure at 6” centers. Tape and finish joints and fastener heads. Patching shall be non-apparent when painted and/or finished.
9. Acoustical Ceilings: Comply with the requirements for new Work specified in related sections of the Contract Documents.
10. Resilient Flooring: Completely remove flooring and prepare substrate for new material.
11. Painting: Prepare areas to be patched, patch and paint as specified under related sections of the Contract Documents.

3.07 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged coverings to their original condition.

END OF SECTION

SECTION 01130

FIELD ENGINEERING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surveying requirements for the Work.

1.02 RELATED SECTIONS

- A. Section 01005: Summary of the Work
- B. Section 01100: Coordination
- C. Section 01300: Submittals
- D. Section 01360: Construction Schedule
- E. Section 01700: Contract Closeout

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 SUBMITTALS

- A. CONTRACTOR shall submit the name and address of the State of California licensed surveyor to ARCHITECT and/or OAR including any changes as they may occur.
- B. At request of ARCHITECT and/or OAR, CONTRACTOR shall submit copies of cut sheets, coordinate plots, data collector printouts, and other documentation as available to verify completeness and/or accuracy of field surveying Work

3.02 LAYOUT OF THE WORK

- A. CONTRACTOR shall employ a State of California licensed surveyor to lay out the entire Work, set grades, lines, levels, control points, vertical and horizontal control, elevations, grids and positions. Before the commencement of Work, surveyor shall, in conjunction with OWNER provided engineering survey of the Project site, locate all reference points and benchmarks, then lay out all lines, elevations, and measurements for the entire Work including but not limited to, buildings, grading, paving and utilities.

3.03 SURVEY REQUIREMENTS

- A. Establish a minimum of two permanent horizontal and vertical control points on the Project site, remote from the building area, referenced to data established by the survey control points.
- B. Indicate the reference points on the project record drawings with the basis of elevation being the established benchmarks.
- C. Establish lines, grades, locations and dimensions by instrumentation. From time to time, verify the layout of all Work by the same methods.
- D. Provide grade stakes and elevations to construct over excavation and re-compaction, rough and final grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required.
- E. Calculate and layout proposed finished elevations and intermediate control as required to provide smooth transitions between the spot elevations indicated in the Contract Documents.
- F. Provide stakes and elevations for grading, fill, and topsoil placement.
- G. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, sewers, water mains, electric and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or AC surfaces at key locations such as BC's, EC's, grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.
- H. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.
- I. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within the building pad perimeter adequate to control both over excavation and re-compaction and the final sub-grade elevation of the building pad.
- J. Submit a certification signed by the surveyor confirming the elevations and locations of improvements are in conformance with the Contract Documents. The statement shall include survey notes for the finish floor and building pad, showing the actual measured elevations on the completed sub-grade, recorded to the nearest 0.01'. Building pad tolerance will be +/- 0.10'.

3.04 RECORD DRAWINGS

- A. Upon Substantial Completion, CONTRACTOR shall obtain and pay for reproducible transparencies of the as built survey drawings. Deliver to ARCHITECT, final “record” drawings of the original drawings and completed Work within specified tolerances.
- B. Record drawings shall indicate locations by coordinate of all utilities onsite with top of pipe elevations at major grade and alignment changes, rim grate or top-of-curb and flow line elevations of all drainage structures and manholes.
- C. Completed record drawing transparencies shall be signed and certified as correct and within specified tolerances by the licensed surveyor.
- D. Attention is called to other sections of the Contract Documents requiring verification or measurements of installed Work by survey. Surveyor shall perform and certify all such surveys or verification are completed in accordance with the Contract Documents.

END OF SECTION

SECTION 01160

REQUEST FOR CLARIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedure for requesting clarification of the intent of the Contract Documents.

1.02 RELATED SECTIONS

- A. Section 01005: Summary of the Work
- B. Section 01100: Coordination
- C. Section 01360: Construction Schedule
- D. Section 01700: Contract Closeout

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 PROCEDURE

- A. CONTRACTOR shall prepare a Request for Clarification on the form provided in Section 01020. CONTRACTOR shall transmit the Request for Clarification to ARCHITECT with a concurrent copy to the OAR.
- B. ARCHITECT response is a clarification of the intent of the Contract Documents and does not authorize changes in the Contract Amount, Milestones and/or Contract Time.
- C. A Request for Clarification may be returned with a stamp or notation "Not Reviewed," if:
 - 1. The requested clarification is ambiguous or unclear;
 - 2. The requested clarification is equally available to the requesting party by researching and/or examining the Contract Documents;
 - 3. CONTRACTOR has not reviewed the Request for Clarification prior to submittal.
- D. Allow a minimum of nine (9) days for review and response time, after receipt by ARCHITECT and OAR. CONTRACTOR shall verify and is responsible in verifying ARCHITECT and OAR receipt of a Request for Clarification.
- E. Changes or alterations to the approved drawings or specifications shall be made by means of addenda or change orders as per section 4-338 of the California Building Standards Administrative Code.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies administrative and procedural requirements for Project meetings, including but not limited to, the following:
 - 1. Job start meeting.
 - 2. Pre-installation conferences.
 - 3. Progress meetings.
 - 4. Meetings as required by the OAR.

1.02 RELATED SECTIONS

- A. Section 01010: Phasing of the Work
- B. Section 01100: Coordination
- C. Section 01300: Submittals
- D. Section 01360: Construction Schedule

PART 2 – PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 JOB START MEETING

- A. In accordance with General Condition Article 2.6, OAR will schedule a job start meeting before starting the Work, at a time and date determined by OAR. Meeting shall be held at the Project site or another location as determined by OAR. Meeting will be held in order to review responsibilities, procedures, and other administrative requirements contained within the Contract Documents.
- B. Authorized representatives of OWNER, IOR, ARCHITECT, CONTRACTOR and other parties shall attend the meeting. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.
- C. Agenda items shall include significant items which could affect progress of the Work, including, but not limited to the following:
 - 1. Preliminary Construction Schedule
 - 2. Critical work sequencing
 - 3. Designation of responsible personnel

4. Identification of OAR
 5. Procedures for processing field decisions
 6. Request for Proposal
 7. Construction Directive and Change Order
 8. Procedures for processing Applications for Payment
 9. Prevailing wages
 10. Submittal of Shop Drawings, Product Data, material lists, and Samples
 11. Preparation of project record documents
 12. Use of the Project site and/or premises
 13. Parking availability
 14. Office, work, and storage areas
 15. Equipment deliveries and priorities
 16. Safety procedures
 17. First Aid
 18. Security
 19. Housekeeping
 20. Working hours
 21. Contract Compliance Officer
 22. Insurance Services including OCIP
 23. Environmental Health & Safety
- D. OAR shall prepare and issue meeting minutes to attendees and interested parties no later than five (5) calendar days after the meeting date.

3.02 PRE-INSTALLATION CONFERENCES

- A. CONTRACTOR shall coordinate and conduct pre-installation conferences at the Project site as required by related Sections of the Contract Documents.
- B. CONTRACTOR, manufacturers, and fabricators involved in or affected by the installation and its coordination or integration with other pre-ceding and/or subsequent installations of Work shall attend the meeting. CONTRACTOR shall advise OAR, IOR, and ARCHITECT of scheduled meeting dates in order to secure their attendance.
 1. CONTRACTOR shall review the progress of construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:
 - a. Contract Documents
 - b. Options
 - c. Related Construction Directives and Change Orders
 - d. Purchases
 - e. Deliveries
 - f. Shop Drawings, Product Data, and quality-control samples
 - g. Review of mockups
 - h. Possible conflicts

- i. Compatibility problems
- j. Time schedules
- k. Weather limitations
- l. Manufacturer's recommendations
- m. Warranty requirements
- n. Compatibility of materials
- o. Acceptability of substrates
- p. Temporary facilities
- q. Space and access limitations
- r. Governing regulations
- s. Safety
- t. Inspecting and testing requirements
- u. Required performance results
- v. Recording requirements
- w. Protection

- 2. CONTRACTOR shall record significant discussions and directives received from each conference. CONTRACTOR shall, within three (3) calendar days after the meeting date, distribute the minutes of the meeting to all concerned parties, including but not limited to, OAR, IOR, and ARCHITECT.

3.03 PROGRESS MEETINGS

- A. Progress meetings will be held at the Project site at regular intervals, typically weekly, as determined by the OAR.
- B. In addition to representatives of CONTRACTOR, OWNER, and ARCHITECT, each Subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of the Work shall, if requested by OAR, be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude all matters relating to the Work.
- C. Failure of the CONTRACTOR to be so represented at any progress meeting which is held at a mutually agreed time or for which a written notice is given, shall not relieve CONTRACTOR from abiding by any and all OAR or ARCHITECT determinations or directives issued at such meeting.
- D. OAR will review and correct or approve minutes of the previous progress meeting and will review other significant items affecting progress. Topics for discussion as appropriate to the status of the Project include but are not limited to:
 - 1. Interface requirements
 - 2. Construction Schedule
 - 3. Sequence and coordination
 - 4. Status of submittals / RFC's

5. Deliveries
6. Off-site fabrication
7. Access
8. Site utilization
9. Temporary Construction Facilities and Controls
10. Hours of work
11. Hazards and risks
12. Housekeeping
13. Quality and workmanship
14. Unforeseen conditions
15. Testing and Inspection
16. defective Work
17. Construction Directive
18. Request for Proposal
19. Change Order Proposals and Change Orders
20. Documentation of information for payment requests
21. Application for Payment
22. Other items as required or as brought forth.

E. No later than three (3) calendar days after each progress meeting, OAR will prepare and distribute minutes of the meeting to each present and absent party. Include a brief summary, in narrative form, of progress, decisions, directives, actions taken, and all other issues since the previous meeting and report.

1. Schedule Updating: If required, CONTRACTOR shall revise the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the next scheduled progress meeting.

3.04 ADDITIONAL MEETINGS

A. OAR, upon giving notice to the intended parties and without further obligation, may require additional meetings to discuss Work and/or Project related activities.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Administrative and procedural requirements for submittals required for the Work, including but not limited to; Shop Drawings, Product Data, Samples, material lists, and quality control items as required by the Contract Documents.
- B. Wherever possible, throughout the Contract Documents, the minimum acceptable quality of workmanship and products has been defined by the name and catalog number of a manufacturer and by reference of recognized industry standards.
- C. To ensure that specified products are furnished and installed in accordance with the design intent, procedures have been established for submittal of design data and for its review by ARCHITECT, OAR and/or others.

1.02 RELATED SECTIONS

- A. Section 01010: Phasing of the Work
- B. Section 01050: Schedule of Values
- C. Section 01080: Application for Payment
- D. Section 01100: Coordination
- E. Section 01120: Cutting and Patching
- F. Section 01130: Field Engineering
- G. Section 01330: Storm Water Pollution Prevention
- H. Section 01360: Construction Schedule
- I. Section 01420: Testing and Inspection
- J. Section 01450: Test and Balance
- K. Section 01500: Construction Facilities and Temporary Controls
- L. Section 01640: Substitutions
- M. Section 01700: Contract Closeout
- N. Section 01740: Warranties

PART 2 – PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 PROCEDURES

- A. CONTRACTOR shall package each submittal appropriately for transmittal and handling. CONTRACTOR shall transmit each submittal to ARCHITECT with concurrent copy of the transmittal to the OAR. ARCHITECT and/or OAR will not accept submittals received from sources other than from CONTRACTOR.
- B. After ARCHITECT review, ARCHITECT will transmit submittals to OAR and OAR shall further distribute to CONTRACTOR, IOR and/or others as required. Work shall not commence, unless otherwise approved by OAR, until approved submittals are transmitted to CONTRACTOR.
- C. CONTRACTOR shall clearly identify any deviations from the Contract Documents on each submittal. Any deviation not so noted even though stamped reviewed is not acceptable.
- D. CONTRACTOR shall coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities requiring sequential activity.
- E. Timing of Submittals:
 - 1. In accordance with General Conditions, CONTRACTOR shall submit to ARCHITECT, with copy of transmittal to the OAR, those Shop Drawings, Product Data, diagrams, materials lists, Samples and other submittals required by the Contract Documents.
 - 2. The schedule of submittals shall provide adequate time between submittals in order to allow for proper review without negative impact to the Construction Schedule.
 - 3. Schedule of submittals shall be related to Work progress, and shall be so organized as to allow sufficient time for transmitting, reviewing, corrections, resubmission, and re-reviewing.
 - 4. CONTRACTOR shall coordinate submittal of related items and ARCHITECT reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received by ARCHITECT.
 - 5. CONTRACTOR shall revise, update and submit submittal schedule to ARCHITECT and OAR on the first of each month, or as required by OAR.
 - 6. CONTRACTOR shall allow in the Construction Schedule, at least sixteen (16) days for ARCHITECT review following ARCHITECT receipt of submittal. For mechanical, plumbing, electrical, and other submittals

requiring joint review with OAR, CONTRACTOR shall allow a minimum of eighteen (18) days following ARCHITECT receipt of submittal.

7. No adjustments to the Contract Time and/or Milestones will be authorized because of a failure to transmit submittals to ARCHITECT sufficiently in advance of the Work to permit review and processing.
 8. In case of product substitution, Shop Drawing preparation shall not commence until such time ARCHITECT and OAR reviews said submittal relative to the General Conditions.
- G. If required, resubmit submittals in a timely manner. Resubmit as specified for initial submittal but identify as such. Review times for re-submitted items shall be as per the time frames for initial submittal review.
- H. Shop Drawing preparation shall not commence until such time as CONTRACTOR receives Product Data approval.
- I. ARCHITECT, or authorized agent, will stamp each submittal with a uniform, action stamp. ARCHITECT, or authorized agent, will mark the stamp appropriately to indicate the action taken, as follows:
1. Final Unrestricted Release: When ARCHITECT, or authorized agent, marks a submittal “ Reviewed, “ the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 2. Final-But-Restricted Release: When ARCHITECT, or authorized agent, marks a submittal “ Reviewed as Noted,“ the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
 3. Returned for Re-submittal: When ARCHITECT, or authorized agent, marks a submittal “ Rejected, Revise and Resubmit,“ do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat as necessary to obtain different action mark. In case of multiple submittals covering same items of Work, CONTRACTOR is responsible for any time delays, schedule disruptions, out of sequence Work, or additional costs due to multiple submissions of the same submittal item. Do not use, or allow others to use, submittals marked “Rejected, Revise and Resubmit” at the Project site or elsewhere where Work is in progress.

4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, the ARCHITECT, or authorized agent, will return the submittal marked "Action Not Required".

3.02 SHOP DRAWINGS

- A. Shop Drawings are original drawings prepared by CONTRACTOR, Subcontractor, supplier, or distributor illustrating some portion of Work by showing fabrication, layout, setting, or erection details. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings.
- B. Produce Shop Drawings to an accurate scale that is large enough to indicate all pertinent features and methods. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 x 11 inches but no larger than 24 x 36 inches.
- C. Shop Drawings shall include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
 1. Dimensions
 2. Identification of products and materials included by sheet and detail number.
 3. Compliance with specified standards.
 4. Notation of coordination requirements.
 5. Notation of dimensions established by field measurement.
- D. Provide a space of approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record CONTRACTOR and ARCHITECT review, and the action taken. Include the following information on the label for processing and recording action taken:
 1. Project name.
 2. Date.
 3. Name and address of ARCHITECT.
 4. Name and address of CONTRACTOR.
 5. Name and address of Subcontractor.
 6. Name and address of supplier.
 7. Name and address of manufacturer.
 8. Name and title of appropriate Specification section.
 9. Drawing number and detail references, as appropriate.
- E. Unless otherwise agreed to or indicated in individual Specification sections, submit a sufficient number to allow for adequate CONTRACTOR, Subcontractor,

supplier, manufacturer and fabricators distribution plus two sets to be retained by ARCHITECT, one set to IOR and one set to OAR. .

3.03 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of Work or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, wiring diagrams, schedules, illustrations, or performance curves.
1. Mark each copy to show or delineate pertinent materials, products, models, applicable choices, or options. Where Product Data includes information on several products that are not required, clearly mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 - g. Notation of dimensions and required clearances.
 - h. Indicate performance characteristics and capacities.
 - i. Indicate wiring diagrams and controls.
 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed. .
- C. Required Copies and Distribution: Same as denoted in sub - section 3.02, E.

3.04 SAMPLES

- A. Procedure:
1. Submit Samples of sufficient size, quantity, cured and finished and physically identical to the proposed product or material. Samples include partial or full sections or range of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches denoting color, texture, and/or pattern.
 - a. Mount or display Samples in the manner to facilitate review of qualities indicated. Include the following:
 1. Specification section number and reference.
 2. Generic description of the Sample.

3. Sampling source.
 4. Product name or name of manufacturer.
 5. Compliance with recognized standards.
 6. Availability and delivery time.
2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
- a. Where variations in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show the approximate limits of the variations.
 - b. Refer to other Specification sections for requirements for Samples that illustrate workmanship, fabrication techniques, assembly details, connections, operation, and similar construction characteristics.
 - c. Refer to other sections for Samples to be returned to CONTRACTOR for incorporation into the Work. Such Samples must be undamaged at time of installation. On the transmittal indicate special requests regarding disposition of Sample submittals.
 - d. Samples not incorporated into the Work, or otherwise not designated as OWNER property, remain the property of CONTRACTOR and shall be removed from the Project site prior to Substantial Completion.
3. Color and Pattern: Whenever a choice of color or pattern is available in a specified product, submit accurate color chips and pattern charts to OAR for review and selection.
4. Number Required: Submit 5 of each. Two will be returned to CONTRACTOR with one to ARCHITECT, OAR, and IOR.
- B. When specified, erect field Samples and mock-ups at the Project site to illustrate products, materials, or workmanship and to establish standards by which completed Work shall be judged.
- C. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of the Work. Sample sets may be used to obtain final acceptance of the Work associated with each set.

3.05 QUALITY CONTROL SUBMITTALS

- A. Submit quality control submittals, including design data, certifications, manufacturer's field reports, and other quality control submittals as required under other sections of the Contract Documents.
- B. When other sections of the Contract Documents require manufacturer's certification of a product, material, and/or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
- C. Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the represented company.
- D. Requirements for submittal of inspection and test reports are specified in other sections of the Contract Documents.

END OF SECTION

SECTION 01365

CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction Schedule procedures, preparation, submittal, updates, and revisions.

1.02 RELATED SECTIONS

- A. Section 01005: Summary of the Work
- B. Section 01300: Submittals.
- C. Section 01700: Contract Closeout.

1.03 PROCEDURES

- A. Within 7 calendar days after date of Notice to Proceed, CONTRACTOR shall submit to OWNER for review, a detailed Construction Schedule setting forth all requirements for complete execution of the Work.
- B. Seven (7) calendar days after receipt of the OWNER'S review comments, submit a final Construction Schedule acceptable to OWNER.
- C. If a Construction Schedule is considered by OWNER to not be in compliance with any requirement of the Contract, CONTRACTOR will be notified to review and revise the Construction Schedule and bring it into compliance. Failure of CONTRACTOR to submit a Construction Schedule in full compliance with the Contract Documents will result in a delay in progress payment processing. The Construction Schedule is to be used in evaluating progress for payment approval.
- D. Subsequently with each Progress Payment Request, CONTRACTOR shall deliver to OWNER an updated Construction Schedule reflecting Work progress to the end of the Progress Payment Request period. Each such Construction Schedule shall indicate actual progress to date in execution of the Work, together with a projected schedule for completion of all the Work.
- E. All schedule submittals are subject to review and acceptance by OWNER. OWNER retains the right to withhold progress payments until CONTRACTOR submits a Construction Schedule acceptable to OWNER.

- F. Concurrent with OWNER'S acceptance of CONTRACTOR'S submitted Construction Schedule, shall be CONTRACTOR'S signature of acceptance.

1.04 SCHEDULE SUBMITTAL PREPARATION GUIDELINES

- A. The Contract Work shall be scheduled and progress monitored using a Critical Path Method (CPM) network type scheduling system. Schedule shall be broken into sub-activities which shall, as a minimum, include major suppliers, all submittal approvals, all major trades, plumbing, mechanical, electrical, security, fire, and elevators/escalators. Scheduling system shall indicate all inter-relationships between trades and suppliers.
- B. Construction Schedule shall represent a practical plan to complete the Work within the Contract time requirement.
 - 1. A schedule extending beyond Contract time or less than Contract time will not be acceptable.
 - 2. A schedule found unacceptable by OWNER shall be revised by CONTRACTOR and resubmitted.
- C. Construction schedule shall clearly indicate sequence of construction activities, grouped by applicable phase and sorted by areas, buildings, or facilities within phase, and shall specifically indicate:
 - 1. Start and completion of all Work items, their major components, and interim milestone completion dates, as determined by CONTRACTOR and OWNER.
 - 2. Activities for procurement, delivery, installation of equipment, materials, and other supplies, including:
 - a. Time for submittals, resubmittals, and reviews. Include decision dates for selection of finishes.
 - b. Time for manufactured products for the Work fabrication and delivery.
 - c. Interdependence of procurement and construction activities.
 - d. As applicable, dates for testing, balancing equipment, and final inspection.

- D. Schedule shall be in sufficient detail to assure adequate planning and execution of the Work.
1. Each task activity shall range in duration from a 1 workday minimum to a 15 workday maximum and shall be total of actual days required for completion. The activity duration shall not include consideration of weather impact on completion of that activity.
 2. Schedule shall be suitable, in judgment of OWNER, to allow monitoring and evaluation of progress in performance of the Work; it shall be calendar time-scaled.
 3. Activities shall include:
 - a. Description; what is to be accomplished and where.
 - b. Workday duration.
 - c. Scheduled activities shall indicate continuous flow, from left to right.
 4. CONTRACTOR shall setup up the schedule calendar to identify workdays per week and shifts per day worked, non-work days, weekends and holidays.
- E. Failure to include any element of Work required for performance of this Contract shall not excuse CONTRACTOR from completing Work required to comply with the Contract Documents, notwithstanding acceptance of Construction Schedule.
- F. Submittal of Construction Schedule shall be understood to be CONTRACTOR'S confirmation that the schedule meets requirements of the Contract Documents, and that the Work will be executed in sequence indicated in schedule.

1.05 REVIEWS, UPDATES, AND REVISIONS

- A. OWNER will review and return the initial submittal of CONTRACTOR'S Construction Schedule, with summary comments, within 7 calendar days. If revisions are required, CONTRACTOR shall resubmit Schedule within 7 calendar days following receipt of OWNER'S comments.

- B. CONTRACTOR shall analyze and update the Project Construction Schedule:
1. As part of monthly payment application, CONTRACTOR shall submit to and participate with OWNER in a schedule review to include:
 - a. Actual start dates for Work items started during report period.
 - b. The percent (%) complete on activities that have actual start dates.
 - c. Actual completion dates for Work items completed during report period.
 - d. Estimated remaining duration for Work items in progress, which will not exceed original duration for activity.
 - e. Estimated start dates for Work items scheduled to start during month following report period, if applicable.
 - f. Changes in duration of Work items.
 2. In case of a change to CONTRACTOR'S planned sequence of Work, CONTRACTOR shall include a narrative report with updated progress schedule which shall include, but not be limited to, a description of problem areas, current and anticipated delaying factors, and any proposed revisions for a recovery plan.
 3. All Change Orders affecting the schedule shall be clearly identified as separate and new activities integrated into the schedule at the appropriate time and in the appropriate sequence as reviewed and approved by OWNER.
 4. The Project Construction Schedule Review will not relieve CONTRACTOR of responsibility for accomplishing all Work in accordance with the Contract Documents.
- D. Updates: CONTRACTOR shall submit to OWNER, with each payment application, an up-to-date Project Construction Schedule to include following:
1. Work Item Report: Detailing Work items and dependencies as indicated on the Schedule.
 2. Separate listing of activities completed during reporting period.

3. Separate listing of activities which are currently in progress, indicating their remaining duration and percentages completed.
 4. Separate listing of activities which are causing delay in Work progress.
- E. Scheduling of change or extra Work orders is responsibility of CONTRACTOR.
1. CONTRACTOR shall revise the Project Construction Schedule to incorporate all activities involved in completing change orders or extra Work orders and submit it to OWNER for review.
- F. If OWNER finds CONTRACTOR is entitled to extension of any completion date, under provisions of the Contract, OWNER'S determination of total number of days of extension will be based upon an analysis of the current Project Construction Schedule, and upon data relevant to the extension.
- G. CONTRACTOR acknowledges and agrees that delays to non-critical activities will not be considered a basis for a time extension unless activities become critical. Non-critical activities are those activities which, when delayed, do not affect an interim or Substantial Completion date.
- H. Any claim for extension of time shall be made in writing to OWNER not more than 7 days after commencement of delay; otherwise, it shall be deemed waived for all purposes. CONTRACTOR shall provide an estimate of the probable effect of such a delay on progress of Work as part of claim.

1.06 CONTRACTOR'S RESPONSIBILITY

- A. Nothing in these requirements shall be deemed to be an usurpation of CONTRACTOR'S authority and responsibility to plan and schedule Work as CONTRACTOR sees fit, subject to all other requirements of Contract Documents.
- B. CONTRACTOR shall provide at all times sufficient competent labor, materials, and equipment to properly carry on Work and to insure completion of each part in accordance with Construction Schedule and within time agreed.
- C. CONTRACTOR shall be responsible for ensuring that all submittals to the OWNER are accurate and consistent. Damage, including extra time and cost, caused by inaccuracies from CONTRACTOR will be compensated by CONTRACTOR.

1.07 SUSPENSION OF PAYMENTS

- A. Initial Submittal: If CONTRACTOR fails to comply with the specified requirements, OWNER reserves the right to engage an independent scheduling consultant to fulfill these requirements. Upon additional notice to CONTRACTOR, OWNER shall retain against CONTRACTOR all incurred costs for additional services.
- B. Update Submittals: OWNER has the right to withhold progress payments if CONTRACTOR fails to update and submit the Project Construction Schedule and reports as required by OWNER.

1.08 RECORD COPY

- A. Prior to the Contract Completion, CONTRACTOR shall submit the Project Construction Schedule showing the as-built sequence. The as-built schedule shall have all activities with actual start and end dates.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01420

TESTING AND INSPECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Testing and inspection services to meet requirements of the California Building Code (CBC), Title 24, Parts 1 and 2, as indicated on the Drawings.
- B. One or more DSA certified inspectors employed by the OWNER in accordance with the requirements of California Building Standards Administrative Code will be assigned to the Work with their duties as specifically defined in Section 4-333(b).
- C. Tests of materials are required by a DSA certified testing agency as set forth in Section 4-335 of the California Building Standards Administrative Code.

1.02 RELATED SECTIONS

- A. Section 01120: Cutting and Patching
- B. Section 01300: Submittals
- C. Section 01360: Construction Schedule
- D. Section 01450: Test and Balance
- E. Section 01500: Construction Facilities and Temporary Controls
- F. Section 01600: Materials and Equipment
- G. Section 01700: Contract Closeout
- H. Section 01740: Warranties

PART 2 – PRODUCTS (Not applicable)

PART 3 – EXECUTION

3.01 TESTS

- A. OWNER will select an independent testing agency to conduct tests, sampling, and testing of materials. Selection of material to be tested shall be by the agency and not by CONTRACTOR.

- B. Any material shipped from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from IOR such testing and inspection is not required shall not be incorporated into the Work.
- C. OWNER will select and directly reimburse testing agency the costs for all DSA and/or DSA required tests and inspections, but may be reimbursed by CONTRACTOR for such costs as noted in related sections of the Contract Documents.
- D. The independent testing agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work. The agency shall not perform any duties of CONTRACTOR.

3.02 TEST REPORTS

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

3.03 VERIFICATION OF TEST REPORTS

- A. Each testing agency shall submit to the Division of the State Architect a verified report in duplicate covering tests which are required to be performed by that agency during progress of the Work. Such report shall be furnished each time construction on the Work is suspended, covering tests up to that time, and prior to Final Completion of the Work, covering all tests.

3.04 INSPECTION BY OWNER

- A. OWNER and its representatives shall at all times have access, for purpose of inspection, to all parts of the Work and to shops wherein the Work is in preparation, and CONTRACTOR shall at all times maintain proper facilities and provide safe access for such inspection.
- B. OAR shall have the right to reject materials and/or workmanship deemed defective Work, and to require correction. Defective workmanship shall be corrected in a satisfactory manner and defective materials shall be removed from the premises and legally disposed of, all without charge to OWNER. If CONTRACTOR does

not correct such defective Work within a reasonable time, fixed by written notice and in accordance with the terms and conditions of the Contract Documents, OWNER may correct such defective Work and proceed in accordance with related Articles of the Contract Documents.

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

3.05 INSPECTOR OF RECORD

- A. Inspector of Record is employed by OWNER in accordance with requirements of Title 24 of the California Code of Regulations with their duties specifically defined therein.
- B. Inspection of Work shall not relieve CONTRACTOR from any obligation to fulfill all of the terms and conditions of the Contract Documents.
- C. CONTRACTOR shall be responsible for scheduling times of inspection, tests, sample taking, and similar activities of the Work.

3.06 TESTS AND INSPECTIONS

- A. The following tests and inspections do not limit inspection of the Work but are required by DSA, other agencies, or are required in related Sections of the Contract Documents.
- B. Concrete – Chapter 19A:
 - 1. Inspection:
 - a. Post-Installed Anchors in Concrete
- C. Light Weight Metals – Chapter 20A:
 - 1. Materials:
 - a. Alloys 2002.1
 - b. Identification 2002.1
 - 2. Inspection:
 - a. Welding 2003.1
- B. Wood - CBC, Chapter 23:
 - 1. Materials:

- a. Lumber and Plywood Grading 2303.1
 - b. Glued Laminated Members 2303.1.3
2. Inspection:
- a. Glued Laminated Fabrication 1704A.6.3.1, 2303.1.3
 - b. Timber Connectors 1704A.6.4
 - c. Manufactured Trusses 1704A.6.2; 1704.6.3.2; 2303.4.7
- C. Exterior Wall Coverings - CBC, Chapter 14, 25:
1. Materials:
- a. Portland Cement Plaster 2508A, 2509A, 2510A

END OF SECTION

SECTION 01450

TEST AND BALANCE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies the requirements for test and balance of ventilation and related systems.

1.02 RELATED SECTIONS

- A. Section 01005: Summary of the Work
- B. Section 01100: Coordination
- C. Section 01300: Submittals
- D. Section 01360: Construction Schedule
- E. Section 01700: Contract Closeout
- F. Section 15010: Basic Mechanical Requirements.
- G. Section 15050: Basic Mechanical Materials and Methods.
- H. Section 15700: Heating, Ventilating and Air Conditioning Equipment

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 DEFINITIONS AND APPLICABLE PUBLICATIONS

- A. For the purposes of this Section definitions are as indicated in applicable publications of AABC, NEBB, ASHRAE, ANSI and SMACNA.
- B.
 - 1. TAB: Testing, Adjusting and Balancing.
 - 2. NEBB: National Environmental Balancing Bureau.
 - 3. OAR: Owner's Authorized Representative
 - 4. IOR: Inspector of record

3.02 QUALITY ASSURANCE

- A. The test and balance agency shall be directly subcontracted to the CONTRACTOR. The qualifications of the agency shall comply with Section 3.02, Quality Assurance. The agency shall be responsible for furnishing labor, instruments, and tools required to

test, adjust and balance the ventilating systems and related plumbing systems, as described and/or as indicated in the Contract Documents.

- B. CONTRACTOR shall obtain services of an independent, qualified testing agency acceptable to ARCHITECT to perform testing and balancing Work as specified and as follows:
 - 1. Agency shall be currently certified by The National Environmental Balancing Bureau (NEBB). NEBB certification shall be Testing, Adjusting and Balancing and Sound and Vibration Measurement.
 - 2. Work shall be in accordance with the latest edition of the NEBB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard than the Contract Documents shall prevail.
- C. Performance Criteria: Work of this Section shall be performed in accordance with approved Testing, Adjusting and Balancing agenda.
- D. Test Equipment Criteria: Basic instrumentation requirements and accuracy/calibration required by Section II of the NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.
- E. Verification: The Test and Balance Agency shall recheck ten percent (minimum ten) of the measurements listed in the report. The locations shall be selected by the IOR/OAR. The recheck will be witnessed by the IOR/OAR. If twenty percent of the measurements that are retested differ from the report and are also out of the specified range, an additional ten percent will be tested. If twenty percent fall outside the specified range, the report will be considered invalid and all test and balance work shall be repeated.

3.03 SUBMITTALS

- A. Submit name of agency to perform the Work. Include in the submittal the certified qualifications of all persons responsible for supervising and performing actual Work of this Section. Agency shall provide name and telephone number of contact person for each listed project.
- B. Submit, for approval, 6 copies of the Agenda as indicated in Section 3.06 to test and balance all mechanical and relevant plumbing systems.
- C. Preliminary Report: Review the Contract Documents, examine Work installations and submit a written report to ARCHITECT and/or IOR/OAR indicating deficiencies in Work precluding proper testing and balancing of the Work.
- D. Final Report: Submit the final report for review by ARCHITECT and/or IOR/OAR outlining the conditions and Work completed on each ventilation unit. All outlets,

devices, equipment, etc. shall be identified, along with a numbering system corresponding to report unit identification.

- E. Submit an “NEBB Quality Assurance Certification” assuring the Project systems were tested, adjusted and balanced in accordance with the Specifications NEBB National Standards.

3.04 GENERAL SCOPE OF WORK

- A. The general scope of Work shall include but not be limited to the following:
 - 1. Measure sound levels in each conditioned space, tabulate results and submit reports.

3.05 SPECIFIC SCOPE OF WORK

- A. The specific scope of Work shall include the following ventilation system components as indicated on the Drawings:
 - 1. Heating and Ventilating Units
 - 2. Exhaust Fans
 - 3. Exhaust Duct Systems

3.06 TESTING, ADJUSTING AND BALANCING AGENDA

- A. Provide proposed materials, methods, procedures, forms, diagrams and reports for test and balance Work.
- B. Agenda to be completed by the test and balance agency and submitted to ARCHITECT and IOR/OAR for review and approval.
- C. Agenda shall include one complete set of AABC or NEBB publications listed in Section 3.02, B, 2, applicable publications, or, in case of other test and balance agencies and or organizations, comparable publications to establish an approved, systematic and uniform set of procedures.
- D. Agenda shall also include the following detailed narrative procedures, system diagrams and forms for test results:
 - 1. Specific standard procedures required and proposed for each system of the Work.
 - 2. Specified test forms for recording each procedure and for recording sound and vibration measurements.
- E. In addition to information recorded for standard AABC or NEBB procedures, the following information is required:

1. Fan Data
2. System number, Location, Manufacturer, Model and Serial Number
3. Fan wheel type and size
4. Motor horse power, type and rpm
5. Number and size of motor and fan shaft sizes and adjustment available motor data, including nameplate data, actual amps, rated and actual motor rpm, volts, phase, hp
6. Fan design airflow and service (outdoor exhaust)
8. Fan static pressure, suction/discharge, static profile and static control point.

F. The following sound test data is required:

1. Area or location
2. Sound level in dB(A) as specified in Section 3.20
3. Sound level at the center band frequencies of eight non-weighted octaves with equipment on and off.
4. Plot corrected sound-level reading on Noise Criteria (NC) curve.

G. The following vibration test data is required:

1. Equipment identification number
2. Vibration levels at all accessible bearings, motors, fans and casings
3. Measurements in mils deflection and velocity in inches per second as specified per section XIV of this document
4. Each measurement taken in horizontal, vertical, and axial planes as accessible.

H. The following water flow station data is required:

1. Station identification number
2. Nameplate data; manufacturer, model, and serial number
3. Design and actual GPM
4. Differential test pressure
5. Setting (open turns, degree, etc.) if required GPM
6. Notes

3.07 PROCEDURES

- A. Schedule the Work of this Section in order for test and balance activities to be completed prior to the date of Substantial Completion. CONTRACTOR shall place all ventilating equipment into operation during each day and until all HVAC adjusting, balancing, testing, demonstrations, and instructions on systems are completed. Agency shall prepare and submit reports within ten (10) days from completion of the Work of this Section to allow sufficient time for corrective measures to be completed before Final Completion of the Work. When an individual building or portion thereof is ready for occupancy, all equipment relative to such portion of Work shall be put into service, tested and balanced.

- B. Prior to the date of Substantial Completion, and upon completion of test and balance Work, place all exhaust fans in operation for a period of fourteen (14) days.
- C. Coordinate test and balance procedures with any phased Project requirements so test and balance procedures on each phased portion of the Work will be completed prior to completion of said designated phase.

3.08 FIELD EXAMINATION

- A. Before the commencement of test and balance Work, CONTRACTOR shall ascertain that following conditions are fulfilled:
 - 1. Over-voltage and current protection have been provided for motors
 - 2. Equipment has been labeled as required
 - 3. Automatic control systems are completed and operating
 - 4. Start up and initial commissioning of all fans shall be by the manufacturer.
- B. In addition to the above, CONTRACTOR shall establish a specific, coordinated plan which details how each area of existing building will be balanced during the various phases of the Work. The evaluation shall address, at a minimum, the following concerns:
 - 1. OWNER operations
 - 2. Building safety and security policies. CONTRACTOR shall first advise and coordinate with OWNER to ensure all concerned parties are notified.

3.09 TEST AND BALANCE

- A. For each ventilating, unit the following shall be performed, recorded and submitted in an approved format for review. Make, type, and model of unit, and location of each piece of equipment shall be included in the report. Readings shall include but not be limited to following:
 - 1. Exhaust Fans:
 - a) Fan speeds: Test and adjust fan RPM to achieve maximum or design CFM.
 - b) Duct Leakage Testing:
 - 1) On new installations, agency shall base one test per isolated section unless otherwise noted. New exhaust ducts shall demonstrate 1.0 % leakage maximum.
 - 2. WATER SYSTEMS:

CONTRACTOR shall confirm all equipment, piping and purged, strainers are clean and all balancing valves (except bypass valves) are set full open. Agency shall perform the following procedures in accordance with the NEBB National Standards:

3.10 FINAL TABULATION

- A. After ventilating components are satisfactorily tested and balanced, entire system shall be put into operation and all cfm, velocities, etc., shall be recorded and checked against design schedules. Design requirements shall be listed on reports and final tabulation shall be within a tolerance of plus or minus 5% of design requirements.

3.11 VIBRATION TESTING

- A. Record initial and final measurements for each unit of equipment on test forms. Where vibration readings exceed allowable tolerance and efforts to make corrections have proved unsuccessful, forward a separate report to ARCHITECT.

3.12 SOUND TESTING

- A. Perform and record sound measurements as specified in this section and if specified in Section 15070: Sound Vibration. Take additional readings if required by ARCHITECT.
- B. Take measurements with a calibrated sound level meter and octave band analyzer of accuracy required by NEBB.
- C. Where measured sound levels exceed specified level, CONTRACTOR shall take all remedial action and necessary sound tests shall be repeated.
- D. Report shall also include ambient sound levels of rooms in which above openings are located, taken without air-handling equipment operating. A report shall also be made of any noise caused by mechanical vibration.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities, construction facilities and controls to be provided, maintained, relocated, and removed by the CONTRACTOR

1.02 RELATED SECTIONS

- A. Section 01005: Summary of the Work
- B. Section 01010: Phasing of the Work
- C. Section 01050: Schedule of Values
- D. Section 01330: Storm Water Pollution Prevention
- E. Section 01360: Construction Schedule
- F. Section 01420: Testing and Inspection
- G. Section 01450: Test and Balance
- H. Section 01700: Contract Closeout

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 QUALITY ASSURANCE

- A. CONTRACTOR shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building Code requirements
 - 2. Division of State Architect
 - 3. Health and safety regulations
 - 4. Utility company regulations
 - 5. Police, fire department and rescue squad requirements
 - 6. Environmental protection regulations
- B. CONTRACTOR shall arrange for the inspection and testing of each temporary utility prior to use. Obtain required certifications and permits and transmit to OAR.

3.02 TEMPORARY UTILITIES

MUSCATEL MIDDLE SCHOOL
MODERNIZATION OF CLASSROOM #5 – BUILDING B
ROSEMEAD SCHOOL DISTRICT

CONSTRUCTION FACILITIES AND
TEMPORARY CONTROLS
01500-1

- A. CONTRACTOR shall submit to OAR reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.
- B. CONTRACTOR shall coordinate with the appropriate utility company to install temporary services. Where the utility company provides only partial service, CONTRACTOR shall provide and install the remainder with matching compatible materials and equipment.
- C. Temporary Water:
 - 1. CONTRACTOR when required shall furnish, install and pay for all necessary permits, inspections, move ins/out, temporary water lines, connections & fees, extensions and distribution, metering devices and use charges, deliveries/pick ups, rentals, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other miscellaneous items for the temporary water system, and upon Substantial Completion of the Work, removal of all such temporary water system devices and appurtenances.
 - 2. CONTRACTOR when required shall provide and maintain temporary water service, including water distribution piping and outlet devices of the size and required flow rates in order to provide service to all areas of the Project site.
 - 3. CONTRACTOR when required shall provide and pay for all potable water needed for construction and all other uses associated with the Work.
 - 4. CONTRACTOR shall at their expense and without limitation, remove, extend and/or relocate temporary water systems as rapidly as required in order to provide for progress of the Work.
- D. Temporary Electric:
 - 1. CONTRACTOR when required shall furnish, install, maintain and pay for all necessary permits, inspections, temporary wiring, metering devices and use charges, move ins/outs, connections & fees, service, extension and distribution, deliveries/pickups, rentals, storage, transportation, taxes, labor, insurance, bonds, materials, equipment and all other required miscellaneous items for the temporary electric systems and upon Substantial Completion of Work, removal of all such temporary electric systems and appurtenances.

- 2. CONTRACTOR when required shall furnish, install, maintain, extend and distribute temporary electric area distribution boxes, so located that

individual trades can obtain adequate power and artificial lighting, at all points required for the Work, for inspection and for safety.

3. CONTRACTOR when required shall provide temporary electric for construction, temporary facilities, and connections for construction equipment requiring power or lighting, at all points required for the Work, for inspection and safety.
4. CONTRACTOR when required shall provide 20 foot candles minimum lighting levels inside building(s) and 5 foot candles outside for safety and security.
5. CONTRACTOR when required shall ensure welding equipment is supplied by electrical generators.
6. CONTRACTOR when required shall at their expense and without limitation remove, extend and/or relocate temporary electric systems as rapidly as required in order to provide for progress of the Work.

E. Temporary Heating, Ventilation and Air Conditioning:

1. CONTRACTOR shall furnish, install, maintain, and pay for all necessary permits, inspections, move ins/out, extensions and distribution, connections and fees, use charges, metering devices and use charges, equipment, rentals, deliveries/pick ups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary heat and ventilation needed for proper installation of the Work and to protect materials and finishes from damage due to weather. Upon Substantial Completion of the Work, CONTRACTOR shall remove all such temporary heating and ventilating system devices and appurtenances.
2. CONTRACTOR shall provide, maintain and pay for all temporary ventilation of enclosed Work areas to cure materials, disperse humidity, remove fumes, and to prevent accumulation of dust, irritants, or gases.
3. CONTRACTOR shall maintain manufacturer required levels of room and/or space temperature, humidity and ventilation necessary to install products, materials and/or systems of the Work.
4. CONTRACTOR shall at their expense and without limitation, remove, extend and/or relocate temporary heating and ventilating systems as rapidly as required in order to provide for progress of the Work.

G. Temporary Telephone and Data:

1. CONTRACTOR shall furnish, install, maintain and pay for all necessary permits, inspections, move ins/outs, extensions and distribution, devices, connections and fees, use charges, rentals, deliveries/pickups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary phone, data service and distribution to Project site temporary offices as required by this Section and Section 01500, 3.03.
2. CONTRACTOR shall at their expense and without limitation, remove, extend and/or relocate temporary phone service and distribution as rapidly as required in order to provide for progress of the Work.
3. Upon Substantial Completion of the Work, CONTRACTOR shall remove all such temporary phone service, distribution, devices and appurtenances.

3.03 CONTRACTOR PROVIDED FACILITIES

- A. CONTRACTOR shall provide temporary offices, utilities, storage units, fencing, barricades, chutes, hoists, scaffolds, railings and other facilities or services as required. CONTRACTOR shall be responsible for providing, installation, maintenance, supplying, and all use charges for the items provided under Section 01500.
- B. At CONTRACTOR expense and without limitation remove and/or relocate temporary office(s) and related facilities as rapidly as required in order to provide for progress of the Work.
- C. Temporary Storage Units:
 1. CONTRACTOR shall provide secure and waterproof storage units for the temporary storage of furniture, equipment and other items requiring protection.
 2. Walls, roof and doors shall be a minimum of 16-gage steel with floors of 1" tongue and groove hardwood or 3/4" minimum exterior type plywood. The undercarriage shall be designed to accommodate forklift blades 42" to 60" long. There shall be doublewide swing out lockable doors at one end equipped with waterproof gaskets.
 3. CONTRACTOR shall be responsible for all delivery charges and will install the storage unit in an appropriate area.

4. CONTRACTOR shall remove the storage unit from the Project site when the storage unit is no longer required for the Work or upon Substantial Completion of the Work.
5. CONTRACTOR shall at their expense and without limitation remove and/or relocate storage units as rapidly as required in order to provide for progress of the Work.

D. Temporary Sanitary Facilities:

1. CONTRACTOR shall provide portable chemical toilet facilities. Quantity of portable chemical toilet facilities shall be based on total number of workers and shall be in accordance with CAL/OSHA standards.
2. Portable chemical toilet facilities shall be maintained with adequate supplies and in a clean and sanitary condition and shall be removed from the Project site upon Substantial Completion of the Work.
3. CONTRACTOR employees shall not use school toilet facilities.
4. At CONTRACTOR expense and without limitation remove and/or relocate portable chemical toilet facilities as rapidly as required in order to provide for progress of the Work.
5. CONTRACTOR will contain their breaks and lunch periods to the areas designated by OAR or any public area outside the Project site. CONTRACTOR shall provide a suitable container within the break/lunch area for the placement of trash. Areas used for break/lunch must be maintained clean and orderly. Once finish flooring has been installed in a particular area, no food or beverages will be permitted in that area.

E. Temporary Security Fence/Barricade:

1. CONTRACTOR shall install temporary Project site security barricade(s) as directed and coordinated with OAR as required for safety and as specified herein. New or used material may be furnished. Security of Project site and contents is a continuous obligation of CONTRACTOR.
2. Unless otherwise indicated or specified, security fence shall be constructed of 8'-0" high chain link fencing with a 8'-0" high windscreen. Space posts not to exceed 10'-0" on centers. Posts shall be of following nominal pipe dimensions: terminal, corner, and gatepost 2-1/2", line posts 2". Chain link fence shall be not less than #13 gage, 2" mesh, and in one width. Posts, fence and accessories shall be galvanized and as follows:

- a. Shall be set in the earth a depth of 30" with soil firmly compacted around post, unless required otherwise in writing by OAR.
- b. Fence fabric shall be attached to posts with #14 gage tie wire at 16" on centers. A #6 gage steel tension wire with turnbuckles shall be installed at top and bottom of barricade fencing. Wire tie fabric to tension wires at 18" centers.
- c. Windscreen shall be attached to fence fabric and steel tension wires at 18" centers with a minimum of #14 gage tie wire. Windscreen shall be maintained and all rips, tears, missing sections shall be corrected upon notification by OAR.
- d. Chain link fencing shall be free from barbs, icicles or other projections resulting from galvanizing process. Fence having such defects will be replaced even if it has been installed.
- e. Gates shall be fabricated of steel pipe with welded corners, and bracing as required. Fence and fabric to be attached to frame at 12" centers. Provide all gate hardware of a strength and quality to perform satisfactorily until barricade is removed upon Substantial Completion of the Work. Each gate shall have a chain and padlock. Provide two (2) gate keys to OAR. At Substantial Completion of the Work, remove barricade from Project site, backfill and compact fence footing holes. Existing surface paving that is cut into or removed shall be patched and sealed to match surrounding areas.
- f. At CONTRACTOR expense and without limitation remove and/or relocate fencing, fabric and barricades or other security and protection facilities as rapidly as required in order to provide for progress of the Work.

F. Other Temporary Enclosures & Barricades:

- 1. Provide lockable, temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, to allow for temporary heating and for security.
- 2. Provide protective barriers around trees, plants and other improvements designated to remain.
- 3. Temporary partitions shall be installed at all openings where additions connect to existing buildings, and where to protect areas, spaces, property, personnel, students and faculty and to separate and control dust, debris, noise, access, sight, fire areas, safety and security. Temporary partitions

shall be directed and coordinated by OAR. At CONTRACTOR expense and without limitation remove and/or relocate enclosures, barriers and temporary partitions as rapidly as required in order to provide for progress of the Work.

4. Since the Work of this Project may be immediately adjacent to existing occupied structures and vehicular and pedestrian right of ways, CONTRACTOR shall, in his sole judgment and in accordance with applicable safety standards, provide all temporary facilities, additional barricades, protection and care to protect existing structures, occupants, property, pedestrians and vehicular traffic. CONTRACTOR is responsible for any damage, which may occur to the property and occupants of the property of OWNER or adjacent private or public properties which in any way results from the acts or neglect of CONTRACTOR.

G. Temporary Storage Yards:

1. CONTRACTOR shall fence and maintain storage yards in an orderly manner.
2. Provide storage units for materials that cannot be stored outside.
3. At CONTRACTOR expense and without limitation remove and/or relocate storage yards and units as rapidly as required in order to provide for progress of the Work.

H. Temporary De-watering Facilities & Drainage:

1. For temporary drainage and de-watering facilities and operations not directly associated with construction activities included under individual sections, comply with de-watering requirements of applicable Division 01 sections. CONTRACTOR shall maintain the Work, Project site and related areas free of water.
2. For temporary drainage and de-watering facilities and operations directly associated with new buildings, additions or other construction activities, comply with Division 01 & 02 Sections. CONTRACTOR shall be responsible for, but not limited to, de-watering of excavations, trenches & below grade areas of buildings, structures, the Project site and related areas.

I. Temporary Protection Facilities Installation:

1. CONTRACTOR shall not change over from using temporary facilities and controls to permanent facilities until Substantial Completion, except as permitted by OAR
2. Until permanent fire protection needs are supplied and approved by authorities having jurisdiction, CONTRACTOR shall provide, install and maintain temporary fire protection facilities of the types needed in order to adequately protect against fire loss. CONTRACTOR shall adequately supervise welding operations, combustion type temporary heating and similar sources of fire ignition.
3. CONTRACTOR shall provide, install and maintain substantial temporary enclosures of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Where materials, tools and equipment are stored within the Work area, CONTRACTOR shall provide secure lock up to protect against vandalism, theft and similar violations of security. OWNER accepts no financial responsibility for loss, damage, vandalism or theft.
4. CONTRACTOR operations shall not block, hinder, impede or otherwise inhibit the use of required exits and/or emergency exits to the public way, except as approved by the OAR. CONTRACTOR shall maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities and other access routes for fire fighting equipment and/or personnel.
5. With approval of OAR and at the earliest feasible date in each area of the Work, complete installation of the permanent fire protection facilities including connected services and place into operation and use.
6. In the event of an emergency drill or an actual emergency, designated by the sounding of the fire alarm and/or other sounding device, all construction activities must cease. CONTRACTOR shall evacuate the Work area and remain outside the Work area until permitted to return. No Work shall be conducted during the evacuation of a building or during an emergency.

J. Temporary Security and Safety Measures:

1. During performance of the Work in existing facilities CONTRACTOR shall provide, install and maintain substantial temporary barriers and/or partitions separating all Work areas from areas occupied by students, faculty and/or administrative staff.

2. During performance of the Work in existing facilities and/or on a Project site occupied by students and where temporary barriers and/or partitions are not physically feasible, CONTRACTOR shall provide an employee meeting the requirements of Education Code Section 45125.2.(2) to continually supervise and monitor all employees of the CONTRACTOR and Subcontractor. For the purposes of this Section, CONTRACTOR employee shall be someone whom the Department of Justice has ascertained has not been convicted of a violent or serious felony as listed in Penal Code Section 667.5(c) and/or Penal Code Section 1192.7(c). To comply with this Section, CONTRACTOR shall have his employee submit his or her fingerprints to the Department of Justice pursuant to Education Code Section 45125.1(a).

3. Penal Code Sections 290 and 290.4 commonly known as “Megan’s Law”, require, among other things, individuals convicted of sexually oriented crimes, to register with the chief of police where the convicted individual resides or with a county sheriff or other law enforcement officials. The CONTRACTOR shall check it’s own employees and require each Subcontractor to check it’s employees and report to the CONTRACTOR if any such employees are registered sex offenders. The CONTRACTOR shall check monthly during the life of the Contract to ascertain this information and report same to OAR. Before starting the Work, and monthly thereafter during the life of Contract, CONTRACTOR shall notify the OWNER in writing if any of it’s employees and/or if any Subcontractor’s employees is a registered sex offender. If so, CONTRACTOR shall proceed in accordance with Section 3.03 M.2 above.

K. Temporary Access Roads and Staging Areas:

1. Due to the limited amount of on and off Project site space for the parking of staff and school visitor’s vehicles there will be no parking of CONTRACTOR vehicles in areas designated for school use only. CONTRACTOR shall provide legal access to and maintain CONTRACTOR designated areas for the legal parking, loading, off-loading & delivery of all vehicles associated with the Work. CONTRACTOR shall be solely responsible for providing and maintaining these requirements whether on or off the Project site.

2. Temporary access roads are to be installed and maintained by CONTRACTOR to all areas of the Project site.

3. CONTRACTOR will be permitted to utilize existing facility campus roads as designated by OAR. CONTRACTOR shall only utilize those entrances and exits as designated by OAR and CONTRACTOR shall observe all traffic regulations of OWNER.

4. CONTRACTOR shall maintain roads and walkways in a clean condition including removal of debris and/or other deleterious material on a daily basis.

3.04 PROJECT SIGNAGE

- A. Until Substantial Completion of the Work, CONTRACTOR shall remove, as required, all graffiti from buildings, equipment, fences and all other temporary and/or permanent improvements on the Project site.
- B. CONTRACTOR shall provide and install signage to provide directional, identification, and contact information to construction personnel and visitors as follows and as reviewed by OAR.
 1. For construction traffic control/flow at entrances/exits, and as designated by OAR.
 2. To direct visitors.
 3. For construction parking.
 4. To direct deliveries.
 5. For Warning Signs as required.
 6. Per CAL/OSHA standards as necessary.
 7. For trailer identification and Project site address.
 8. For "No Smoking" safe work site at designated locations.
 9. Emergency contact information and phone number of CONTRACTOR.
 10. Emergency contact information and phone number of local police, fire, and emergency personnel.

3.05 TRENCHES

- A. Open trenches for installation of utility lines (water, gas, electrical and similar utilities) and open pits outside barricaded working areas shall be barricaded at all times in a legal manner determined by CONTRACTOR. Trenches shall be backfilled and patch-paved within twenty-four (24) hours after approval of installation by authorities having jurisdiction or shall have "trench plates" installed.

Required access to buildings shall be provided and maintained. CONTRACTOR shall comply with all applicable statutes, codes & regulations regarding trenching and trenching operations. Open trenches deeper than 3'-6", and not located within a public street access, shall be enclosed within an 8'-0" high chain-link fence.

3.06 DUST CONTROL

- A. CONTRACTOR is responsible for dust control on and off the Project site. When Work operations produce dust the Project site and/or streets shall be sprinkled with water to minimize the generation of dust. CONTRACTOR shall clean all soils and debris from construction vehicles and cover both earth and debris loads prior to leaving the Project site. CONTRACTOR shall, on a daily basis, clean all streets and/or public improvements within the right of way of any and all debris, dirt, mud and/or other materials attributable to operations of CONTRACTOR.

3.07 WASH OUT

- A. CONTRACTOR shall provide and maintain a minimum of four (4) wash out boxes of sufficient size and strength to provide for concrete mixer wash out. CONTRACTOR shall locate and relocate both the wash out boxes and wash out areas in order to accommodate the progression of the Work. The wash out area shall be located as to minimize the amount of potential run off onto adjacent private and/or public property. CONTRACTOR shall legally dispose of the contents of the wash out boxes and area on an as needed basis or as required by OAR.

3.08 WASTE DISPOSAL

- A. CONTRACTOR shall provide and maintain trash bins on the Project site. Trash bins shall be serviced on an as needed basis and CONTRACTOR is responsible for the transportation of and the legal disposal of all contents.

3.09 ADVERSE WEATHER CONDITIONS

- A. Should warnings of adverse weather conditions such as heavy rain and/or high winds be forecasted, CONTRACTOR shall provide every practical precaution to prevent damage to the Work, Project site and adjacent property. CONTRACTOR precautions shall include, but not be limited to, enclosing all openings, removing and/or securing loose materials, tools, equipment and scaffolding.
- B. CONTRACTOR shall provide and maintain drainage away from buildings and structures.
- C. CONTRACTOR shall implement all required storm water mitigation measures as required under related Division 01 Sections.

3.10 DAILY REPORTS

- A. CONTRACTOR shall provide and maintain in the Project site office of CONTRACTOR, a daily sign in sheet for use by all employees of CONTRACTOR and all Subcontractors at whatever tier. At the beginning of each work day, the foreman, project manager, superintendent of CONTRACTOR and/or Subcontractors shall visit the site office of the CONTRACTOR and shall enter onto the daily sign in sheet: all employee names; trade classification; and represented company. The completed sign in sheet shall serve as the basis of and shall be submitted with the daily construction report as set forth in Section 3.10 B.

- B. By the end of each workday, CONTRACTOR shall submit to OAR and IOR a daily construction report denoting the daily manpower counts and a brief description/location of the workday activities. Manpower shall be broken down by trade classification such as foreman, journeyman or apprentice. The report shall also note the date, day of the week, weather conditions, deliveries, equipment on the Project site whether active and/or idle, visitors, inspections, accidents and unusual events, meetings, stoppages, losses, delays, shortages, strikes, orders and requests of governing agencies, Construction Directive and/or Change Orders received and implemented, services disconnected and/or connected, equipment start up or tests and partial use and/or occupancies. CONTRACTOR shall also include on the daily construction report the above information for all Subcontractors at whatever tier.

3.11 FIELD OFFICE SUPPLIES

- A. CONTRACTOR shall provide the initial supply of field office supplies to the OAR in the quantities listed as set forth below in Table A. CONTRACTOR shall provide additional supplies as required by the OAR.

- B. CONTRACTOR may utilize different suppliers as the specified information is only to establish the required quantities and levels of quality.

Table A

ITEM	DESCRIPTION	UNIT	QUANTITY	SUPPLIER/ITEM NUMBER
Three Ring Binders – 3”	N/A	Each	{ SPECIFY }	Staples / 823526-54
Three Ring Binders – 2”	N/A	Each	{ SPECIFY }	Staples / 816199-54
Three Hole Punch	N/A	Each	{ SPECIFY }	Staples / 104695-54
Two Hole Punch	N/A	Each	{ SPECIFY }	Staples / 506261-54
File Organizer	N/A	Each	{ SPECIFY }	Staples / 120162-54
Calculator	MS80TE	Each	{ SPECIFY }	Staples / 425912-54
Computer Diskettes	3-1/2 DS-HD	25/Lot	{ SPECIFY }	Staples / 384385-64
Wastebasket	N/A	Each	{ SPECIFY }	Staples / 125039-54
Digital Camera	SONY MVC-100	Each	1	Staples / 479265-64
Cordless Phone with	ATT - 2255	Each	1	Staples / 475028-54

Answering Machine				
Surge Suppressors	N/A	Each	{ SPECIFY }	Staples / 481841-64
Flashlight	N/A	Each	{ SPECIFY }	Staples / 391655-54
Batteries	N/A	4/Lot	{ SPECIFY }	Staples / 318956-54
Clipboard	N/A	3/Lot	{ SPECIFY }	Staples / 450422-54
8" Cast Iron Shears	N/A	Each	{ SPECIFY }	Staples / 421040-54
First Aid Kit	N/A	Each	1	Staples / 503979-54
Journal	N/A	Each	{ SPECIFY }	Staples / 217695-54
Pens	N/A	12/Lot	{ SPECIFY }	Staples / 441884-64
Pencils	N/A	48/Lot	{ SPECIFY }	Staples / 711382-54
Pencil Sharpener	1900	1	{ SPECIFY }	Staples / 330250-54
Mouse Pad	N/A	Each	{ SPECIFY }	Staples / 382955-64
Date Received Stamp	N/A	Each	1	Staples / 920274-54
Colored Pencils	N/A	12/Lot	{ SPECIFY }	Staples / 317297-54
Markers	N/A	12/Lot	{ SPECIFY }	Staples / 479159-54
Telephone Message Book	N/A	Each	{ SPECIFY }	Staples / 256347-54
Wall Calendar	PM233-28	Each	{ SPECIFY }	Staples / 527861-54
Steno Pad	N/A	12/Lot	{ SPECIFY }	Staples / 163485-64
Legal Pad	N/A	12/Lot	{ SPECIFY }	Staples / 163865-64
Post Its	N/A	12/Lot	{ SPECIFY }	Staples / 130005-64
File Folders – 8-1/2x11	N/A	50/Lot	{ SPECIFY }	Staples / 831099-54
File Folders – 8-1/2x14	N/A	50/Lot	{ SPECIFY }	Staples / 831057-54
Tape / Dispenser	N/A	Each	{ SPECIFY }	Staples / 211540-54
Highlighters	N/A	12/Lot	{ SPECIFY }	Staples / 479156-54
Rubber Bands	N/A	Each	{ SPECIFY }	Staples / 363150-54
Push Pins	N/A	Each	{ SPECIFY }	Staples / 480118-54
Dry Erase Board	S537	Each	{ SPECIFY }	Staples / 518928-54
Binder Clip – Medium	N/A	24/Lot	{ SPECIFY }	Staples / 831602-54
Binder Clip - Large	N/A	12/Lot	{ SPECIFY }	Staples / 831610-54
Stapler	818	Each	{ SPECIFY }	Staples / 395059-54
3 Pocket Wall File	N/A	Each	{ SPECIFY }	Staples / 730523-54
Heavy Duty Stapler	415	Each	1	Staples / 386312-54
Heavy Duty Staples	SW1-35312	Each	1	Staples / 504191-54
Hanging File Folder	8-1/2 x 11	25/Lot	{ SPECIFY }	Staples / 116806-54
Hanging File Folder	8-1/2x14	25/Lot	{ SPECIFY }	Staples / 163352-54
File Folder Labels	5266	750/Lot	{ SPECIFY }	Staples / 287292-54
Fax Notes	N/A	12/Lot	{ SPECIFY }	Staples / 210625-64
Paper Clips	N/A	Each	{ SPECIFY }	Staples / 480108-54
Paper Clips	N/A	Each	{ SPECIFY }	Staples / 480109-54
Poster Kit - State	CA	Each	1	Staples / 378965-54
Poster Kit - Federal	US	Each	1	Staples / 935983-54
Broom	N/A	Each	1	Staples / 428881-54
Fire Extinguisher	First Alert	Each	{ SPECIFY }	Staples / 238774-54
Copy Paper	8-1/2 x 11	5000/Case	{ SPECIFY }	Staples / 122374-69
Copy Paper	8-1/2 x 14	500/Ream	{ SPECIFY }	Staples / 122598-69
Copy Paper	11 x 17	500/Ream	{ SPECIFY }	Staples / 238105-69

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements governing selection of products for incorporation into the Work.

1.2 RELATED SECTIONS

- A. Section 01100: Coordination
- B. Section 01300: Submittals
- C. Section 01360: Construction Schedule
- D. Section 01420: Testing and Inspection
- E. Section 01640: Substitutions
- F. Section 01740: Warranties

1.3 DEFINITIONS

- A. Definitions used in this Section are not intended to change the meaning of other terms used in the Contract Documents, such as “specialties,” “systems,” “structure,” “finishes,” “accessories,” and other similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. “Products” are items purchased for incorporation into the Work, whether purchased for the Work or taken from previously purchased stock. The term “product” includes the terms “material” and “equipment” and terms of similar intent.
 - a. “Named Products,” are items identified by the manufacturer’s product name, including make, model number or other designation, shown or listed in the manufacturer’s published product literature, current as of the date of the Contract.
 - b. “Foreign Products,” as distinguished from “domestic products,” are items substantially manufactured (50 percent or more of value) outside the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.

2. “Materials,” are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. “Equipment,” is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

- A. Material list: Prepare a list in tabular form acceptable to ARCHITECT and/or OAR showing proposed products. Include generic names. Include the manufacturer’s name and proprietary names for each item listed.
1. Coordinate material list with the Construction Schedule and the submittal schedule.
 2. Form: Prepare material list with information on each item tabulated under the following column headings.
 - a. Related Specification Section number
 - b. Generic name used in Contract Documents
 - c. Proprietary name, model number, and similar designations
 - d. Manufacturer’s name and address
 - e. Supplier’s name and address
 - f. Installer’s name and address
 - g. Projected delivery date or time span of delivery period
 3. Initial Submittal: Within ten (10) days after execution of each subcontract agreement, as set forth in General Condition Article 6.25, submit three (3) copies of an initial material list to the ARCHITECT with a copy to the OAR. Provide a written explanation for omissions of data and for known variations from the Contract Documents.
 4. ARCHITECT Action: ARCHITECT will respond in writing to OAR within fourteen (14) days and OAR will forward response to CONTRACTOR within sixteen (16) days of receipt of the completed material list. No response outside this period constitutes no objection to listed items but does not constitute a waiver of the requirement that selected items comply with the Contract Documents. ARCHITECT response will include a list of unacceptable item selections, containing a brief explanation of reasons for this action.

1.5 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. CONTRACTOR is to verify necessary lead times for all materials; however, when specified products are available only from sources that do not, or cannot, produce a quality adequate to complete Work in a timely manner, consult with the ARCHITECT to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing these qualities, to the fullest extent possible.
- B. Compatibility of Options: When the CONTRACTOR is given the option of selecting between two or more products for use in the Work, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion into the Work:
 1. No available domestic product complies with the Contract Documents.
 2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.
- D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed in view in occupied spaces or on the exterior.
 1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer
 - b. Model and serial number
 - c. Capacity
 - d. Speed
 - e. Ratings

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
1. Schedule delivery to minimize long-term storage at the Project site and to prevent overcrowding of Work spaces.
 2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to the Project site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 5. Store products at the Project site in a manner that will facilitate inspection and measurement of quantity or counting of units.
 6. Store heavy materials away from structures in a manner that will not endanger the structure's supporting construction.
 7. Store products subject to damage by the elements above ground, under cover in a weather-tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MATERIAL SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other Projects.

- B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:
1. Proprietary Specification Requirements: Where Specifications name only a single material or manufacturer, provide the product indicated. No substitutions will be permitted.
 2. Semi-proprietary Specification Requirements: Where Specifications name two or more products or manufacturers, provide one of the products indicated. No substitutions will be permitted.
 - a. Where Specifications specify products or manufacturers by name, accompanied by the term “or equal” comply with General Condition Article 6.14 to obtain approval for use of an unnamed product.
 3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, list exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with the Contract Documents.
 4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.
 - a. Manufacturer’s recommendations may be contained in published material literature or by the manufacturer’s certification of performance.
 5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes, or regulations specified.
 6. Visual Matching: Where Specifications require matching an established Sample, decision of the ARCHITECT will be final on whether a proposed product matches satisfactorily.
 7. Visual Selection: Where specified product requirements include the phrase “... as selected from manufacturer’s standard or premium colors, patterns, textures...” or a similar phrase, select a product and manufacturer that complies with other specified requirements. The ARCHITECT will select the color, pattern, and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located, and aligned with other Work.
 - 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

END OF SECTION

SECTION 01640

SUBSTITUTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements for handling requests for substitutions submitted eleven (11) days or more after the date established in the Notice to Proceed.

1.2 RELATED SECTIONS

- A. Section 01300: Submittals
- B. Section 01600: Materials and Equipment
- C. Section 01700: Close Out

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.1 APPLICATION

- A. CONTRACTOR proposed changes in products or materials required by the Contract Documents eleven (11) days or more after the date established in the Notice to Proceed, are considered to be requests for substitutions. OAR will consider requests for substitution if a product is no longer manufactured and/or cannot be acquired from existing inventories. The following are not considered to be valid requests for substitutions:
 - 1. Revisions to the Contract Documents requested by OAR or ARCHITECT.
 - 2. Specified options of products included in the Contract Documents.
 - 3. Substitutions requested on a “or equal” basis.

3.2 SUBMITTALS

- A. Transmit submittals as described in related Sections for each request for substitution.
 - 1. Identify the product to be replaced in each request. Include related Specification Section and Drawing number.

2. Provide complete documentation denoting compliance with the requirements for substitutions, and the following information, as appropriate.
 - a. A detailed comparison of significant qualities of the proposed substitution with those specified in the Contract Documents. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
 - b. Product Data, including Drawings, descriptions of products, fabrication, and installation procedures.
 - c. Samples, where applicable or requested.
 - d. CONTRACTOR certification the proposed substitution conforms to requirements of the Contract Documents in every respect and is appropriate for the applications indicated.
 - e. CONTRACTOR waiver of rights to an increase in the Contract Amount, Milestones and/or Contract Time that may subsequently become necessary because of the failure of the substitution to adequately perform.
3. If required, ARCHITECT will request additional information or documentation for evaluation. OAR will notify CONTRACTOR of acceptance or rejection of the substitution.
4. ARCHITECT will review and consider request for substitution and provide a recommendation to OAR
5. Where a proposed substitution involves and/or effects more than one Subcontractor, CONTRACTOR shall ensure each Subcontractor cooperates with the other Subcontractor involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of all products.
6. CONTRACTOR submittal and ARCHITECT review of Shop Drawings, Product Data, material lists or Samples do not constitute an acceptable or valid request for substitution.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements for Contract Closeout, including but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project record documents submittal.
 - 3. Operation and maintenance manual submittal.
 - 4. OWNER orientation and instruction.
 - 5. Final cleaning.
- B. Closeout requirements for specific Work activities are included in the appropriate Sections in Divisions 01 through 16.

1.02 RELATED SECTIONS

- A. Section 01080: Application for Payment
- B. Section 01300: Submittals
- C. Section 01360: Construction Schedule
- D. Section 01450: Test and Balance
- E. Section 01500: Construction Facilities and Temporary Controls
- F. Section 01740: Warranties

PART 2 – PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 SUBSTANTIAL COMPLETION

- A. Inspection Procedures: On receipt of a request for a certificate of Substantial Completion, OAR will either authorize commencement of inspection or advise CONTRACTOR of unfilled requirements. IOR, OAR, CONTRACTOR and ARCHITECT will inspect the Work and IOR shall prepare a comprehensive punch list of items to be completed.
 - 1. IOR will repeat inspection when requested and assure the Work is complete.

2. Results of the completed inspection will form a partial basis of the requirements for Final Completion.
- B. Re-inspection Procedures: IOR, OAR, CONTRACTOR and ARCHITECT will inspect the Work upon notice the Work, including final inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to OAR.
1. Upon completion of inspection, OAR will recommend Final Completion. If the Work is incomplete, OAR will advise CONTRACTOR of Work that is incomplete or of obligations that have not been fulfilled but are required for Final Completion.
 2. If necessary, re-inspection will be repeated, but may be assessed against CONTRACTOR if OWNER is subject to additional professional service and or additional costs of inspection.

3.02 PROJECT RECORD DOCUMENT SUBMITTAL

- A. General: Do not use project record documents for construction purposes. Protect record documents from deterioration and loss. Provide access to record documents for ARCHITECT, IOR and OAR reference during normal working hours. Project record document shall be updated on a weekly basis. Prior to submitting each application for payment, secure IOR and ARCHITECT approval of project record documents.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white prints of Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which Drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Drawings. Provide detailed and accurate field dimensions for concealed elements that would be difficult to measure and record at a later date.
1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Date and number entries in the same format as submitted. Call attention to entry by a “cloud” around the affected areas.
 2. Mark new information important to OWNER but was not shown on Drawings or Shop Drawings.
 3. Utility location and depth below finished grade and/or above ceilings and attic spaces shall be fully dimensioned and indicated on record drawings.

Dimensions shall be measured from building lines or permanent landmarks and shall be triangulated to those features.

4. Note related Change Order or Construction Directive numbers where applicable. RFC submissions shall be referenced on each affected sheet, Drawing and/or Shop Drawing.
 5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
 6. Prior to Final Completion of the Work, and review of the project record drawings by ARCHITECT, prepare a final set of project record drawings using reproducible Mylar or vellum. Submit final set of transparencies to ARCHITECT.
- C. Record Specifications: Maintain two complete copies of the Specifications, including Addenda. Include with the Specifications two copies of other written Contract Documents, such as Change Orders and/or Construction Directives issued during construction.
1. Mark these record documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
 2. Give particular attention to substitutions and selection of options and information on concealed Work that cannot otherwise be readily discerned later by direct observation.
 3. Note related record document information with Product Data.
 4. Prior to Final Completion of the Work, submit record Specifications to ARCHITECT for OWNER records.
- D. Record Product Data: Maintain two copies of each Product Data submittal. Note related Change Orders and Construction Directives and mark-up of record drawings and Specifications.
1. Mark these documents to illustrate significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Project site and from the manufacturer's installation instructions and recommendations.
 2. Provide detailed and accurate information regarding concealed products and portions of Work that cannot otherwise be readily discerned later by direct observation.

3. Prior to Final Completion of the Work, submit complete set of record Product Data to the ARCHITECT for OWNER records.
- E. Record Samples: Immediately prior to Substantial Completion, CONTRACTOR shall meet with ARCHITECT and OAR at the Project site to determine which Samples are to be transmitted to OWNER for record purposes. Comply with OAR instructions regarding delivery to OWNER storage area.
- F. Miscellaneous Records: Refer to other Specification sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date of Final Completion, complete and compile miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to ARCHITECT for OWNER records.
- G. Maintenance Manuals: Prior to Substantial Completion, organize operation and maintenance data into suitable two sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-3", 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit to OAR for ARCHITECT and for OWNER records. Include the following types of information.
 1. Emergency instructions
 2. Spare parts list
 3. Copies of warranties
 4. Wiring diagrams
 5. Recommended "turn-around" cycles
 6. Inspection procedures
 7. Shop Drawings and Product Data
 8. Fixture lamping schedule
- H. Verified Reports: Construction progress of the Work shall be reported to DSA via a duly verified report as per Sections 4-336 and 4-343 of the California Building Standards Administrative Code.

3.03 CLOSEOUT PROCEDURES:

- A. Operation and Maintenance Instructions: Prior to Substantial Completion, arrange for each installer of equipment that requires regular operation and maintenance to meet with designated OWNER personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
 1. Maintenance manuals

2. Record documents
3. Spare parts and materials
4. Tools
5. Lubricants
6. Fuels
7. Identification systems
8. Control sequences
9. Hazards
10. Cleaning
11. Warranties and bonds
12. Maintenance agreements and similar continuing commitments

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up
2. Shutdown
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments
7. Effective energy utilization

3.04 FINAL CLEANING

A. General: Related sections of the Contract Documents specify general cleaning during performance of the Work. General cleaning is included in Division 01 Section "Construction Facilities and Temporary Controls".

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for a certificate of Substantial Completion.
 - a. Remove labels that are not permanent labels.
 - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - c. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films, and similar foreign

substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

- d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
- e. Clean the Project site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

END OF SECTION

SECTION 01740

WARRANTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers and/or installer's standard warranties on products and special product warranties.
 - 1. Refer to the General Conditions for terms of the guarantee period for the Work.

1.2 RELATED SECTIONS

- A. Section 01120: Cutting and Patching
- B. Section 01600: Materials and Equipment
- C. Section 01700: Contract Closeout

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.1 WARRANTY REQUIREMENTS

- A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties shall not relieve CONTRACTOR of the warranty of the Work incorporating such materials, products, and/or equipment. Manufacturer's disclaimers and limitations on warranties do not relieve suppliers, manufacturers, installers, and Subcontractors of the requirement to countersign special warranties with CONTRACTOR.
- B. Standard warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to OWNER.
- C. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for OWNER.
- D. Related Damages and Losses: When correcting failed or defective warranted Work, remove and replace Work that has been damaged as a result of such failure

or which must be removed and replaced to provide access for correction of warranted Work.

- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement with the reinstated warranty equal to the original warranty.
- F. Replacement Cost: Upon determination the Work covered by a warranty has failed and/or is defective, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether OWNER has benefited from use of the Work through a portion of its anticipated useful service life.
- G. OWNER Recourse: Expressed warranties made to OWNER are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which OWNER can enforce such other duties, obligations, rights, or remedies.
- H. Rejection of Warranties: OAR reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- I. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, OAR reserves the right to refuse to accept the Work until CONTRACTOR presents evidence the entities required to countersign such commitments have done so.

3.2 SUBMITTALS

- A. Submit written warranties to ARCHITECT prior to Final Completion of the Work. If the certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, submit written warranties as set forth in the certificate of Substantial Completion.
 - 1. When a designated portion of the Work is partially used and/or occupied by OWNER, submit properly executed warranties to ARCHITECT within fifteen (15) days of the Partial Use or Occupancy of the designated portion of the Work.
- B. When the Contract Documents require CONTRACTOR, or CONTRACTOR and a Subcontractor, installer, supplier or manufacturer to execute a special warranty, prepare a written document containing appropriate terms and identification, ready for execution by the required parties. Submit a draft to OAR, through the ARCHITECT, for approval prior to final execution.

1. Refer to Divisions 02 through 16 for specific content requirements and particular requirements for submitting special warranties.
- C. Form of Submittal: Prior to Final Completion of the Work, compile two copies of each required warranty properly executed by CONTRACTOR, or by CONTRACTOR and Subcontractor, installer, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Specifications.
- D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ by 11” (115 by 280 mm) paper.
1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the item or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.
 2. Identify each binder on the front and spine with the typed or printed title “WARRANTIES,” Project title and/or name, and name of CONTRACTOR.
 3. When warranted Work requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

END OF SECTION

SECTION 02221

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes: Furnishing labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, or required for completion of the Work. Includes items such as the following:
 - 1. Protection of existing improvements to remain.
 - 2. Cleaning existing improvements to remain.
 - 3. Disconnecting and capping utilities.
 - 4. Removing debris, waste materials, and equipment.
 - 5. Removal of items for performance of the Work.
 - 6. Salvageable items to be retained by the Owner.
- C. Related Sections:
 - 1. Section 01010: Summary of the Work.
 - 2. Section 01120: Cutting and Patching

1.02 SUBMITTALS

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

1.03 QUALITY ASSURANCE

- A. Perform the Work of this section by workers skilled in the demolition of buildings and structures. Perform the Work of this section under direct superintendence at all times.
- B. Prior to commencement of Work, schedule a walkthrough with the OAR, to confirm Owner property items have been removed from scheduled Work areas. Identify and mark remaining property items and schedule their removal.

- C. Coordinate demolition for the correct sequence, limits, and methods. Schedule demolition Work to create least possible inconvenience to the public and facility operations.
- D. Related Standard: American National Standard A10.6-1983

1.04 PROJECT CONDITIONS

- A. Drawings may not indicate in detail all demolition Work to be performed. Examine existing conditions to determine the full extent of required demolition.
- B. Repair damage to existing improvements or damage due to excessive demolition.
- C. Provide all measures to avoid excessive damage from inadequate or improper means and methods, improper shoring, bracing or support.
- D. If conditions are encountered that varies from those indicated, promptly notify the Architect for clarification before proceeding.

PART 2 - PRODUCTS

2.01 HANDLING OF MATERIALS

- A. Items scheduled for salvage by the Owner shall be delivered to a location designated by the OAR. Items shall be cleaned, packaged and labeled for storage.
- B. Items scheduled for reuse shall be stored on the Project site and protected from damage, theft and other deleterious conditions.

PART 3 - EXECUTION

3.01 GENERAL

- A. Protection:
 - 1. Do not commence demolition until safety partitions, barricades, warning signs and other forms of protection are installed. Refer to Section 01500: Construction Facilities and Temporary Controls.
 - 2. Provide all safeguards, including warning signs, lights and barricades, for protection of workers, occupants, and the public.
- B. If, at any time, safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the Architect and OAR.

3.02 DEMOLITION

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

- B. Remove existing construction only to extent necessary for proper installation of Work and interfacing with existing construction. Cut back finished surfaces to straight, plumb or level lines as required for a smooth transition.
- C. Where openings are cut oversize or in improper locations, replace or repair to required condition.

3.03 CUTTING EXISTING CONCRETE

- A. Cutting of existing concrete shall be performed by skilled workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Do not damage concrete intended to remain.
- B. Extent of cutting of structural concrete shall be as indicated on Drawings. Cutting of non-structural concrete shall be as indicated on Drawings or as reviewed by the Architect or structural engineer. Replace concrete demolished in excess of amounts indicated.
- C. Prior to cutting or coring concrete, determine locations of hidden utilities or other existing improvements and provide necessary measures to protect them from damage.

3.04 REMOVAL OF OTHER MATERIALS

- A. Masonry: Cut back to joint lines and remove mortar without damaging units to remain. Allow space for repairs to backing where applicable.
- B. Woodwork: Cut or remove to a joint or panel line.
- C. Remove existing improvements not specifically indicated or required but necessary to perform Work. Cut to clean lines, allowing for installation of Work.

3.06 PATCHING

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

3.07 CLEANING

- A. Clean existing materials to remain with appropriate tools and equipment.
- B. Protect existing improvements during cleaning operations.
- C. Debris shall be dampened by fog water spray prior to transporting by truck.
- D. Debris pick-up area shall be kept broom-clean and shall be washed daily with clean water.

- E. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Owner, or store and protect for reuse where required. Continuously clean up and remove items as demolition Work progresses.
- F. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes: Metal fabrications as indicated or required, including items such as the following:
 - 1. Steel pipe.
 - 2. Square and rectangular steel tubing.
 - 3. Gratings, frames and covers.
 - 4. Miscellaneous fabrications, as indicated on the Drawings.
- C. Related Sections:
 - 1. Section 01420: Testing and Inspection.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating provided materials, dimensions, anchoring detail, and details of termination or connection to adjacent construction. Indicate items that are purchased from a manufacturer and items that are shop fabricated. Indicate component parts requiring Project site fabrication or assembly.
- B. Product Data: Submit Product Data for manufactured items. Submit Product Data for primers and finishes.
- C. Material Samples: Submit Samples of primers and finishes on fabricated items.
- D. Installation Instructions: Submit installation instructions for manufactured items.

1.03 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
 - 1. Design, fabricate, and install miscellaneous metals in accordance with AISC - Design, Fabrication, and Erection of Structural Steel for Buildings.
 - 2. AWS D-1.1 Code - Welding in Building Construction.
 - 3. Inspection of Welding: Refer to Section 01420: Testing and Inspection.

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4. Welding: Refer to Section 01420: Testing and Inspection.

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

1.04 DELIVERY, STORAGE AND HANDLING

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

B. Protect from corrosion or damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Pipe:

1. Steel pipe for pipe columns, and other structural purposes shall conform to ASTM A 53, Type E or S, Grade B, as required.

2. Steel pipe other than pipe furnished for structural purposes shall conform to ASTM A 53.

B. Square and Rectangular Steel Tubing:

1. Steel tubing for structural purposes shall be carbon steel conforming to ASTM A 500..

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

C. Cast Steel: ASTM A 27, Grade 65-35.

D. Steel Bolts: ASTM A 307, Grade A, with bolt head and nut dimensions conforming to ANSI B 18.2.1.

E. Rolled Steel Plates and Shapes:

1. Shapes and plates shall conform to ASTM A 36, except for plates to be bent or cold-formed.

2. Plates to be bent or cold-formed shall conform to ASTM A 283, Grade C.

F. Grout: Non-shrinking type; Por-Rok, or equal.

2.02 FABRICATION

A. General:

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1. For fabrication of Work exposed to view, provide only materials smooth and free of blemishes. Remove blemishes by grinding or by welding and grinding, before cleaning, treating, and installation of surface finishes including zinc coatings.
2. Form exposed Work true to line and level with accurate angles, surfaces, and straight sharp edges.
3. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated or specified.
4. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise damaging Work.
5. Form exposed connections with hairline joints, flush and smooth. Provide concealed fasteners wherever possible.
6. Remove loose rust, mill scale, cutting, and punching burrs.
7. Fabricate items in as large sections as practical to minimize assembly at the Project site.

B. Welding:

1. Weld connections unless otherwise indicated.
2. Weld corners and seams continuously and in accordance with requirements of AWS Code.
3. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

C. Galvanizing:

1. ASTM A 123, ASTM A 153, or ASTM A 386, as applicable, hot dip with 2.0 ounces per square foot on actual surface and 1.8 ounces per square foot minimum on any specimen, and as specified herein.
2. Galvanizing Repair Material: All States Galvanizing Powder, Drygalv by American Solder and Flux, or equal. Hot applied repair material, or anodic zinc-rich galvanizing repair paint conforming to Mil Spec DOD-P-21035.
3. Items to be galvanized shall be hot-dip galvanized in sections as large as possible.

D. Shop Finish:

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

2. Primer: Lead-free red metal primer complying with Fed Spec TT-P-86G, Type I, II, or III; zinc molybdate complying with Fed Spec TT-P-645A. Minimum dry film thickness of primer shall be 2.0 mils.
3. Preparation for Primer Painting: Miscellaneous ferrous metal, except items specified galvanized, shall be thoroughly cleaned and prepared for painting, including removal of shipping oils or protective coatings, mill scale, grease, dirt and rust. Prepare in accordance with SSPC recommendations. Deliver to Project site primed or galvanized as indicated, and ready to receive Project site applied finishes.
4. Galvanized Metal Work to receive Paint: Clean oil, grease and other foreign materials from surfaces. Apply vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Gratings, Frames and Covers:

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

3.02 ADJUSTING

A. Touch Up Damaged Surfaces:

1. Shop Painted Finishes: Comply with SSPC-PA-1 for touch-up; apply with brush to produce a minimum 2.0 mil dry film thickness.
2. Galvanized Surfaces: Clean field welds, connections and damaged areas. Repair galvanized finishes in accord with ASTM A 780.

3.03 CLEAN UP

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

3.04 PROTECTION

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

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END OF SECTION

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SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Rough carpentry Work.
- C. Related Sections:
 - 1. Section 01420: Testing and Inspection.
 - 2. Section 06200: Finish Carpentry.
 - 3. Section 09250: Gypsum Board.

1.02 SYSTEM DESCRIPTION

- A. Regulatory Requirements:
 - 1. Work of this Section shall comply with CBC Chapter 23A.

1.03 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
 - 1. Redwood structural and framing lumber shall be graded in accordance with Standard Specifications for Grades of California Redwood Lumber of the Redwood Inspection Service.
 - 2. Douglas fir, larch or hemlock structural and framing lumber shall be graded in accordance with the Standard Grading Rules of the West Coast Lumber Inspection Bureau (WCLIB) or the Western Lumber Grading Rules of the Western Wood Products Association (WWPA).
 - 3. Plywood shall conform to requirements of Product Standard PS 1-95, and shall be grade marked by a recognized grading agency (APA and PTL).
- B. Lumber shall bear official grade mark of the association under whose rules it was graded or official grade mark of another recognized grading agency.
- C. Structural and framing members 2 inches in thickness shall be air-dried to moisture content not to exceed 19 percent before installation.

- D. Each piece of preservative treated lumber shall be identified by the Quality Mark of an approved inspection agency in accordance with CBC Chapter 23A; refer to Section 01420: Testing and Inspection.

1.04 STORAGE, HANDLING AND PROTECTION

- A. The materials supplied as part of the Work of this section shall be protected from exposure to inclement weather before being covered by other Work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Lumber: Structural and framing lumber shall be of following species and grades:

	<u>INSTALLATION</u>	<u>SPECIES</u>	<u>GRADE</u>
1.	Framing lumber (2" to 4" thick, 5" and wider).	Douglas fir and Larch	No. 1 Structural Joists and Planks, WCLIB; WWPA.
2.	Sills or plates installed on concrete surfaces 6" or less above earth or finish grade.	Douglas fir and Larch treated	Construction Light Framing WCLIB; WWPA

- B. Plywood: Plywood furnished for structural purposes, when exposed outdoors, shall be exterior type plywood. Other plywood furnished for structural purposes shall be exterior type, or Exposure 1.

- C. OSB Board or Panels:

- 1. Oriented strand board or panels shall not be furnished as part of the Work of this section.

- D. Preservative Treated Wood:

- 1. Wood and plywood specified; as treated wood shall be pressure treated wood in accordance with CBC requirements.
- 2. Seasoning: Treated lumber shall be air seasoned after treatment, for a minimum of 2 weeks before installation. Moisture content shall be 15 percent maximum.
- 3. Creosote or arsenic is not permitted for treating wood.
- 4. When treated wood member have been notched, dapped, drilled, or cut, such newly cut surfaces shall be painted with a heavy coat of the same preservative material originally provided for treatment of wood member.

- E. Gypsum Sheathing: USG, or equal, gypsum sheathing, fire-resistant, 5/8 inch thick with asphaltic gypsum core and specially formulated black water repellent paper on both faces and both long edges. Furnish screws conforming to ASTM C 646, Type S, corrosion resistant treated, minimum one inch long.

- F. Adhesive: Tec, Inc. Sturdi-Bond TA-175, or Top Industrial Inc., Rainbuster 345, elastomeric adhesive conforming to ASTM D 3498 and APA-AFG-01.

PART 3 - EXECUTION

3.01 FASTENINGS

A. Nails and Spikes:

1. Furnish only common wire nails or spikes whenever indicated, specified or required. Provide hot-dipped zinc coated galvanized fasteners for pressure-preservative treated wood per CBC 2304.3.
2. Whenever necessary to prevent splitting, holes shall be pre-drilled for nails and spikes.
3. Nails in plywood shall not be overdriven.
4. Machine Applied Nailing: Use of machine nailing is subject to a satisfactory Project site demonstration for each Project and approval by the Architect or structural engineer retained by the Architect as an Architect Consultant and DSA. Installation is subject to continued satisfactory performance. Machine nailing is not permitted for 5/16 inch plywood. Do not permit nail heads to penetrate outer ply. Maintain minimum allowable edge distances when installing nails.

B. Lag Screws:

1. When installing lag screws in a wood member, pre-drill hole as required by the CBC.
2. Lag screws, which bear on wood, shall be fitted with standard steel plate washers under head. Lag screws shall be screwed and not driven into place.

C. Bolts:

1. Lumber and timber to be fastened together with bolts shall be clamped together with holes for bolts bored true to line.
2. Bolts shall be fitted with steel plates or standard cut washers under heads and nuts. Bolts shall be tightened when installed and again before completion of the Work of this section.

D. Wood Screws: When installing wood screws, pre-drill holes as required by the CBC.

E. Framing Anchors: Framing anchors, joist hangers, ties, and other mechanical fastenings shall be galvanized or furnished with a rust inhibitive coating. Nails and fastenings shall be of the type recommended by manufacturer.

F. Powder Driven Fasteners:

1. The allowable loads shall be 100 pounds or 80% of ICBO approved values whichever is less. Qualification for use of all power-actuated tools must meet ANSI A10.3 standard as required by the manufacturer and all OSHA requirements.
2. The operator, tool, and fastener shall perform the following as observed by the IOR.
 - a. Obtain pre-qualification by the IOR.
 - b. Observe installation of first 10 fasteners.
 - b. Test the first 10 fasteners by performing a pullout test. Load shall be at least twice the design load. The test load shall be applied to the pin in such a manner as not to resist the spalling tendency of the concrete surrounding the pin.
 - c. Random testing under project inspector's supervision shall be made of approximately 1 in 10 pins.
3. Failure of any test will result in testing of all installed pins of the same category not previously tested until 20 consecutive pass then resume the initial testing frequency.
4. Nail heads shall not break the outer skin of sheathing.
5. Non-compliant pins shall be replaced.
6. Shot pins may not be used in concrete curbs.

3.02 INSTALLATION

A. Stud Walls, Partitions and Furring:

1. Wood stud walls, partitions and vertical furring shall be constructed of members of size and spacing indicated. Provide single plate at bottom and double plate at top unless otherwise indicated. Interior, nonbearing non-shear partitions may be framed with a single top plate, installed to provide overlapping at corners and at intersections with other wall and partitions or by metal ties as detailed.
2. Walls and partitions shall be provided with horizontal staggered blocking at least 2 inch nominal thickness and same width as studs, fitted snugly, and nailed into studs. Blocking shall be installed at mid-height of partition or not more than 7 feet on center vertically. Install wood backing on top of top plate wherever necessary for nailing of lath or gypsum board.
3. Walls, partitions and furred spaces shall be provided with 2 inch nominal thickness wood firestops, same width as space to be firestopped, at ceiling line, mid-height of partition and at floor line. Firestops at floor line are not required when floor is concrete. If width of opening is such that more than one piece of lumber is necessary, provide 2 thicknesses of one inch nominal material installed with staggered joints.

4. Firestops shall be installed in stud walls and partitions, including furred spaces, so the maximum dimension of any concealed space is not over 10 feet.
5. Corners, and where wood stud walls and wood vertical furring meet, shall be constructed of triple studs. Openings in stud walls and partitions shall be provided with headers as indicated and a minimum of 2 studs at jambs, one stud of which may be cut to support header in bearing.
6. Where wood masonry or concrete walls intersect, end stud shall be fastened at top, bottom and mid-height with one 1/2 inch diameter bolt through stud and embedded in masonry or concrete a minimum of 4 inches. Bolts shall be provided with washers under nuts.
7. Sills under bearing, exterior or shear walls shall be bolted to concrete with 5/8 inch diameter x 12 inch long bolts spaced not more than 4 feet on center. There shall be a bolt within 9 inches of each end of each piece of sill plate. Sills shall be installed and leveled with shims, washers, with nuts tightened to level bearing. Space between sill and concrete shall be dry packed with cement grout.

B. Roof and Ceiling Framing:

1. Wood joists shall be of the size and spacing indicated, installed with crown edge up, and shall have at least 4 inch bearing at supports. Provide 2 inch solid blocking, cut in between joists, same depth as joists, at ends and bearings, unless otherwise indicated.
2. Floor joists of more than 4 inches in depth and roof joists of more than 8 inches in depth shall be provided with bridging. Floor joists shall be bridged every 8 feet with solid blocking or metal cross bridging. Roof joists shall be bridged every 10 feet.
3. Joists under and parallel to bearing partitions shall be doubled and nailed or bolted together as detailed. Whenever a partition containing piping runs parallel to floor joists, joists underneath shall be doubled and spaced to permit passage of pipes and blocked with solid blocking spaced at not more than 4 feet intervals.
4. Trimmer and header joists shall be doubled, when span of header exceeds 4 feet. Ends of header joists more than 6 feet long shall be supported by framing anchors or joist hangers unless bearing on a beam, partition, or wall. Tail joists over 12 feet long shall be supported at header by framing anchors or on ledger strips at least 2 x 4.
5. Provide solid blocking between rafters and ceiling joists over partitions and at end supports where indicated.

C. Beams and Joists:

1. Ends of wood beams and joists which are 2 feet or less above finished outside grade and which abut, but do not enter concrete or masonry walls, as well as wood blocking used in connection with ends of those members shall be treated with wood preservative.

2. Where wood beams and joists enter masonry or concrete walls 2 feet or less above outside wall, metal wall boxes or equivalent moisture barriers shall be provided between wood and masonry or concrete.

D. Wall Sheathing:

1. Plywood sheathing for walls shall be Structural I, Grade C-D Exterior Type, thickness as indicated. Install with the long dimension parallel or perpendicular to the supports. Blocking shall be provided behind edges not located over supports. Sheathed wall construction, nailing, and top and bottom anchorage shall be as indicated.

E. Furring:

1. Rafters or ceiling joists indicated to be furred for support of materials other than acoustical tile shall be furred with 2x4 wood members installed at right angles to supports, spaced as indicated and nailed in place. Furring shall be aligned, and bottoms shall be leveled by installing wood shims as required, and nailed as indicated.

F. Grounds:

1. Provide and set wood grounds at points where wood trim occurs and work is to be plastered. Grounds at 3/4 inch metal lath shall be 5/8 inch thick, net, 1-1/2 inches wide Douglas fir, S1S. Grounds shall be doubled where trim member exceeds 5 inches width, or wherever indicated. Grounds shall be applied after lath has been installed set plumb, level and true to line.
2. Apply grounds over wood framed surfaces and lath and securely nail to wood backing at each stud or bearing
3. Grounds applied to concrete surfaces shall be securely nailed to woodblocks provided and built into concrete.

G. Nailing Strips and Plates:

1. Provide wood nailing strips, plates and blocking indicated or required. Nailing strips in connection with metal work shall be bolted to metal. Wood nailing blocks for securing grounds shall be built into concrete, or masonry.
2. Nailing schedule shall comply with CBC requirements.
3. Treated wood nailing strips for base of curbs and wherever else indicated, shall be provided and installed. Strips shall be treated Douglas fir, 4 inches (nominal) width by thickness of insulated concrete.

H. Wood Backing: Provide wood backing as indicated and as required to receive plumbing, electrical fixtures and equipment, cabinets, door stop plates and other fixed equipment.

I. Wood Bucks: Furnish and set wood bucks to form openings for doors and other openings in concrete or masonry walls and in steel stud or channel partitions and furring. Bucks shall be Douglas fir, S1S2E, 2 inches (nominal) thickness and of width

indicated or required. Bucks in connection with concrete shall be bolted thereto, and bucks in masonry walls shall be attached by means of strap anchors embedded in masonry joints. Bucks in connection with steel studs and metal channels shall be secured with nails or screws spaced not to exceed 24 inches on centers.

3.03 CLEAN UP

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

3.04 PROTECTION

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

END OF SECTION

SECTION 06200
FINISH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Finish carpentry.
- C. Related Sections:
 - 1. Section 06100: Rough Carpentry.
 - 2. Section 06400: Architectural Woodwork.
 - 3. Section 08710: Door Hardware.
 - 4. Section 09250: Gypsum Board.

1.02 SUBMITTALS

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

1.03 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
 - 1. Douglas fir finish lumber shall be manufactured and graded in accordance with WCLIB - Standard Grading and Dressing Rule No. 17.
 - 2. Redwood finish lumber shall be manufactured and graded in accordance with RIS - Standard Specifications for Grades of California Redwood Lumber.
 - 3. Hardwood finish lumber shall be manufactured and graded in accordance with NHLA - Rules for the Measurement and Inspection of Hardwood and Cypress Lumber.
 - 4. Softwood Plywood: Plywood shall comply with APA - Product Standard PS 1-95. Plywood shall be grade marked by APA.
- B. Finish lumber shall be kiln-dried according to recognized methods for the thickness and species. Lumber one inch thick or less shall be dried to an average moisture content of

not more than 15 percent. Lumber 1-1/4 inches to 2 inches in thickness shall be dried to an average moisture content of not more than 19 percent.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the Project site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.
- B. Interior millwork and finish carpentry shall not be installed unless interior building temperature and humidity levels are within the ranges recommended by the manufacturer and/or recognized standards.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Douglas Fir: Interior trim, solid lumber shelves, partitions, door frames and other concealed members of interior finish; WIC Economy Grade.
- B. Hardwood: Birch, maple firsts and seconds.
 - 1. Birch: WIC Custom Grade.
 - 2. Maple: WIC Custom Grade.
- C. Softwood Plywood: Except where otherwise specified, WIC Custom Grade, Douglas fir unless otherwise indicated.
- D. Hardwood Plywood: WIC Premium Grade, species as indicated.
- E. Redwood: Exterior millwork, except framing lumber, shall be clear heartwood redwood. Where installed in direct contact with earth or provided for exterior storage units, install Foundation Grade.

2.02 FABRICATION

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

PART 3 - EXECUTION

3.01 GENERAL

- A. Interior and exterior wood, millwork, blocking, and lumber shall be installed level, plumb, and true to line. Members shall be neatly and accurately scribed in place, maintaining full widths of end members, wherever possible. Trim shall be installed in

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full lengths, without piecing, except where use of single lengths is not required. Butt joints, if necessary, shall be beveled. Exterior angles shall be mitered, and interior angles of molding parts coped. Nails shall be set for putty. Grain and color of adjoining interior finish shall match adjacent finishes. Where Work specified in this section adjoins other Work, provide a neat tight joint.

- B. Interior and exterior finish carpentry and other fixed wooden equipment having hammer marks or other visible damage will be deemed defective Work.
- C. Staff or brick moulds of exterior wood doorframes shall be attached to frames after frames have been set and caulked. Moulds shall be mitered at corners and coped to sills, accurately secured in place with finish nails, and nails set.

3.02 INSTALLATION

- A. Install Work of this section as specified in the WIC Manual of Millwork.
- B. Combination Shelf and Pole: Hanging poles shall be 1-1/4 inch round oak, supported on brackets fastened to the underside of the shelf.
- C. Caulking of Joints: Joints between exterior frames and adjoining surfaces shall be primed before caulking.

3.03 CLEAN UP

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

3.04 PROTECTION

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

END OF SECTION

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SECTION 06400

ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Architectural woodwork, casework, trim, hardware, countertops, and shelving as indicated on Drawings.
- C. Related Sections:
 - 1. Section 06100: Rough Carpentry.
 - 2. Section 06200: Finish Carpentry.
 - 3. Section 09900: Paints and Coatings.

1.02 SECTION DEFINITIONS

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

1.03 SYSTEM DESCRIPTION

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

1.04 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings of casework indicating materials and hardware, details of construction, dimensions, methods of fastening and installation details. Shop Drawings shall bear a WIC Certified Compliance Label indicating that Shop Drawings fully meet requirements of WIC grade specified. Shop Drawings shall indicate grounds, backing, blocking, sleepers and other items required for installation of casework, which are to be provided and installed as part of the Work.
- B. Certificates: Provide WIC Certified Compliance Certificate certifying that materials, fabrication and installation will comply with the specified requirements.
- C. Material Samples: Submit 2 inch x 3 inch plastic laminate color Samples of manufacturer's entire color range.

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- D. Closeout Submittals: Provide a WIC Certified Compliance Certificate for Installation.

1.05 QUALITY ASSURANCE

- A. Comply with WIC Manual of Millwork, Custom grade or as specified herein.
- B. Each elevation of casework shall bear WIC Certified Compliance Label indicating that casework fully meets requirements of WIC grade specified.
- C. Each plastic laminate countertop shall bear WIC Certified Compliance Label indicating tops fully meet requirements of WIC grade specified.
- D. Mock-ups: When required by the Architect, submit a full-scale base cabinet, countertop, and wall-hung cabinet, illustrating joinery and plastic laminate finish. Base cabinet shall incorporate a drawer, an adjustable shelf, and a door. Wall-hung cabinet shall incorporate 2 doors, one adjustable shelf and finished end, including required hardware.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the Project site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in humidity and temperature. Refer to WIC Manual for recommended care and storage.
- B. In event of damage immediately furnish necessary repairs or replacements.

1.07 PROJECT CONDITIONS

- A. Store indoors, in ventilated areas with constant but minimum temperature of 60 degrees F. and maximum relative humidity of 25 percent to 55 percent. At least seven days before installation, maintain temperature of 70 degrees F. and relative humidity of 50 percent to 55 percent. Acclimate materials to the installation temperature and humidity for at least 72 hours prior to installation. Maintain conditions until Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Plastic Laminate Faced Cabinets:
 - 1. Plastic laminate: High pressure plastic laminate conforming to NEMA standard LD-3; 0.050 inches at horizontal surfaces, 0.028 inches at exposed vertical surfaces and edge bands, and 0.042 inch minimum for post-formed countertops.
 - 2. Particle Board Core Material: 45 lb. density, conforming to ANSI A208.1, Table 1, Grade 1-M-2.
 - 3. Solid Lumber:

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- a. Solid lumber for exposed members, drawers, trays and special details shall be Clear birch or maple.
 - b. Unexposed solid lumber for concealed webs or structural members shall be of Clear Douglas fir.
4. Softwood Plywood: Rotary cut exterior type A-C grade softwood plywood complying with PS1.
 5. Hardboard: Factory finished pressure sealed hardboard conforming to the requirements of PS 58. Oil tempered hardboard shall conform to CS 251.
 6. Cabinet Liner: Semi-exposed surfaces shall be finished with 0.020 inch high-pressure laminate cabinet liner, conforming to NEMA Standard LD-3.
 7. Edge Banding:
 - a. T-type extruded tenite-butyrate 1/16 inch minimum thickness, with serrated leg 3/8 inch in length.
 - b. 0.028 inch minimum thickness plastic laminate.
 8. Glass Doors: 1/4 inch laminated safety glass.
 9. Adhesive: Type II water-resistant, rigid type glue of formula conforming to PS 51.
 10. Sealer: Thompson Water Seal 101 or Watco Oil.
 11. The Owner will supply tote trays unless otherwise indicated.
 12. Base: Cover toe spaces with typical wall base unless otherwise indicated.

B. Hardware:

1. Drawer Slides for Custom Grade Cabinetry:
 - a. Pencil drawers: Partial extension type: Accuride 2006.
 - b. Drawers and box drawers, up to 24 inches wide: Accuride 3832A.
 - c. Lateral file drawers, up to 30 inches wide: Accuride 4034 overtravel or 4033 equal travel.
 - d. Lateral file drawers, more than 30 inches wide: Accuride 3640.
2. Flipper Door Slides for Custom Grade Cabinetry:
 - a. For vertically mounted retracting cabinet doors up to 75 lbs. and 72 inches tall: Accuride 1432 with hinge carrier strip.

4. Mutes: Rubber, approximately 1/4 inch diameter, colors to match adjacent finish.
5. Plastic Grommets: Doug Mockett, or equal; color as selected by Architect.
6. Adjustable Shelves with Clips: Adjustable shelf supports (EDP type, unless otherwise noted) set in 5 mm holes spaced 32 mm on center:
 - a. Hafele America, Co., No. 282.04.711.
 - b. Hafele America, Co., No. 282.24.13.
7. Cabinet Hinges: Concealed type, minimum 170 degree opening, self-closing:
 - a. Hafele America, Co., No. 326.05.
 - b. Julius Blum, Inc., No. B71650.
 - c. Mepla, No. MD61-253-Z00.
8. Cabinet Locks:
 - a. Door Locks: Pin tumbler type – National No. 3713 x 2475-172 strike or Olympus 100DR x 12-1 strike.
 - b. Locks for Sliding Doors: National No. C8142 x thimble strike or Olympus 300 SD x thimble strike.
 - c. Drawer Locks: National 68-3718 x 68-2480C brass strike or Olympus 200 DW x 12-1 strike.
 - d. Cabinet locks shall be flush with surface of door and protrude no greater than 3/16”.
9. Top-hung Hardware Assembly for Sliding Doors: Grant No. 6064.
10. Track for Sliding Doors: K & V 455 x or 455.55.
11. Pull Flush Ring at Drawers behind Doors: Safe No. 6116 or BBW 24.
12. Pulls: BBW No. 79P, Quality No. 179 x 180 or Trimco No. 553P. Provide u-shaped wire pulls or equally accessible pull hardware at all accessible case work.
13. Catches: Magnetic type - EpcO No. 592 or Lawrence No. SC1364-AL.
14. Four-way Tension Catch: Glynn-Johnson GJ21A.
15. Noiseless Catch: Hardware Specialties 11687-FW7.
16. Elbow Catch: Ives 2A.

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17. Bolts: Surface type BBW No. 97-B6, Quality B6 or Trimco No. 4856-6.
18. Brackets and Shelf Strip for Glass Shelves: K & V No. 80 x 180 or Garcy 604 x 686.
19. Shelf Standards and Brackets: K & V No. 255 x 256 or line bored holes for pins as approved by WIC standards Stanley No. 798 x 799, steel zinc plated.
20. Card Holders for Drawers: Corbin No. 1913-1/4H or Garcy No. 853.
21. Hanger Rods: 1-1/16 inches minimum diameter metal tubing, aluminum or stainless steel clad, KV660; heavy wall steel tubing KV770.
22. Hanger Rod Flanges: KV757, or flanges KV734, KV735; Ronther Reiss R44-55; or equal.
23. Hardware Finish: With exception of finish hardware items which have finishes specified, hardware shall be furnished with dull chrome US 26D or dull stainless steel US 32D finish.
24. TV Pullout Extension and Swivel: Accuride Model CB360-258TV, or equal.
25. Keying:
 - a. Key locks inside one room alike. Furnish 3 keys for each lock keyed separately, and 2 keys for each lock in keyed alike groups. Master keys shall be tagged and delivered to the IOR. Locks and keys shall be stamped with coded set number / direct digit.
 - b. Cabinet locks shall be master-keyed and keyed alike. Backside of cabinet lock bolts (on visible side following installation) and change keys shall be stamped with manufacturer's code, either direct digit or coded series. Change keys shall also be stamped with set numbers direct digit.
 - c. Master keys shall be National GM2

2.02 FABRICATION

- A. Plastic Laminated Casework: Construction of plastic laminated casework shall conform to the material and construction requirements for WIC Custom grade flush overlay construction.
 1. Exposed Vertical Panels and Doors: Exposed fixed panels and doors, including exposed ends of cabinets and both ends of each cabinet shall be 3 ply laminate construction consisting of plastic laminate with particle board and a balancing sheet, bonded together under pressure with adhesive. Total nominal thickness of panels and doors shall be 0.75 inch unless otherwise indicated.

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2. Exposed bottom of wall-hung cabinets shall be furnished with plastic laminate finish.
3. Semi-exposed Panels: Interior panels, bottoms, and tops shall be 3/4 inch particleboard minimum. Bottoms of upper cabinets spanning 42 inches or more shall be one inch thick.
4. Webs: Stiles, rails and muntins of web frame shall be tongue and grooved at joints and glued. Top and bottom rails shall be continuous. Use of 8 mm wooden dowels, screws or biscuits shall be in accordance with WIC Standards.
5. Cabinet bases may be integral or separate. Bases shall be 3/4 inch thick plywood securely jointed at 4 corners to a supporting block 1-1/2 inches thick.
6. Ends: Cabinet ends shall be minimum 3/4 inch thick, lock-jointed, doweled, glued, and screwed to webs or top and bottom of the cabinet.
7. Backs shall be 1/4 inch thick plywood or 1/4 inch thick particle board, and shall be plowed into sides and top (except countertops) glued and nailed on 4 inch centers. Back shall be braced with horizontal 3/4 inch x 3-1/2 inch backing strips on 3 feet centers maximum. Cabinets with exposed finish backs shall have 3/4 inch backs of laminate construction. Where exposed finished cabinet end and back form an external corner, plastic laminates shall meet at corner.
8. Adjustable shelving shall be 3/4 inch thickness particleboard for spans up to 25 inches and one inch thickness for spans over 25 inches up to 34 inches. Adjustable shelving over 34 inches in span shall be one inch thick plywood core with 0.020 inch cabinet liner both sides. Shelving hardware shall be adjustable to one inch centers. Faces and edges of shelving shall be finished with 0.020 inch thickness cabinet liner both sides.
9. Drawers:
 - a. Sides, backs, and sub-fronts of drawers shall be of dovetail or dowel construction and made of 1/2 inch thick clear birch or maple solid stock. Drawer bottoms shall be in accordance with WIC requirements, glue blocked and nailed.
 - b. Drawers shall be fitted with ball bearing slides accurately installed for smooth drawer operation.
 - c. Drawer fronts shall be of 3/4 inch thick plastic laminate construction, fully edge-banded with plastic laminate T-banding to be used when matching existing. T-banding joint shall occur at center of bottom edge of panel.
10. Doors:
 - a. Doors shall be of overlay type with flush exposed surfaces. Doors shall be fully edge-banded with plastic laminate. Joint in banding shall occur

at center of bottom edge. Doors of cabinets within any group of adjacent units shall be in alignment.

- b. Hinges shall be routed into edge of door. Doors over 40 inches in height shall have 3 hinges.
11. Back Priming: Seal unfinished materials installed for backs, bases, self-edge backing, stripping and other concealed portions with a water-repellent sealer.
12. Banding:
- a. Exposed edges of interior and exterior laminates shall be edge banded with plastic laminate. Edge banding shall be provided in longest available lengths.
 - b. Edge banding shall be accurately fitted. Where edge band joins plastic surfaces, there shall be no open spaces, voids, or chipping of plastic laminate surface.
 - c. Exposed cabinet surfaces shall be flush, and any protruding edges of banding shall be machined or trimmed to provide a flat smooth corner at intersection of banding and adjoining surfaces. Plastic laminate edge banding shall be installed on tops, webs, bottoms, ends, and inside partitions. T banding may only be installed on drawer fronts and door edges and only as required to match existing.

B. Countertops:

1. Plastic Laminate Tops: Each plastic laminate countertop shall bear the WIC Certified Compliance Label.
- a. Laminated plastic countertops shall be self-edged, except that plastic countertops containing sink cutouts shall have a no-drip tilt-front edge. Edge shall rise 1/8 inch above counter surface and back and return splashes shall be 6 inches high measured from exposed countertop surface, unless otherwise indicated.
 - b. Cove and roll front sticking, for plastic laminate back-up, shall be kiln dried clear sugar pine glued to core material. Cove sticking shall be secured in each direction with 2-1/2 inch long wood screws, 3 inches from each end and 10 inches on center.
 - c. Splash shall be end applied and be set in mastic and secured to top with screws 8 inches on centers. Splash edges shall be self-edged and scribed to wall.
 - d. Joints shall be splined and fastened with screw clip fasteners on at least 8 inch centers. Water resisting mastic or glue shall be applied in joints. Joints shall not occur at sink cutouts. Sink cutouts shall be sealed.

- e. Core material for counters and splashes shall be 3/4 inch thick, 7-ply, rotary cut Philippine mahogany 2-4 faces, type 1, or 3/4 inch 1-M-2 grade particleboard.
- f. Metal sink moldings shall be stainless steel, Hudee, Kintrim T-Type or Chromedge Sink-Lok, with bolts and lugs.
- g. Mastic: Metal trim shall have a continuous layer of mastic in voids between metal and plywood and sink. Counter cutout edge shall be waterproofed to prevent delamination of countertop. Metal trim shall be applied over finished plastic surfaces without kerfing or routing of molding.
- h. Installation of plastic laminate shall be in accordance with published specifications and recommended practices of the plastic laminate manufacturer.

C. TV Extension Shelf:

- 1. Install according to manufacturer's installation instructions.
- 2. Provide Plastic Laminate covered platform (shelf) to be affixed to swivel plate of TV extension shelf hardware. Platform to be fabricated with the minimum necessary clearance between cabinet sidewalls and the swivel mounting plate to avoid interference during rotation.

2.03 FINISHING

- A. Unexposed materials such as backs, webs, back of tops, and the like, shall be sealed with one oil base prime coat. Semi-exposed wood surfaces such as drawer interiors shall be finished with one coat of sanding sealer and one coat of clear gloss lacquer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install Work of this section as specified in the WIC Manual of Millwork.
- B. Cabinets: Install cabinets level, plumb, and secure to walls. Exposed screws shall have finish washers.
- C. End Panels and Fillers: Furnish to match exposed surfaces and accurately scribe to walls and neatly and securely fit to cabinets.
- D. Completion: Upon completion of installation, cabinets including drawers and shelves shall be cleaned. Doors and drawers shall operate easily and freely.

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

3.02 CLEAN UP

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

3.03 PROTECTION

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

END OF SECTION

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ARCHITECTURAL WOODWORK

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SECTION 07210
BUILDING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Thermal batt insulation for exterior walls and under roof decks.
 - 2. Thermal batt insulation in furring at concrete or masonry walls.
 - 3. Acoustical batt insulation in partitions and above acoustical ceilings where indicated.

1.02 SYSTEM DESCRIPTION

- A. Regulatory Requirements:
 - 1. Surface Burning Characteristics: Flame spread rating shall not exceed 25 and smoke density shall not exceed 50.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Material List: Provide a list of materials for installation under this section.
 - 2. Provide manufacturer's printed Product Data for each type insulation and accessory.
- B. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.
- C. Certification: Provide certification that insulation materials conform to requirements of CBC Section 701 and are installed to meet flame spread ratings and other requirements of Section 701.

1.04 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
 - 1. ASTM C 177 - Steady-State Heat Flux-Measurements and Thermal Transmission Properties by Means of the Guarded-Heat-Plate Apparatus
 - 2. ASTM C 518 - Steady-State Heat Flux-Measurements and Thermal Transmission Properties by Means of the Heat-Flow-Meter Apparatus

3. ASTM C 665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
4. ASTM E 84 - Surface Burning Characteristics of Building Materials
5. ASTM E 119 - Fire Tests of Building Construction and Materials
6. ASTM E 136 - Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the Project site and store in a safe, dry place, with labels intact and legible at time of installation.
- B. Protect building insulation materials from damage.

1.06 PROJECT CONDITIONS

- A. Avoid exposure to humidity and moisture. Protect from exposure to sunlight.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Owens Corning, Four Hutton Centre Dr., Suite 100, Santa Ana, CA.
- B. Johns Manville, 14030 Crest Way, Del Mar, CA.
- C. Fibrex, Inc. and Venture Tape Corp.
- D. USG, Thermafiber Division.

2.02 MATERIALS

- A. Thermal Insulation:
 1. Unfaced Mineral Fiber Blanket/Batt Insulation: Thermal insulation consisting of mineral fibers, glass or slag, and thermosetting resins complying with ASTM C 665, Type I.
 2. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation consisting of mineral fibers, glass or slag, and thermosetting resins complying with ASTM C 665, Type III, Class A, with reflective vapor-retardant membrane facing.
- B. Acoustic Insulation: Fiberglass batts, with or without facing, friction fit, incombustible, minimum 3-1/2" thickness unless otherwise indicated, nominal 0.65 to 2.50 pcf density.
- C. Fasteners for Attaching Insulation to Wood Framing:
 1. Staples: Stainless steel, monel, or copper-coated steel, size as required by manufacturer or applicable code.

2. String Wires: Minimum 18 gage galvanized steel wire.
- D. Fasteners for Attaching Insulation to Underside of Metal Roof Decks:
1. Spindle Anchors: Stic-Klip Mfg. Co., Type A or B as required, with Type S adhesive; Miracle Adhesives Corp. "Miracle StukUps" with Type HT994 adhesive; or Goodloe E. Moore Gemco or Tuff-Weld with G-P Improved or Tuff-Bond Quik-Set Type Adhesive as applicable; or equal. Provide adhesives of correct type for substrates and type of anchor.
 2. String wires as specified above.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine installed Work to verify suitability to receive insulation. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Fit batt or blanket insulation, of R-value as designated on the Drawings, snugly between framing members.
 2. Maintain total insulation integrity over entire area to be insulated, including areas between closely spaced members.
 3. Extend full thickness insulation over entire area to be insulated. Furnish manufacturer's recommended clips to tightly fit batts at joints.
 4. Cut and fit batt or blanket insulation tightly around pipes, conduits and penetrations.
 5. Do not compress batt insulation in excess of 10 percent.
 6. Prevent batt or blanket insulation from sagging during and after installation.
 7. Metal door and window frames in acoustically insulated walls shall be filled with insulation, unless otherwise indicated.
- B. Batts In Metal Framing: Provide friction-fit batts tightly fitted to stud webs and to metal furring. Install batts in exterior walls with vapor barrier facing room.
- C. Batts Under Metal Roof Decks: Install foil-faced flanged-type insulation batts secured with spindle anchors. Staple flanges together at maximum 4" centers and seal joints at abutting vertical surfaces with a pressure-sensitive plastic tape. Provide 18 gage galvanized string wires under batts wherever necessary to prevent sagging, stretched taut.
- D. Batts In Wood Wall Framing: Staple flanges to wood supports at 4" centers and ensure batt facings form a continuous vapor barrier. Provide tightly stretched string wires along center of horizontal or sloping batts where support spacing exceed 16" on centers. Install

batts in exterior walls with vapor barrier facing room. Allow at least 3/4-inch air space between vapor barrier and wall finish.

- E. Batts in Ceiling Framing: Install batts between joists, so top of insulation is level with top of framing members. Do not install insulation over recessed lighting fixtures, speakers, or other heat producing elements in the ceilings. At junction boxes, access panels, and other items requiring access from above or below the ceiling, cut insulation on each side to fit the item and install loosely on top. Fit insulation snugly around ducts, conduits, pipes, and other items projecting through ceiling construction.
- F. Batts on Acoustical Ceilings: Install batts on top of ceiling grid and board, completely covering areas as indicated. Do not install insulation over recessed lighting fixtures, speakers, or other heat producing elements in the ceilings. At junction boxes, access panels, and other items requiring access from above or below the ceiling, cut insulation on each side to fit the item and install loosely on top. Fit insulation snugly around ducts, conduits, pipes, and other items projecting through ceiling construction.

3.03 PROTECTION

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

3.04 CLEANUP

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

END OF SECTION

SECTION 07220

ROOF AND DECK INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Roof and non-tapered polyisocyanurate roof insulation as indicated.
- C. Related Sections:
 - 1. Section 06100: Rough Carpentry
 - 2. Section 07552: Modified Bituminous Membrane Roofing Cold Adhesive Applied
 - 3. Section 07600: Flashing and Sheet Metal.

1.02 SYSTEM DESCRIPTION

- A. Regulatory Requirements: Comply with requirements of DSA and/or authorities having jurisdiction over the Work.

1.03 SUBMITTALS

- A. Shop Drawings: Submit roof plans and details. Include roof dimensions, drain and scupper locations, gutter locations, and the layout of insulation boards. Provide details indicating components, attachment and insulation thickness. Provide calculations indicating the average R-value for the system. Indicate drainage patterns and slopes required.
- B. Product Data: Submit manufacturer's data substantiating the insulation complies with specified requirements.
- C. Installation Instructions: Submit manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
 - 1. ASTM C 1289 - Faced Rigid Cell Polyisocyanurate Thermal Insulation Board; Type 2.

2. Provide systems complying with requirements for FM Class 1.
 3. Provide systems complying with requirements for UL Class A.
 4. Achieve a minimum thermal resistance value of R-7 for re-roofing projects, unless noted otherwise.
- B. Qualifications: Installers: Minimum 5 years experience installing specified type of insulation under roofing systems, and certified by the insulation manufacturer to install the Work of this section.
- C. Pre-installation Meetings: In accordance with related Division 01 sections, conduct a pre-installation meeting on the Project site.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original sealed and labeled containers.
- B. Avoid exposure to sunlight and the elements.
- C. Handle materials in a manner to avoid damage or contamination with moisture or foreign matter.

1.06 PROJECT CONDITIONS

- A. Environmental requirements:
 1. Install products in strict accordance with manufacturer's recommendations.
 2. Do not install any materials when water in any form is present on the deck or materials are wet. Do not install any materials if precipitation is forecast and partially completed Work will be left unprotected.
 3. Do not install the Work of this section if the temperature of the roof deck is below 40 degrees F.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Roof and Deck insulation components shall be manufactured by:

1. Dyplast Products Dyplast Products
 1-800-433-5551
 12501 NW 38th Ave
 Miami, FL 33054
 www.dyplastproducts.com

- 2. Celotex Insulation Celotex Building Products
32332 Camino Capistrano
San Juan Capistrano, CA 92675
- 3. GAFTEMP G.A.F.
11800 Industry Avenue
Fontana, CA 92337

B. Insulation shall be rigid polyisocyanurate foam insulation, with specially formulated organic/inorganic facers as manufactured by Dyplast Products, Celotex Building Products, or G.A.F.

2.02 DESCRIPTION

- A. Tapered Roof insulation shall provide 1/4 inch minimum per foot slope and provide minimum R19 insulation value.
- B. Roof and Deck insulation shall consist of polyisocyanurate foam panels, chemically bonded during the foaming process to special organic/inorganic facers on the top and bottom surfaces, and shall conform to the following:

<u>PROPERTIES</u>	<u>TEST METHOD</u>	<u>VALUE</u>
Compressive Strength	ASTM D 1621	16PSI min.
Dimensional Stability (Thermal & Humid Aging)	ASTM D 2126 (-4 degrees F, amb RH) (158 degrees F, 97 percent RH) (200 degrees F, ambient RH)	<2.0 percent Linear change <2.0 percent Linear change <2.0 percent Linear change
Flexural Strength (Modulus of Rupture) (Break load)	ASTM C 203	40 PSI min. 17 PSI min.
Tensile Strength (Perpendicular to surface)	ASTM C 203	500 PSF min.
Water Absorption	ASTM C 209	
Water Vapor Transmission	ASTM E 96	
Core Foam Flame Spread	ASTM E 84	

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify suitability of substrates to receive the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Verify suitability of related Work such as the following:
 - 1. Roof drains and scuppers are properly installed.

2. Roof curbs, nailers, equipment supports, vents, and other items penetrating the roof are of the proper height, properly prepared and fastened to the substrate.
3. Concrete surface are sufficiently dry, free from extremes in pH, properly primed and free of fines, edges, or voids.

3.02 INSULATION APPLICATION

A. General:

1. Install the Roof and Deck insulation in accordance with the manufacturer's recommendations and to provide the R values indicated. Butt the panels snugly together.
2. Start boards from either the roof drain or the high point depending on the insulation system. Stencil direction of slope on each board. Stagger joints of underlayment boards from insulation boards.
3. Cut valleys and hips. Field cut crickets from insulation boards. Install valleys, hips, and crickets as required for R values and drainage.

- B. All Roofing Systems: Fasten insulation with a method recommended by the manufacturer. Method of attachment shall provide a minimum FM 1-90 Wind Uplift Rating.

3.03 PROTECTION

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

3.04 CLEANUP

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

END OF SECTION

SECTION 07552

COLD-APPLIED BITUMINOUS ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish and install three ply cold process roof membrane assembly consisting of 80# Inverted Cap and 2 plies of 25# base sheets adhered in cold adhesive. Surface with asphalt emulsion blended with chopped glass and reflective coat.

1.02 RELATED SECTIONS

- A. Section 06100: Rough Carpentry
- B. Section 07210: Building Insulation
- C. Section 07600: Flashing and Sheet metal
- D. Section 07920: Sealants and Calking
- E. Section 15400: Plumbing
- F. Section 15850: Air Conditioning and Air Handling

1.03 REFERENCE STANDARDS

- A. References to code sections, standards, and test methods, are to the latest version or edition. The following is a list of associations, institutions, and societies referenced:
 - 1. California Code of Regulations: CCR, Title 24, Part 2
 - 2. ASTM D 5147
 - 3. HARK Handbook of Accepted Roofing Knowledge as published by the National Roofing Contractor's Association.
 - 4. ICBO International Conference of Building Officials.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01300:Submittals.
 - 1. Samples: Two 3 inch x 5 inch mock up of the roof assembly.
 - 2. Latest edition of the roofing system manufacturer's specifications and installation instructions.
 - 3. Submit proof showing that proposed membrane adhesive conforms to the V.O.C. requirements of the South Coast Air Quality Management District.

1.05 RELATED WORK

- A. Furnish and install new wood blocking beneath pipes spaced a minimum 8 feet o.c. and provide the specified walktread material under all wood pipe supports; extend the walktread a minimum of 2 inches beyond all blocks.
- B. Paint exposed pipe stacks, fans, etc. with non-fibrated aluminum paint.
- C. Furnish and install the specified walktread material applied around the serviceable side of all A/C units.
- D. Ensure that roof drains are clear and free running; replace rusted, damaged or deteriorated clamping rings with new components and provide new strainers where existing are damaged or missing.
- E. Fabricate and install lead jacks incorporating a water-tight rain collar at heat stacks and pipe penetrations. Furnish and install lead flashings at soil stacks as specified herein.
- F. Fabricate edge metal components from the specified sheet metal stock to incorporate a 3/8" gravel stop rise and install in accordance with SMACNA and the membrane manufacturer's guidelines.
- G. At the large pipe supports, fabricate a curb to provide a flashing height of 8 inches above finished roof level. Flash the curb using the specified flashing materials and install sheet metal cover over the curb. Fabricate and install pipe stands and fasten into the curb. Curbs shall be installed at intervals specified..
- I. Install metal expansion joints and interior gutters to match existing.
- J. Install wood blocking as a base to secure the antenna supports. Flash the blocking using the specified flashing materials prior to attachment to the supports.

1.06 ACCEPTABLE CONTRACTOR.

- A. Contractor shall have a minimum of 5 years experience in successfully installing the same or similar roofing materials and shall be certified in writing by the roofing materials manufacturer to install the primary roofing products.
- B. Contractor shall have successfully installed a minimum of 5 jobs using the proposed membrane manufacturer's specification and the guarantee issued to the owner.

1.07 GUARANTEE/WARRANTY

- A. Upon successful completion of the project, and after all post installation procedures have been completed, furnish the District with the manufacturer's 10+10 year labor and materials membrane guarantee.
- B. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and shall be issued at no additional cost to the Owner.

1.08 PRODUCT DELIVERY STORAGE AND HANDLING

- A. Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.
- B. Store materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Rolls of roofing must be stored on ends. Store materials such as solvents, adhesives and asphalt cutback products away from open flames, sparks or excessive heat. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.
- C. Handle all materials to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.

1.09 SITE CONDITIONS

A. REQUIREMENTS PRIOR TO JOB START

- 1. Give a minimum of 5 days notice to the District and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
- 2. Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

B. ENVIRONMENTAL REQUIREMENTS

1. Precipitation: Do not apply roofing materials during precipitation or if there is a high probability of precipitation during installation. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.
2. Temperature restrictions: cold adhesive. At low temperatures, store cold adhesive in a warm place immediately prior to use. Use shop squeegee should to distribute adhesive evenly (cut notches out of the rubber blade of the squeegee). Suspend application when adhesive cannot be kept at temperatures allowing for even distribution.

C. SAFETY REQUIREMENTS

1. Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
2. Designate one person on each crew to perform a daily fire watch to include watching for fires or smoldering materials on all areas of roof construction; continue the fire watch for one hour after roofing material application has been suspended for the day.
3. Prevent public access to materials, tools and equipment during the course of the project.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. For the purposes of establishing quality, products of the following manufacturers are acceptable: Henry Company, 2911 Slauson Avenue, Huntington Park, CA 90255 (323) 583-5000.

B. ROOF ASSEMBLY

1. Sheathing paper (wood decks only) -1 ply
2. UNDERLAYMENT OR BUFFER PLY -605 80# Mineral Surface Underlayment, reverse rolled – ASTM D 3909-91
3. INTERPLY - #604 Fiberglass Ply Sheet
 - a. nominal 25# asphalt coated base sheet
 - b. Tensile Strength: 65 lbs. MD – 55 lbs. XD
4. SURFACING (9 Gallons with 3 lbs. Glass/Square):
 - a. #107 Asphalt Emulsion – meeting following requirements:

ASTM D-1227 Type III, Class I	
Color.	Black
Viscosity @ 77°F	8000-15000 cps (ASTM D2196)
Density @ 77°F	8.7 lbs./gal
Non-volatile Matter by Weight	47-53% (ASTM D2939)
Pliability @ 32°F	No cracking or separating
b. and #189 Chopped Fiberglass	

5. REFLECTIVE SURFACING: #229 Aluminum Emulsion- 1½ gal/Square

2.02 DESCRIPTION OF SYSTEM

A. Henry Specification #H3-NG4C-MR

Over prepared deck surface mechanically fasten one layer #605 80# Inverted Cap and two ply #604 25# adhered in #902 Permanent Bond Adhesive. Surface with #107 Asphalt Emulsion reinforced with #189 Chopped Fiberglass. Finish with #229 Aluminum Emulsion.

Specification System & Weights per 100 Sq.ft.

	Dry Weights
#605 80# Inverted Cap - Mechanically fastened	80 lbs.
#902 Permanent Bond Adhesive – 2 gallons per 100 sq.ft.	11 lbs.
#604 Fiberglass Base Sheet	25 lbs.
#902 Permanent Bond Adhesive – 2 gallons per 100 sq.ft.	11 lbs.
#604 Fiberglass Base Sheet	25 lbs.
#107 Emulsion topcoat – 9 gallons per 100 sq.ft.	36 lbs.
#189 Chopped Fiberglass – 3 lbs. Per 100 sq.ft.	3 lbs.
#229 Aluminum Coat – 1-1/2 Gallons per 100 sq.ft.	5 lbs.

Approximate Total Dry Weight

196 lbs.

B. Flashing membrane assembly: Consisting of a prefabricated, 2-ply polyester reinforced, Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane. modifiedPlus NP180 s/s – SBS modified, 180 gram polyester reinforced membrane. Lightly sanded on both sides. Membrane to be adhered with cold adhesive. Meets requirements of ASTM D-6164-97 when tested in accordance with ASTM D-5147.

Tensile Strength -	MD 112 lbf/in. - CD 88 lbf/in.
Elongation @ 0°F (-18°C)	MD 40% - CD 37%
Tear Resistance	MD 117 lbf/in. - CD 88 lbf/in.
Thickness	2.2mm (90 mils)

2.03 ROOFING ACCESSORIES

- A. Roofing Adhesives: #902 Permanent Bond Adhesive – high solids, modified and rubberized cold adhesive - meets the requirements of ASTM D-3019, Type III and conforms to the V.O.C. requirements of the South Coast Air Quality Management District.

Stormer viscosity @ 77°F	75-100 sec. (ASTM D-4479)
Density @ 77°F	9.8-10.2 lbs/gal. (ASTM D-1475)
Solids by weight	80%±.2% minimum (ASTM D-4479)
Flash Point	100°F minimum (ASTM D-3278)
Moisture by weight	2.5% maximum (ASTM D-4479)
Mineral/Other stabilizers by wt.	30-33% (ASTM D-4479)
Asphalt by weight	45% (ASTM D-4479)
Lap Adhesion @ 24hrs cure	30 lbf/in. min. (ASTM D-3019)
Appearance	Black, fibrous
Max.VOC	250 grams/liter

- B. Miscellaneous materials:
1. #103 VOC Compliant Primer
 2. #504 Plastic Cement
 3. #600 Ruftac – 75 mil - SBS modified self-adhesive membrane
 4. #209 ElastoMastic
 5. #183 Reinforcing Glass – Yellow
 6. #196 Polyester Fabric
 7. #109 Liquid Roof - Neoprene Modified Emulsion
 8. #176 Pond Patch
 9. Walk pads approved by manufacturer
 10. Approved mechanical fasteners
 11. Wolmanized wood nailers
 12. Lead Flashings to be minimum 4 oz. – factory or field soldered
 13. Josum or Smith drains and overflows
 14. ChemCurb pitch pockets (approved in lieu of galvanized pitch pockets)
 15. Four inch cant strips ASTM C-208

- C. Caulking/Sealants: Refer to Section 07920: Sealant and Calking.

D. FASTENERS

1. Base sheet fasteners: Approved by Factory Mutual and the manufacturer of the primary roofing products. Acceptable base sheet fasteners for wood decks are listed below:
 - a. 12 gauge, spiral or annular threaded shank, zinc coated steel roofing fastener having a minimum 1 inch head;
 - b. Square Cap by W.H. Maze Co.; Peru, IL (815) 223 8290;

c. 12 Gauge Simplex Nail by the Simplex Nail and Manufacturing Co., Americus, GA (912) 924-2767;

2. Wood cants lead drain flashings, lead pipe flashings.
- E. FABRICATED METAL. Fabricate all metal components to be used in conjunction with the roof system using 24 gauge galvanized steel, meeting ASTM A-526 specifications. Replacement metal to be 24 gauge galvanized sheet metal
1. Metal edge and fascia to have maximum 1/4" rise
 2. All flanges to be 4 inches with full corners
 3. Pitch pans to have soldered joints
 4. Metal pipe flashings
 5. Splashpans.
- F. Walktread. A prefabricated, puncture resistant polyester core reinforced, polymer modified bitumen sheet material topped with a ceramic-coated granule wearing surface.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Pre-job conference. Conduct a pre-job conference to include the designer, District, roofing Contractor and manufacturer's representative prior to application of roofing.
- B. Deck penetrations: Verify that work penetrating the roof deck, or which may otherwise affect the roofing application, has been properly completed.

3.02 PREPARATION

- A. Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing.
- B. Remove all existing surface gravel, roof membrane, base flashing, edge metal, flanged metal flashings cants, wood blocking walkways, non-functional penetrations and curbs, metal trim and counterflashing.
- C. Raise all existing curbs to a minimum height of eight inches above roof line.
- D. Repair minor cracks, surface irregularities, open joints, etc. in masonry walls using a quick dry grout mix to ensure a smooth, even surface for application of the roofing/flashing membranes.

3.03 SUBSTRATE REQUIREMENTS

- A. Underlayment/rosin sheet: Lay the rosin sheet in tandem with the Underlayment (granule side down) over entire area to be roofed, lapping sides 2 inches and ends a minimum of 4 inches. Using the specified fasteners, fasten each sheet every 9 inches through laps and stagger fasten the remainder of the sheet in 2 rows, each on 12 inch centers.

3.05 ROOF MEMBRANE INSTALLATION

- A. Membrane application. Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing membrane components shall immediately follow application of underlayment as a continuous operation.
- B. Priming. Prime metal flanges and concrete and masonry surfaces with a uniform coating of #103 asphalt primer.
- C. Membrane adhesive application. Apply cold adhesive in a smooth, even, continuous layer without breaks or voids at the rate of 2 gallons per square per ply. (The porosity of some substrates may require a heavier application to ensure full adhesion.)
- D. Roofing application:
 - 1. Apply all layers of roofing free of wrinkles, creases or fishmouths and exert sufficient pressure on the roll during application to ensure prevention of air pockets.
 - 2. Apply all layers of roofing perpendicular to the slope of the deck.
 - 3. Over the underlayment, apply two (2) layers of #604 25# interply sheets set in a uniform application of #902 Permanent Bond Adhesive at a rate of 2 gallons per 100 sq.ft.
 - 4. Apply the first sheet with an 18" (457mm) width then over that a full width piece. Install the remaining sheets full width overlapping preceding sheet 19". Stagger laps with the layer below. Run plies to top of cant.
- E. Flashing application on masonry and wood surfaces: Comply with the requirements of Section 07600: Flashing and Sheet Metal and the following:
 - 1. Base ply shall be applied to turn down the vertical surfaces at the roof edge a minimum of one inch and tack-nailed to the vertical surfaces.
 - 2. Vertical surfaces shall be flashed using SBS modified sheet flashing.
 - 3. Extend top layer of base sheet over edge of roof approximately 1".

4. Install metal flange over completed membrane but before application of surfacing. Set metal flange in trowel application of plastic cement. Nail 3" (76mm) o.c. staggered.
 5. Over prepared surface install 12 inch wide Ruftac over metal flange and extending onto the field of the roof.
- 3.06 SURFACING - Monolithic System
- A. After the adhesive has thoroughly cured (no solvent odor is evident and laps cannot be pulled apart), but not less than five days, sweep or pressure blow dust and debris from the roof surface to provide a clean surface. Hose and/or scrub off with water any residue accumulation.
 - B. Protect adjacent walls not scheduled for emulsion and reflective coating. Protect equipment, roof top units, valves, switches, coils or moveable parts etc. not scheduled to receive Monolithic application from overspray. Mask off identification plates on equipment.
 - C. Clean gutters prior to surfacing.
 - D. Cover prepared roof and flashing surfaces with not less than 9 gallons (34l) per 100 sq.ft of undiluted #107 Asphalt Emulsion. Evenly blend emulsion with 3 lbs. (1.4kg) of ¾" (19mm) long chopped glass reinforcing sprayed with equipment approved by Henry Company. Tufting of the glass fibers is not acceptable. Spray emulsion in a pattern into laps of base sheet so that when system is dry, there are no voids or bridging of glass over any seam of the membrane. Finish to be 72 dry mils.
 - E. Unless otherwise specified, spray vents, ducts, and parapet walls. Spray parapet walls to within one inch of outside edge; above reglets and/or 5-course counterflashing.
 - F. Spray base flashings and other designated surfaces with the Monolithic System.
- 3.07 REFLECTIVE COATING:
- A. As soon as emulsion surfacing has cured (tack-free and black), clean the surface of dust and debris. After five (5) days hose roof surface and scrub out any pockets of residue.
 - B. Apply #229 Aluminum Emulsion Coating at the rate of 1½ gallons per 100 square feet (.6l/m²) in one coat.
 - C. Any areas that peel must be redone before the project will be considered complete.
 - D. In arid climates when rain is unlikely within 30 days of application of the aluminum coat, hose roof surface 30 days after application.

3.08 INSTALLATION OF ROOFING COMPONENTS

- A. The following is recommended installation of components integrated into the roof membrane assembly. In all cases, unless otherwise approved, incorporate flanged components into the system between the application of the base ply and the finish ply. The flange must be primed with a uniform coating of approved ASTM D 41-85 asphalt primer and allowed to dry thoroughly; all flanges must be set in approved mastic.
- B. Edge metal: Completely prime metal flanges and allow to dry prior to installation. Turn the base ply down 2 inches past the roof edge and over the nailer. After the base ply and continuous cleat (if applicable) have been installed, set the flange in mastic and stagger nail every 3 inches on center. Strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the gravel-stop rise of the edge metal.
- C. Lead pipe flashings: Completely prime the lead flanges and allow to dry prior to installation. After the base ply has been applied, set the flange in mastic and strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the flange-sleeve juncture of the pipe flashing.
- D. Lead drain flashings. Completely prime the lead drain flashing and allow to dry prior to installation. After the base ply has been applied, set the lead flashing sheet in mastic and form to turn down inside of the drain bowl. Ply-in the perimeter of the lead flashing using an additional layer of the base ply material, overlapping the perimeter of the lead a minimum of 4 inches. Terminate the finish ply to extend beneath the clamping ring seal. Install the clamping ring with all clamps, bolts etc., in place.
- E. Light air unit supports: Separate light air handling units that are supported by wood sleepers from the new roof assembly using the manufacturer's walktread-roof protection material. Cut each walktread pad to a size which extends a minimum of 2 inches beyond the perimeter of each sleeper block. Set the walktread pad dry over the new assembly, and each sleeper block dry over the walktread pad.
- F. Small pipe supports:
 - 1. Support all gas lines and conduits which are a maximum of 1 inch diameter and run horizontally over roof membrane surface with 4"x 4" x 12" wood blocking and the manufacturer's walktread - roof protection material.
 - 2. Cut each walktread pad to a size which extends a minimum of 2 inches beyond the perimeter of the blocking.
 - 3. Loosely secure the pipe to allow movement over the 6 inch center of each block; the spacing for the blocks shall be of adequate distance to prevent sagging of the pipe and to prevent the pipe from coming into contact with the new roof assembly.

4. Set the walktread dry over the new roof assembly; set each pipe support block dry over the walktread pad.
- G. Pitchpans: The following procedures are recommended for pitchpan installation:
1. Completely clean the metal penetration of all roofing materials and clean any residual oil shop coatings from the inside wall of the pitch pan using naphtha solvent.
 2. Etch pitchpan using a 5% acetic acid solution.
 3. Completely prime the flange of the pitch pan and allow to dry prior to installation.
 4. After applying the base ply, set flange in mastic and secure to the deck; strip-in the flange using the stripping-ply material, extending a minimum of four inches beyond the edge of the flange.
 5. Fill the pitch pan with a non-shrink grout to a level approximately 1-1/2 - 2 inches below the top rim.
 6. Install duct tape around the pitch pan wall to act as a form for the pitch pan filler.
 7. Slowly and carefully fill the pitch pan to the top level of the duct tape, ensuring the finished level is above the top rim.
 8. Apply the finish ply, terminating at the flange-pitch pan wall juncture.
 9. Install a watertight umbrella to the penetration, completely covering the opening of the pitch pan.
- H. Metal pipe flashings: Refer to Section 07920: Sealants and Calking.
- I. Splashpans:
1. Install splashpans below every downspout that distributes water directly on to the roof membrane.
 2. Place each splashpan over walktread cut to extend a minimum of 2 inches beyond the perimeter of the splashpan in all directions.
- J. Walktread:
1. Cut the walktread into maximum 5 foot lengths and allow to relax until flat, then, adhere the sheet using the specified plastic cement.

2. Apply the specified cement in a 3/8 inch thickness to the back of the product in 5 inch by 5 inch spots in accordance with the pattern supplied by the walktread manufacturer.
 3. Walk-in each sheet after application to ensure proper adhesion, use a minimum spacing of 2 inches between sheets to allow for proper drainage.
- K. Sealant: Caulk all exposed finish ply edges at gravel stops, waste stacks, pitch pans, vent stacks, etc., with a smooth continuous bead of approved sealant.

3.09 CLEAN UP

- A. Remove debris, roofing materials, equipment and related items after completion of job.
- B. Clean-up all areas affected by the construction including building interior, exterior and landscaping.

3.10 FINAL INSPECTION.

- A. Post-installation meeting: At the completion of the project, Contractor shall attend post installation inspection during which a punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Sheet metal flashings in connection with roofing.
 - 2. Reglet and counter flashing assemblies.
 - 3. Miscellaneous metal flashing and counter flashing as required, except where provided under Division 15 or Division 16.
 - 4. Coping caps.
 - 5. Drip flashings.
 - 6. Sheet metal wall coverings.
 - 7. Roof pipe flashings.
 - 8. Other sheet metal items, not necessarily specified herein or in other sections, but required to prevent penetration of water into building.
- C. Related Sections:
 - 1. Section 07552: Cold-Applied Bituminous Roofing
 - 2. Section 07920: Joint Sealants.
 - 3. Section 09220: Portland Cement Plaster and Metal Lath
 - 4. Division 15: Mechanical.
 - 5. Division 16: Electrical.

1.02 SUBMITTALS

- A. Shop Drawings: Submit for fabricated sheet metal indicating shapes, details, methods of joining, anchoring and fastening, thicknesses and gages of metals, concealed reinforcement, expansion joint details, sections, and profiles.
- B. Samples: Submit Samples for materials or assemblies as requested.
- C. Product Data: Submit brochures of manufactured items.

1.03 QUALITY ASSURANCE

- A. Drawings and requirements specified govern. Provide the Work of this section in conformance with the Architectural Sheet Metal Manual published by SMACNA for conditions not indicated or specified and for general fabrication of sheet metal items.
- B. Materials shall conform to following standards:
 - 1. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 - 2. ASTM A 653 - Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM B 370 - Copper Sheet and Strip for Building Construction.
 - 4. ASTM B 749 - Lead and Lead Alloy Sheet, Strip and Plate Products.
- C. Pre-installation Meetings: Refer to Division 7 roofing sections as appropriate. Attend the pre-installation and inspection meetings for roofing Work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Do not install bent and/or otherwise damaged materials.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Galvanized Sheet Steel: ASTM A 653, coating designation G90, hot-dip galvanized.
- B. Copper Plate, Sheet and Strip: ASTM B 370, cold-rolled, tempered. Copper sheet and strip shall be cold-rolled-temper.
- C. Sheet Lead: ASTM B 749, Type L50049 or L51121, weighing not less than 4 pounds per square foot.
- D. Stainless Steel: Plate, sheet and strip shall conform to ASTM A 167, Type 304 or Type 316, No. 4 finish on exposed surfaces and No. 2 finish on concealed surfaces unless otherwise specified or indicated. Furnish Type 304 for general applications and Type 316 where exposed to acidic or alkaline conditions.
- E. Fastenings:
 - 1. Galvanized Steel: Nails, rivets, and other fastenings furnished in connection with galvanized sheet steel Work shall be sealed with rust resistive coating. Rivets shall be tinned. Nails and other fastenings shall be zinc-coated.
 - 2. Copper: Nails, rivets, and other fastenings furnished in connection with copper sheet metal Work, shall be manufactured from hard-temper copper or hard brass.
 - 3. Stainless Steel: Nails, rivets and other fastenings furnished in connection with stainless steel Work, shall be 300 series alloy to match alloy of stainless steel being fastened.

- F. Soldering Flux: Raw muriatic acid for galvanized steel; rosin for tin, lead and tinned copper; non-corrosive soldering salts for uncoated copper and acid-type flux formulated for soldering stainless steel.
- G. Solder: ASTM B 32, Grade 50A. Name of product manufacturer and grade designation shall be stamped or cast onto each bar.

2.02 FABRICATION

- A. General:
 - 1. Accurately form sheet metal Work to dimensions and shapes indicated and required. Cope finish molded and brake metal shapes with true, straight, sharp lines and angles and, where intersecting each other, to a precise fit. Unless otherwise specified, all galvanized sheet steel shall be 22 gage. Exposed edges of sheet metal shall have a 1/2 inch minimum hemmed edge.
 - 2. Soldering of sheet steel or copper shall be performed with well-heated copper soldering iron or soldering torch, joints full flowing, neat and consistent. Thoroughly clean materials at joints before soldering, and tin coppers before soldering. Exposed soldering on finished surfaces shall be scraped smooth. Lock seam Work shall be fabricated flat and true to line and soldered along its entire length. Acid-fluxed Work shall be neutralized after fabrication.
 - 3. Form and install sheet metal Work to provide proper allowances for expansion and contraction, without causing undue stresses in any part of completed Work. Installation shall be water and weathertight.
- B. Reglet Type Counterflashing: Where roof comes in contact with vertical surfaces, provide counterflashing. Set top of counterflashing 8 inches above roof deck unless otherwise indicated, and extend down at least 5 inches or to top of cant strip. Counterflashing and reglet shall be 22 gage galvanized sheet steel. Lap counterflashing and reglet 3 inches minimum at splices and miter at angles, or supply special metal corner fittings. Reglet and method of securing flashing shall be so constructed that flashing is firmly locked in place, but may be readily removed for replacement.
- C. Miscellaneous Flashing: Unless otherwise indicated, miscellaneous flashing shall be fabricated of galvanized steel. Exterior doors and windows, unless covered by overhangs shall be provided with 22 gage galvanized steel drip flashing as detailed. At wood construction, nail flashing to framing before paper backed lath is installed.
- D. Roof Pipe Flashings: Provide welded seam 4 pound lead flashings. Field fabricated flashings shall also be welded.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Wood in contact with sheet metal shall be painted with 2 coats of aluminum paint or one coat of heavy-bodied bituminous paint.

3.02 INSTALLATION

- A. General: Coordinate with installation of underlayment indicated in the Drawings and specified in Section 09220.
- B. Reglets: Install reglets at constant height above cant or as indicated. Provide minimum 3 inch lap at end splices of reglets. Caulk laps solidly.

- C. Counterflashing:
 - 1. Install at constant horizontal elevation across roof slope and slope at constant height above cant or as indicated.
 - 2. Provide minimum 3 inch lap at all end splices of counterflashing.
- D. Galvanized sheet steel parapet coping and flashing shall be continuous over top of parapet to form a watertight cap, with waterproof seams at approximately 10 feet on center, or as indicated. Anchor coping to outside of wall with a continuous cleat face nailed at 24 inch centers. Coping shall be fastened on inside wall with hex head screws and bonded sealing washers through oversized holes in the back of the coping. Corners and angles shall be lapped and soldered; do not install joint sealant.

3.03 TESTING

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

3.04 PROTECTION

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

3.05 CLEANING

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

END OF SECTION

SECTION 07700

ROOF SPECIALTIES AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Roof hatches.
 - 2. Gravity ventilators.
- C. Related Sections:
 - 1. Section 05300: Metal Decking.
 - 2. Section 05410: Load-Bearing Metal Studs.
 - 3. Section 06100: Rough Carpentry.
 - 4. Section 07542: Thermoplastic (PVC) Membrane Roofing Mechanically Attached
 - 5. Section 07544: Thermoplastic (PVC) Membrane Roofing Fully Adhered
 - 6. Section 07600: Flashing and Sheet Metal.

1.02 SUBMITTALS

- A. Shop Drawings: Submit for fabricated sheet metal indicating details, methods of joining, anchoring and fastening, thicknesses and gauges of metals, concealed reinforcement, sections, and profiles.
- B. Samples: Submit Samples for materials or assemblies as requested. Provide finish Samples of exposed items.
- C. Product Data: Submit brochures of manufactured items.
- D. Installation Instructions: Provide manufacturer's recommended installation methods and instructions for each item. Instructions shall be prepared to indicate exact conditions of roofing, structure and adjoining construction.

1.03 QUALITY ASSURANCE

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

- B. Qualifications of Installer: Minimum 5 years experience in successfully installing the same or similar sheet metal specialties on roofing systems similar to the roofing systems specified.
- C. Coordinate opening sizes and installation with roofing and related Work to ensure fit and installation.
- D. Pre-installation Meetings: Refer to Division 7 roofing sections as appropriate. Attend the pre-installation and inspection meetings for roofing Work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Protect roof specialties and accessories by storing above grade on required skids or supports. Protect from physical damage and do not install bent and/or damaged materials.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Roof Hatches:
 1. Babcock Davis.
 2. Bilco Company.
 3. Lane-aire Model CRH.
 4. Dur-Red Products.
- B. Ventilators: Loren Cook Company, Greenheck, or equal.

2.02 PRODUCTS

- A. Roof Hatches: Provide roof hatches of indicated sizes. Hatches shall be fabricated of galvanized steel, 14 gage curb and cover, 22 gage cover liner, and 1 inch thick insulation in cover and curb. Cover shall operate by a compression spring enclosed in a telescopic case or enclosed torsion spring, with automatic hold-open arm. Provide padlock hasp on inside of unit.
 1. Accessories: Provide manufacturers fixed hatch railing system, providing a permanent means of fall protection for roof hatch openings. Rail system shall meet OSHA Standard 29 CFR 1910.23
- B. Gravity Ventilators: Provide ventilators at locations and of sizes and type indicated on plans. Ventilators shall be securely fastened to roof curbs as indicated in manufacturer's details. Ventilators shall have 1/2 inch mesh galvanized steel mesh bird screen.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrate to receive roofing accessories and associated Work and conditions under which accessories will be installed. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install roof accessories in accordance with SMACNA and manufacturer's recommendations as required.

3.03 FIELD QUALITY CONTROL

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

3.04 PROTECTION

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

3.05 CLEANUP

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

END OF SECTION

SECTION 07920
JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Joint sealants as indicated or required.
- C. Related Sections:
 - 1. Section 06200: Finish Carpentry.
 - 2. Section 07600: Flashing and Sheet Metal.
 - 3. Section 08110: Steel Doors and Frames.
 - 4. Section 08520: Aluminum Windows.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating sealant joint locations, with full-size sealant joint details.
- B. Product Data: Submit manufacturer's literature for each sealant material.
- C. Material Samples: Submit Samples indicating color range available for each sealant material intended for installation in exposed locations.
- D. Certifications: Submit manufacturer's certification materials comply with requirements specified.
- E. Site Samples: At locations required, provide a Sample of sealant for each typical installation, approximately 24" long, including joint preparation, backing, sealant and tooling. Allow backing to extend 6" beyond end of sealant for inspection of substrate.
- F. Test Reports: Submit manufacturer's adhesion compatibility test reports according to ASTM C 794 for each substrate.

1.03 QUALITY ASSURANCE

- A. Qualifications of Installer: The Work of this section shall be installed by a firm which has been in the business of installing similar materials for at least 5 consecutive years; and can show evidence of satisfactory completion of 5 projects of similar size and scope. Installer shall have applicators trained and approved by manufacturer for performing this Work.

1.04 DELIVERY, STORAGE AND HANDLING

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

1.05 WARRANTY

- A. Manufacturer shall provide a 5 year material warranty.
- B. Installer shall provide a 2 year labor warranty.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Furnish sealants meeting following in-service requirements:
 - 1. Normal curing schedules are permitted.
 - 2. Non-staining, color fastness (resistance to color change), and durability when subjected to intense actinic (ultraviolet) radiation are required.
- B. Furnish the products of only one manufacturer unless otherwise required, sealant colors as selected to match the adjoining surfaces.

2.02 MATERIALS

- A. Sealants:
 - 1. Sealant 1: Acrylic latex, one-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C 834, Type S, Grade NS, formulated to be paintable.
 - a. Tremco Inc., Acrylic Latex Caulk.
 - b. Bostik Construction Products Division, Chem-Calk 600.
 - c. Pecora Corporation, AC-20.
 - 2. Sealant 2: Butyl sealant, one-part, non-sag solvent-release-curing sealant complying with FS TT-S-001657 for Type 1 and formulated with a minimum of 75 percent solids.
 - a. Tremco Inc., Tremco Butyl Sealant.
 - b. Bostik Construction Products Division, Chem-Calk 300.
 - c. Pecora Corp., BC-158.
 - 3. Sealant 3: Silicone sealant, one-part non-acid-curing silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25.
 - a. Dow Corning Corp., Dow Corning 790, 791, 795.

- b. General Electric Co., Silpruf.
 - c. Tremco, Inc., Spectrem 1.
 - d. Pecora Corp., 864.
4. Sealant 4: One-part mildew-resistant silicone sealant, complying with ASTM C 920, Type S, Grade NS, Class 25.
- a. Dow Corning Corp., Dow Corning 786.
 - b. General Electric Co., Sanitary 1700.
 - c. Tremco, Inc., Proglaze White.
 - d. Pecora Corp. 863 White.
5. Sealant 5: One-part non-sag urethane sealant, complying with ASTM C 920, Type S, Grade NS, Class 25.
- a. Bostik Construction Products Div., Chem-Calk 900.
 - b. Mameco International, Inc., Vulkem 116.
 - c. Tremco, Inc., Dymonic.
 - d. Sika Corporation, Sikaflex 1-A.
6. Sealant 6: Multi-part pouring urethane sealant, complying with ASTM C 920, Type M, Grade P, Class 25.
- a. Tremco, Inc., HPL.
 - b. Mameco International, Inc., Vulkem 255.
 - c. Sika Corporation, Sikaflex 2C NS/SL.
 - d. W.R. Meadows, Pourthane.
7. Sealant 7: Acoustical sealant, non-drying, non-hardening permanently flexible conforming to ASTM D 217.
- a. Pecora Corp., BA-98 Acoustical Sealant.
 - b. Tremco, Inc., Tremco Acoustical Sealant.
 - c. United States Gypsum Co., Sheetrock Acoustical Sealant.

B. Penetrations Through Fire Barriers:

- 1. 3M Brand Fire Barrier Calk CP-25.

- 2. 3M Brand Fire Barrier Putty 303.
- C. Primer: Non-Staining Type. Provide primer as required and shall be product of manufacturer of installed sealant.
- D. Lacquer sealer shall be clear, as recommended by sealant manufacturer.
- E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer.
- F. Sealants shall have normal curing schedules, shall be nonstaining, color fast and shall resist deterioration due to ultraviolet radiation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that joint openings are ready to receive Work and field tolerances are within the guidelines recommended by sealant manufacturer.

3.02 SURFACE PREPARATION

- A. Joints and spaces to be sealed shall be completely cleaned of all dirt, dust, mortar, oil, and other foreign materials which might adversely affect caulking Work. Where necessary, degrease with an solvent or commercial degreasing agent. Surfaces shall be thoroughly dry before application of sealants.
- B. If recommended by manufacturer, remove paint and other protective coatings from surfaces to be calked before priming and installation of sealants.
- C. Preparation of surfaces to receive sealant shall conform to the sealant manufacturer's specifications. Provide air pressure or other methods to achieve required results. Provide masking tape to keep sealants off surfaces that will be exposed in finished Work.
- D. Etch concrete or masonry surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.
- E. Perform preparation in accordance with ASTM C 804 for solvent release sealants, and ASTM C 962 for elastomeric sealants.
- F. Protect elements surrounding Work of this section from damage or disfiguration.

3.03 SEALANT APPLICATION SCHEDULE

	<u>Location</u>	<u>Type</u>	<u>Color</u>
A.	Exterior & Interior joints in horizontal surfaces of concrete; between metal & concrete masonry and mortar.	Sealant 6	To match adjacent material
B.	Exterior door, entrance & window	Sealant 3 or 5	To match adjacent

	frames. Exterior & interior vertical joints in concrete & masonry metal flashing.		material
C.	Joints within Skylight framing system.	Sealant 3	Translucent or Black
D.	Interior joints in ceramic tile and at plumbing fixtures.	Sealant 4	Translucent or White
E.	Under thresholds.	Sealant 2	Black
F.	All interior joints not otherwise scheduled	Sealant 1	To Match Adjacent Surfaces
G.	Heads and sills, perimeters of frames and other openings in insulated partitions	Sealant 7	Match Adjacent Surfaces

3.04 APPLICATION

- A. Provide sealant around all openings in exterior walls, and any other locations indicated or required for structure weatherproofing and/or waterproofing.
- B. Sealants shall be installed by experienced mechanics using specified materials and proper tools. Preparatory Work (cleaning, etc.) and installation of sealant shall be as specified and in accordance with manufacturer's printed instructions and recommendations.
- C. Concrete, masonry, and other porous surfaces, and any other surfaces if recommended by manufacturer, shall be primed before installing sealants. Primer shall be installed with a brush that will reach all parts of joints to be filled with sealant.
- D. Sealants shall be stored and installed at temperatures as recommended by manufacturer. Sealants shall not be installed when they become too jelled to be discharged in a continuous flow from gun. Modification of sealants by addition of liquids, solvents, or powders is not permitted.
- E. Sealants shall be installed with guns furnished with proper size nozzles. Sufficient pressure shall be furnished to fill all voids and joints solid. In sealing around openings, include entire perimeter of each opening, unless indicated or specified otherwise. Where gun installation is impracticable, suitable hand tools shall be provided.
- F. Sealed joints shall be neatly pointed on flush surfaces with beading tool, and internal corners with a special tool. Excess material shall be cleanly removed. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Sealing shall be complete before final coats of paint are installed.
- G. Comply with sealant manufacturer's printed instructions except where more stringent requirements are indicated on Drawings or specified.
- H. Partially fill joints with joint backing material, furnishing only compatible materials, until joint depth does not exceed 1/2 inch joint width. Minimum joint width for metal to metal

joints shall be 1/4 inch. Joint depth, shall be not less than 1/4 inch and not greater than 1/2 inch.

- I. Install sealant under sufficient pressure to completely fill voids. Finish exposed joints smooth, flush with surfaces or recessed as indicated. Install non-tracking sealant to concrete expansion joints subject to foot or vehicular traffic.
- J. Where joint depth prevents installation of standard bond breaker backing rod, furnish non-adhering tape covering to prevent bonding of sealant to back of joint. Under no circumstances shall sealant depth exceed 1/2 inch maximum, unless specifically indicated on Drawings.
- K. Prime porous surfaces after cleaning. Pack joints deeper than 3/4 inch with joint backing to within 3/4 inch of surface. Completely fill joints and spaces with gun applied compound, forming a neat, smooth bead.

3.05 MISCELLANEOUS WORK

- A. Sealing shall be provided wherever required to prevent light leakage as well as moisture leakage. Refer to Drawings for condition and related parts of Work.
- B. Install sealants to depths as indicated or, if not indicated, as recommended by sealant manufacturer but within following general limitations:
 - 1. For joints in concrete walks, slab and paving subject to traffic, fill joints to a depth equal to 75 percent of joint width, but not more than 3/4 inch deep or less than 3/8 inch deep, depending on joint width.
 - 2. For building joints, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

3.06 CLEANING

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

3.07 CURING

- A. Sealants shall cure in accordance with manufacturer's printed recommendations. Do not disturb seal until completely cured.

3.08 PROTECTION

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

END OF SECTION

SECTION 08110
STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Steel doors and frames as indicated.
- C. Related Sections:
 - 1. Section 07920: Joint Sealants.
 - 2. Section 08710: Door Hardware.
 - 3. Section 09900: Paints and Coatings.

1.02 SYSTEM DESCRIPTION

- A. Design Requirements: Drawings indicate profile and general details of steel frame fabrication and installation, in addition to referenced details 1, 2, 3 and 3A this section.
- B. Regulatory Requirements: Comply with CBC Standard 7-2 requirements for positive pressure smoke testing.

1.03 SUBMITTALS

- A. Shop Drawings:
 - 1. Submittal to include elevations of each hollow metal door type, details of each frame type, location schedule of doors, and frames indicating the same reference for details and openings as indicated on the Drawings, conditions of openings of various wall sections and materials, typical and special details of construction, methods of assembling sections, location and installation requirements for hardware, material size, shape, and thickness, and all joints and connections.
 - 2. Submit composite Shop Drawings indicating detailed relationships of installation including the Work of adjacent construction, finish hardware, security, fire, and life safety devices, glazing, caulking, and requirements for field installation.
- C. Product Data: Submit manufacturer's Product Data indicating composition and construction for each fabricated item including louvers, coatings, finishes, and other components.

- D. Certification: Submit to indicate compliance with specified criteria, including fabrication and required fire rating.
- E. Samples:
 - 1. Hollow Metal Frame: Corner section of typical interior frame, of sufficient composite size to illustrate corner joint, hinge reinforcement, closer reinforcement, floor anchor, dust cover, and jamb anchors.
 - 2. Hollow Metal Door: Section of typical interior door of sufficient composite size to illustrate edge, top, bottom, and core construction, hinge reinforcement and face stiffening, closer reinforcement and kick plate reinforcement, and corner of vision opening construction with glazing beads.

1.04 QUALITY ASSURANCE

- A. Steel doors and frames shall be the product of one manufacturer.
- B. Coordinate with hardware supplier for fabrication of doors and frames to receive hardware items.
- C. Coordinate with intrusion alarm supplier for fabrication of doors and frames to receive intrusion detection devices.
- D. References: Work not subject to more stringent provisions of regulatory agencies and the Contract Documents shall satisfy as a minimum the requirements of:
 - 1. Fire-rated Door Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated doors and frame assemblies that comply with NFPA 80 “Standard for Fire Doors and Windows”, and have been tested, listed, and labeled in accordance with ASTM E152 “Standard Methods of Fire Test of Door Assemblies” by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction. Do not modify or perform field changes to labeled doors or frames to violate the terms and conditions of the specified listing and/or cause voiding of the listing.
 - 2. ANSI/SDI-100: Steel Door Institute, Recommended Specifications Standard Steel Doors and Frames.
 - 3. U.L.: Underwriters Laboratories, Inc.
 - 4. AISI: American Iron and Steel Institute.
 - 5. NAAMM HMM: Specifications for Custom Hollow Doors & Frames by National Association of Architectural Metal Manufacturers.
 - 6. CS242-62: Commercial Standard, U.S. Department of Commerce.
- E. Standards of Manufacturer and Workmanship:
 - 1. Finished Work shall be of uniform profile, accurately fabricated, rigid and strong, square and true, neat in appearance, smooth and free from dents, waves, warps, buckles, open joints, tool marks and/or other defects.

2. Construction joints shall be flush, tight and welded their full length, ground flush and smooth on exposed surfaces.
3. All frame and door reinforcing and hardware provisions shall be performed in the fabrication shop. Provide all cuts, welds, and other fabrications before galvanizing or shop priming.
4. Lines and molded members shall be straight and true with angles as sharp as practical for thickness involved, surfaces flat, and fastenings concealed.
5. Tolerances: Fabricate doors and/or frames to provide a maximum 1/8" gap between side edges of door face and frame after installation, a maximum of 1/8" at top edge, and maximum 1/4" clearance above finish floor, except as otherwise required by floor finish material. Provide maximum 1/8" gap between door edges adjoining stiles or at astragals.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Frames: Before shipment, install temporary spreaders at bottom of bucks and do not remove until frames are installed.
- B. Doors: Provide wrapping as required to protect doors during shipping and storage.
- C. Inspect hollow metal Work upon delivery for damage. Remove and replace damaged items with new Work as required.
- D. Store doors and frames in an upright position at the Project Site under cover from weather related elements. Store units on minimum 4" high wood blocking with 1/2" air spaces between stacked doors to provide circulation. Do not store doors and frames under plastic or canvas shelters. If shipping packaging becomes wet, immediately remove the packaging.

1.06 WARRANTY

- A. Manufacturer shall provide a 2 year material warranty.
- B. Installer shall provide a 2 year labor warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Overly Manufacturing Co., as a standard of quality
- B. Krieger Steel Products, Co.
- C. Steelcraft Manufacturing Co.
- D. Amweld Metal Doors and Frames

2.02 MATERIALS

- A. Steel:

1. Galvanized Carbon Sheet Steel: Furnish best quality, stretcher-leveled, cold-rolled carbon steel conforming to ASTM A526, with ASTM A525, G90 zinc coating (0.30 ounces per square foot per side), with clean, smooth surfaces free of scale, pitting or other defects.
 2. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A526 with ASTM A525 G90 zinc coating (0.30 ounces per s.f. per side).
- B. Sound Deadening Core Insulation: Furnish rigid, unsettling, vermin-proof, and non-combustible fiberglass or rockwool type material to provide required STC and thermal ratings within door fabrications.
- C. Supports and Anchors: Fabricate of not less than 16-gauge sheet metal. Galvanize after fabrication. Units to be installed into exterior walls, comply with ASTM A-153, Class B.
- D. Fasteners: Provide as shown on Drawings and to suit conditions of secure installations. Furnish 304 Grade stainless steel types at exterior doors.
- E. Louvers:
1. Louvers for exterior doors shall be furnished with not less than #12 grille welded to 18 gage steel blades, and removable bronze insert screen on inside. Install louver with tamperproof head through-bolts.
 2. Fusible link louvers: Furnished and listed by the State Fire Marshal, UL labeled and installed with tamperproof fasteners.
 3. Lightproof louvers: Furnished type to be DRDL by Anemostat-West, Carson, CA, or equal.
- F. Vision panels in fire labeled doors and exterior doors shall be framed with FGS-75 Fire Glass Stop by Anemostat-West and shall be State Fire Marshal listed. Frame shall be furnished with manufacturer's standard baked-on enamel finish.
- G. Shop Paint:
1. Conform to Steel Structures Painting Council (SSPC).
 2. Pretreatment/priming coatings shall be compatible with Project site finish painting system per Section 09900.
 3. At frames to be grouted, all surfaces that are inaccessible after installation shall be coated with bituminous or asphaltic base paint.
- H. Grout: Mix shall be non-chloride. Provide a minimum slump with 6 gallons, maximum of potable water (reduced with height in frame) to each sack of Type I/II Portland cement with fine aggregate, natural and of low porosity.

2.03 SHOP FABRICATION

- A. Fabricate steel door and frame units to comply with ANSI A 250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, factory or shop fit and assemble units.
- B. General: Welded Unit Construction: Fabricate hollow metal units so as to be rigid, neat in appearance, and free from defects, warp, or buckle.
 - 1. Accurately form metal to required sizes and profiles. Fit and assemble all units in the manufacturer's plant. Weld all joints continuously; grind, dress, and make smooth, flush, and invisible. Metallic filler to conceal manufacturing defects is not permitted.
 - 2. Corner Joints: Furnish corner joints by mitering, or coping and butting, or a combination of both. In both cases, reinforce with steel angle splines. Trim and backbend shall be continuous around corner. Continuously weld joints for full depth and width of frame and trim.
 - 3. Comply with additional fabrication requirements, finishes, and provisions including hardware and alarm systems.
- C. Exterior Door and Frame Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.
- D. Interior Door Faces: Fabricate exposed faces of doors and panels, from the following material:
 - 1. Cold-rolled steel sheet, unless otherwise indicated.
 - 2. Metallic-coated steel sheet for exterior locations and where indicated.
- E. Clearances for Fire-Rated Doors: As required by NFPA 80.

2.04 FRAMES

- A. General: Provide fully welded steel frames with integral stops and trim for doors, transoms, sidelights, borrowed lights, and other openings complying with ANSI/SDI 100, ANSI A 250.4, and with details indicated for type and profile. Furnish concealed fastenings, unless otherwise indicated.
- C. Metal Gauge of Frames: Thickness indicated are minimum:
 - 1. Interior hollow metal frames up to 4'-0" wide 16 gauge sheet steel
 - 2. Interior hollow metal frames wider than 4'-0" 14 gauge sheet steel
 - 3. All exterior hollow metal frames 14 gauge sheet steel
 - 4. Borrowed lights up to 4'-0" wide 16 gauge sheet steel

- D. Supports and Anchors: Fabricated from at least 0.042 inch thick, electrolytic zinc-coated or metallic-coated steel sheet. Frame anchors shall comply with fire rated label requirements of the opening.
1. Floor Anchors:
 - a. 12 gauge minimum, sheet steel or bent steel plate, securely welded inside each jamb, with two holes in anchor at each jamb for 3/8" floor anchorage fasteners.
 - b. Where required at sloping and uneven floor conditions, or to coordinate adjustments for trim alignments, provide adjustable floor anchors, providing at least 2" height adjustments.
 2. Jamb Anchors:
 - a. Locate anchors near top and bottom and at intermediate points not to exceed 24 inches on center. Provide 2 anchors per head for openings up to 48 inches wide; over 48 inches wide provide anchors at 24 inches on center maximum.
 - b. Furnish glazed openings in frames with steel glazing stops and moulding of sizes indicated for field installation with countersunk oval head sheet metal screws. Stops and mouldings shall be 16 gage material unless otherwise indicated or specified.
 - c. Anchors in masonry construction: Provide adjustable jamb anchors, "Strap-and-Stirrup" type, and 16 gauge minimum sheet steel. Stirrups shall be corrugated, 1-1/2" x 10" minimum size. Steel wire complying with ASTM A510, 0.177 inch in diameter, may be furnished instead of steel sheet.
 - d. Anchors in Stud Partitions: Provide steel anchors, 16 gauge minimum sheet steel, of design to suit partition construction, securely welded inside each jamb.
 - e. Through Frame Anchors: At frames indicated to be anchored with bolts through the frame, provide countersunk holes for bolts with 16 gauge minimum sheet steel stiffeners full thickness of frame, and securely welded inside each frame at each hole.
- E.. Inserts, Bolts, and Fasteners: Provide manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153 Class C or D as required.
- F. Head Reinforcing: Furnish reinforced heads of frames when wider than 42" with steel angles or channel of 12 gauge minimum, full width of frame and factory welded inside frame. Reinforcing shall not act as lintel or load-carrying member and shall comply with fire rating requirements.
- G. Hardware Reinforcement:
1. Butt reinforcing shall be 10 gage minimum.

2. Head assemblies shall be reinforced internally with a full profile, full length, channel-shaped, 12 gage closer reinforcement.
 3. Reinforcing for other items of finish hardware shall be 12 gage minimum.
- H. Mullion and Transom bars: Furnished and fabricated as specified for frames.
- I. Glass Lights: At glazed openings, furnish applied stops with mitered corners, of minimum 20 gauge galvanized steel, one-piece lengths, secured within 3” of ends and at 12” centers with flathead countersunk screws, tamper resistant. Corner joints shall be furnished with contact edges closed tight, with trim faces mitered and continuously welded. Frames for multiple openings shall be provided with mullion and/or rail members, fabricated of closed tubular shapes with no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth. Provide condensate weeps 4’0” on centers, maximum.
- J. Finish: Thoroughly clean surfaces and chemically treat for painting. Inaccessible surfaces shall be painted before assembly. Exposed surfaces of doors, frames and accessories shall be filled, sanded smooth and shall receive manufacturer's standard rust-inhibitive primer until complete coverage is achieved. Interior surfaces of frames shall be factory primed.
- K. Door Silencers: Except on weather-stripped frames, furnish stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

2.05 DOORS

- A. Doors Construction: Custom made, flush panel “seamless type” with one-piece face panels; fully welded seamless construction with no visible seams or joints on faces or on vertical edges.
1. Provide type and size of doors with louvers and openings for glazing where indicated.
 2. Minimum Door thickness: 1 ¾”.
 3. Face Sheet Minimum Gauge: 16 gauge sheet steel.
 4. Stiffeners: Stiffen door face sheets with vertical continuous minimum 20 gauge formed steel (rib) sections, full thickness of interior space between door faces, spaced 6” on center maximum, and spot welded to both faces 4” to 5” on center maximum.
 5. Core Insulation: Sound deadens and insulates entire core of door (full height, width, and thickness of door) with rigid inorganic non-combustible materials, such as fiberglass. Provide STC ratings where indicated on Drawings, scheduled, or partition rating indicated on Drawings.
 - a. Doors, when installed without applied sound seal hardware, shall be provided with the following minimum STC rating: 29
 - b. Exterior doors shall be meet or exceed required thermal rating indicated on Drawings, scheduled, or partition rating.

6. Door Edges: Join door face sheets at vertical edges of door with continuous weld full height of door. Grind, fill, and dress welds smooth to provide invisible seam with smooth, flush surface.
 - a. Door shall be provided with all edges reinforced.
 - b. Close ends of doors with continuous recessed channels, 16 gauge steel minimum, spot welded to both face sheets and profile filler channels at tops of exterior doors to form flush surface. Provide openings in bottom closure of exterior doors to permit escape of entrapped moisture.
 - c. Vertical door edge seams shall be spot welded at approximately 2" on center, filled, ground and finished smooth.
 - d. Profile of Doors Edges:
 - 1) Single-acting swing doors: Bevel both vertical edges 1/2" in 2"
 - 2) Pairs of single-acting swing doors: Bevel hinge edge 1/8" in 2". Form integral center rabbet or edge rabbet, as reviewed by Architect, at vertical meeting edges. Surface mounted astragals are not permitted for labeled or unlabeled doors unless shown on Drawings or required.
 - 3) Double-acting swing doors: Round both vertical edges on 2-1/8" radius.
7. Door Louvers:
 - a. Provide louver with 50% free air.
 - b. Provide all louvers with mesh screens.
 - c. Exterior louvers shall be galvanized sheet metal.
 - d. All louvers shall be furnished with a gray primer.
8. Glass Moulding and Stops:
 - a. Furnish fixed mouldings of 18 gauge minimum sheet steel, integral with and welded to security side of door.
 - b. Finish: Gray primer.
9. Transom: Fabricate to requirements specified for flush doors.
10. Labeled Doors: Where fire-rated openings and conditions are indicated.
 - a. Labeled doors shall be provided with fire-resistance rating indicated and shall be constructed as tested and approved by Underwriters' Laboratories (U.L) for installation in labeled frame and door assemblies.

- b. Gaskets: Provide smoke control gaskets fabricated of silicone rubber for fire-rated doorframes. Gaskets shall be integrally attached to frames during manufacturing. Fastening by self-adhesive strips is not permitted. Gaskets and installation shall conform to requirements of NFPA 105, "Installation of Smoke and Draft Control Door Assemblies."
- c. Fabricate labeled doors with same finished appearance as specified for non-labeled hollow metal doors; with welded door edges, filled and ground smooth; with label affixed to door. Provide heavier gauge materials if required for fire tested door assembly.
- d. Where fire labels are required and continuous hinge is specified, install label on top of door within 6" of hinge side of door.

2.06 FABRICATION PROVISIONS FOR HARDWARE

- A. Hardware Reinforcement: Provide reinforcement for finish hardware items. Mortise, drill and tap to template requirements for mortise type hardware. Reinforcement shall be sheet steel or plate.
 - 1. Butt reinforcing shall be 10 gauge minimum of length 4" longer than length of butt.
 - 2. Door closer reinforcement shall be from the top of door down, 10" high, full width of door, 10 gauge sheet steel as indicated in the detail section of this Specification.
 - 3. Kickplate reinforcement shall be located from the bottom of the door, 12" high, full width of door, 10 gauge sheet steel as indicated in the detail section of this Specification.
 - 4. Gauge and size or reinforcement for hardware items not listed shall be as required by Reference Standards, 12 gauge minimum, or the templates of those items, whichever is heavier.
- B. Silencers: Except for exterior doors, drill and punch frames for three (3) silencers at lock jamb of single swing doors or in double doors with astragal and one (1) silencer per leaf in heads of doubled door frames. Install plastic plugs to keep holes clear during construction.
- C. Plaster Guards: Provide 26 gauge galvanized steel plaster guards or dust cover boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- D. Other Hardware Requirements: Cut, reinforce, drill, and tap doors and frames for other hardware including energy management switches or contacts and security devices in accordance with furnished hardware templates for accessory items.
 - 1. Provide minimum 12 gauge reinforcing or manufacturer's recommendation, whichever is greater.
 - 2. Provide minimum 26 gauge cover boxes behind all hardware cutouts.

3. Fire rated doors shall accommodate mortised or other specified hardware.
4. Install lock strikes with required clearances for silencers and weather/sound stripping.

2.07 SHOP PRIMING

- A. All exposed and concealed carbon steel metal surfaces of all hollow metal doors, frames and other hollow metal Work of this Section, not otherwise finished (galvanized) shall be shop primed.
- B. All exposed metal Work shall be bonderized before shop priming.
- C. All concealed surfaces shall be shop primed before assembly. All exposed surfaces shall be shop primed after assembly
- D. Hollow metal Work shall be shop prime painted by being completely immersed or coated. Items of hollow metal fabrication may be oven baked for fast dry conditions.

PART 3 - EXECUTION

3.01 FRAME INSTALLATION

- A. Install steel frames accurately in location, perfect alignment, plumb, straight and true. Brace frames to prevent displacement.
- B. Anchor frames in concrete and concrete unit masonry with galvanized anchor bolts; 3/8 inch diameter, counter-sunk at 24 inches on center at head and jamb.
- C. Anchor frames in steel and wood frame partitions with manufacturer recommended anchors.
- D. Provide adjustable floor clips for frames.
- E. Install frame at fire rated openings in accordance with NFPA Standard No. 80.
- F. Furnish filler for anchor attachment screws, and sand smooth.

3.02 DOOR INSTALLATION

- A. Install steel doors in accordance with manufacturer's instructions and as indicated on Drawings and finish hardware specifications. Coordinate with the Work of other trades.
- B. Adjust operable parts for correct function.
- C. Remove hardware, except primer-coated items, tag, box and install after finish painting has been completed.

3.03 PRIME COAT TOUCH-UP

- A. Immediately after installation, remove rust, repair damaged surfaces to new condition, sand smooth, and install touch-up primer.

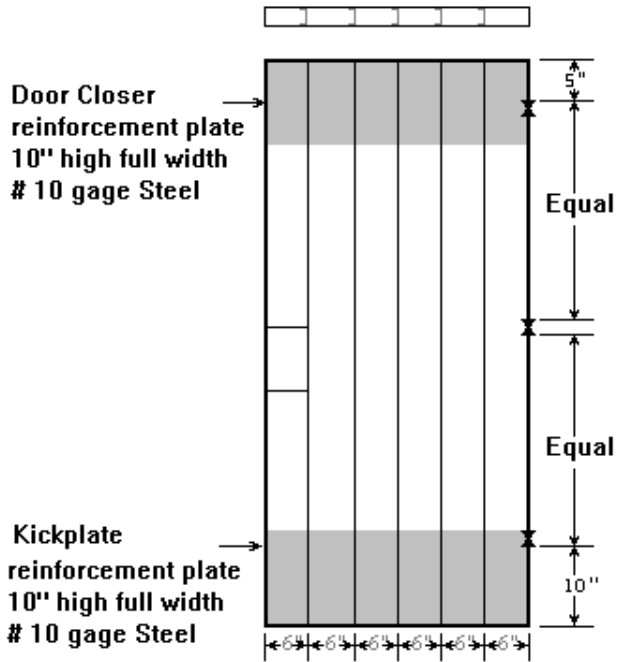
3.04 CLEAN UP

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

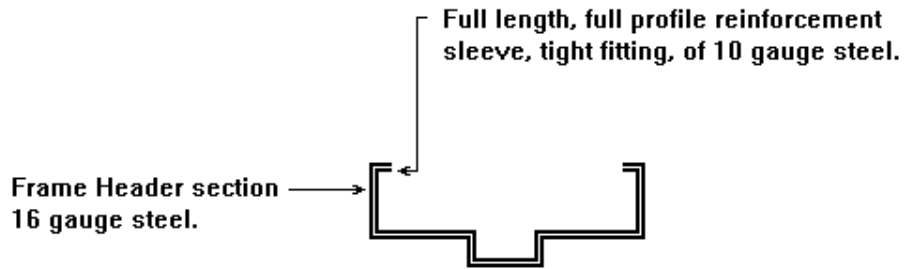
3.05 PROTECTION

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

Detail # 1 - Door Hardware Reinforcement



Detail # 2 - Frame Header Reinforcement
 Door Closer reinforcement for all steel door frames.



END OF SECTION

SECTION 08710
DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Door hardware.
- C. Related Sections:
 - 1. Section 06200: Finish Carpentry.
 - 2. Section 08110: Steel Doors and Frames.
 - 3. Section 16720: Intrusion Detection Systems
- D. Items listed in other sections and not included herein as "Door Hardware"
 - 1. Cabinet hardware.
 - 2. Nameplates, room numbers exit signs.
 - 3. Handicapped signs.
 - 4. Access panels, except padlocks.
 - 5. Gate hardware, except locking devices.

1.02 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Exit doors, including each leaf of a pair of doors, shall always be operable from the inside by the simple turn of a lever or by pushing an exit device without the use of a key or any special knowledge or effort; this includes doors of toilet and storage rooms.
 - 2. Unless otherwise specified, hand activated door opening hardware shall be located 36 inches above the finish floor.
 - 3. Dead bolts are not permitted unless operable with a single effort by a lever type hardware.
 - 4. The force applied to operate exit hardware shall not require more than 15 lbs. applied in the direction of travel.
- B. Regulatory Requirements:
 - 1. Comply with CBC requirements.

2. Hardware for fire doors shall conform to requirements of UL - Fire Protection and Accident Hazard Equipment and the California State Fire Marshal listing, NFPA - 80 and CBC requirements for positive pressure testing.
3. All hardware shall meet the requirements of CCR, T-24, and CBC Sections 1133B.2, 1133B.2.5 and 1008.1.9.

1.03 SUBMITTALS

A. Shop Drawings:

1. Wiring Diagrams: Submit diagrams, templates, instruction, and installation manuals, for electrical and electronic hardware.

B. Product Data: Finish Hardware Schedule:

1. Submit schedule including recap sheet:

- a. Include manufacturer's name, catalog number, relevant dimensions, fasteners, location of item in Work, door index number, frame material, door material, door size and thickness, door type, handing, fire-rating (if any), and sound-rating (if any).
- b. Hardware shall be listed by "Headings" in following manner:

(1) HW NO. 1

1 SINGLE/PAIR OF DOORS NO. (Room and Number) from/to
(Room and Number)

1 SINGLE/PAIR OF DOORS NO. (Room and Number) from/to
(Room and Number)

SPEC. NO. List the appropriate numbers from the specified
LIST OF FINISH HARDWARE

List of finish hardware

(2) HW NO. 2, etc.

C. Material Samples:

1. Submit Samples of door hardware as required by Architect.

- D. Submittal Review Time:
 - 1. In lieu of what is specified in Section 01300, allow at least twenty-eight (28) days in the Milestones Schedule for Architect and/or OAR review following receipt of submittal.

1.04 QUALITY ASSURANCE

- A. Each type of finish hardware furnished for the Work shall be of same make or manufacture, unless otherwise specified. Where existing items are being supplemented with new items, match existing items, subject to current code requirements and ADA accessibility recommendations.
- B. Coordinate and deliver templates or physical Samples of finish hardware items to manufacturer of interfacing items, such as doors and frames, in a timely manner to insure orderly progress of Work.
- C. Comply with the following as a minimum requirement:
 - 1. Conform to Builders Hardware Manufacturers Association (BHMA) Finish Code, latest edition.
 - 2. Comply with ANSI A 117.1 and recommendations of ADA-AG.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Package each item of hardware and each lockset individually, complete with necessary installation instructions, screws and fastenings, and installation templates; marked with item number corresponding to number on Finish Hardware Schedule.

1.06 WARRANTY

- A. Manufacturer shall provide a minimum 2 year material warranty except as follows:
 - 1. Provide a 10 year manufacturer's material warranty for door closers.
 - 2. Provide a 5 year manufacturer's material warranty for locksets and exit devices.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Butts and Hinges:
 - 1. Width of hinges shall be of sufficient size to clear trim. Where provided with magnetic holders, hinge width shall be of sufficient size to ensure door is parallel to wall when magnetic holders are engaged.
 - 2. Furnish one pair of hinges for door leaves up to 5 feet high. Furnish one additional hinge for every additional 30 inches or fraction thereof.
 - 3. Butts for doors shall be non-rising, loose pins, with button tip.
 - 4. Exterior and interior out-swinging doors with butt hinges shall be furnished with hinges furnished with a setscrew in hinge barrel to make pin non-removable (NRP); exterior and interior out-swinging doors hinges shall have

continuous hinges furnished with hospital tips. Butt hinges at exterior out-swinging doors shall have stainless steel pins and bearings.

5. Hinges installed on painted doors shall be BHMA 600 finishes. Hinges installed on stained and varnished doors shall be BHMA 626 or 613 for bronze/brass base metals and BHMA 652 or 641 for steel base metal. Exterior doors shall have non-ferrous hinges. Fire-rated doors shall have steel or stainless steel hinges.
6. Following doors shall be furnished with full-length continuous pin and barrel type hinges:
 - a. Student Multi-Occupancy Toilet.
 - b. 42-inch Wide or Wider Doors.

B. Locksets and Trim:

1. Unless otherwise specified, locks shall be of mortise type, complying with ANSI A156.13, grade 1.
2. Unless otherwise specified, escutcheons shall be 7-1/2 inches by 2-1/4 inches wide x .050 thick minimum.
3. Levers shall be cast, and shall return to within 1/2 inch of face of door.
 4. Outside lever shall be pinned. Inside lever shall be by "Allen Head Set Screw" or by "Spanner Ring Nut".
5. Lock strikes shall be curved lip type, with exposed edges and corners rounded, of sufficient length to protect jamb and trim, and shall not extend more than 1/8 inch beyond trim, jambs or face of doors in pairs. At out-swinging pairs with overlapping astragal, strike shall have a 7/8" lip-to-center dimension. Dust box shall be provided for door locks.
6. Locksets throughout shall be lever type of same manufacture.

C. Exit Devices:

1. Unless otherwise specified, exterior doors shall be furnished with rim touch bar device; right hand reverse active leaf - night latch function x cylinder x hardened cylinder ring x flush pull x sex nut and bolt. Left-hand reverse inactive leaf - exit only x flush pull x sex nut and bolt.
2. Unless otherwise specified, interior doors shall be furnished with rim touch bar device; right hand reverse active leaf-lever handle x cylinder, left hand reverse inactive leaf; exit only.
3. Fire labeled exit devices shall conform to UL label requirements and be listed by the California State Fire Marshal.
4. Exit devices throughout shall be touch bar types of same manufacture.
5. Lever design shall match lock levers.
6. Exit devices shall be furnished sized for the specific door width and height.

7. Panic hardware shall comply with CBC. Section 1008.1.9, (consider that if the device is mounted lower than 36" AFF, the clear opening may be restricted to less than the 32" required clear opening). Panic bar shall be mounted above 36" to 44" above finished floor surface.
8. The unlatching force shall not exceed 15 lbs (66.72N), applied in the direction of travel.
9. Panic hardware shall not be provided with "Night Latch" (NL) function per DS Interpretation 10-08 DSA/AC (External) dated 12/9/08.

D. Door Closers:

1. Door closers shall conform to ANSI A156.4, Grade 1, CBC 1133B.2.5.1 and ADAAG 4.13.10 – Door Closers.
2. Door closers shall be heavy duty, rigid parallel arm; provide regular arm for regular bevel doors.
3. Door closer shall be full rack and pinion type, adjustable back check, and sweep and latch speed with key regulating screws.
4. Provide spacer block or support bracket for securing fifth screw on closer arm shoe. Provide special brackets, shoes, or other attachment devices as required.
5. Maximum pressure to operate doors shall not exceed following:
 - a. Fire rated doors: When fire doors are required, the maximum effort to operate the doors shall not exceed 5 lbs (22.2N), except that, when approved by the appropriate administrative authority, the maximum effort required to operate the doors may be increased not to exceed 15lbs (66.72N). CBC Sections 1008.1.2 and 1133B.2.5 / ADAAG 4.13.11.
 - b. Exterior doors: 5.0 lbs (22.2N)
 - c. Interior doors: 5.0 lbs. (22.2N)
6. Door closers shall be installed at the following:
 - a. Exterior doors.
 - b. Fire rated doors.
 - c. Corridor doors.
 - d. Toilet doors.
7. The sweep period of the closer shall be adjusted so that from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3" from the strike. CBC Section 1133B2.5.1.

- E. Protection Plates: Furnish kick plates of 10 inches x 2 inches less door width on single doors, 10 inches x 1 inch less door width on pairs of doors. Provide one plate for push side of closer-equipped doors. Furnish mop plates of 4 inches x 1 inch less door width

on doors swinging into toilet rooms.

1. Kick and mop plates shall be a minimum 0.050 inch thick; Type 304 stainless steel, with finished beveled edges (B4E).

F. Stops:

1. Floor stops shall not be located in the path of travel and 4" maximum from walls. DSA Policy 99-08.
2. Furnish stop of appropriate height, minimum 3/4" above undercut of door.
3. Where the specified floor stop cannot be installed or would present a pedestrian hazard, omit and furnish a heavy-duty overhead stop (US32D finish); if closer is specified, furnish closer with integral spring-cushion stop arm. Floor stops shall not be located in the path of travel and a maximum of 4" from walls.

G. Weatherstripping/Gasketing:

1. Install gaskets and intumescent seals on fire rated doors and frames.
2. Unless otherwise specified, install weatherstripping on doors from air-conditioned spaces to the exterior: fastener-applied frame seals, nylon-brush door sweeps, and, at pairs, astragals.

H. Thresholds: Unless otherwise specified, thresholds shall comply with CBC Sections 1008.1.6 and 1133B.2.4.1.

I. Push Plates: Plates shall be 0.050 thick, 6 inches x 16 inches minimum, with beveled edges.

1. Door Pulls: Pulls shall have protective plate mounted under pull, 0.050 inches thick, 4 inches x 16 inches beveled on 4 edges.
2. Hardware Cutouts: Pull plates and push plates installed over locking hardware shall have cylinder and turn lever cutouts as required.

J. Automatic Flush Bolts:

1. Strike plates for automatic bolts shall be provided for active door.
2. Provide dust proof strikes for bottom bolts.

K. Coordinators:

1. Provide brackets as required for items fastened to coordinators.
2. Provide door strike plates for both doors with coordinators.

L. Smoke Detectors and Magnetic Holders: Coordinate electrical devices with Division 16 and the Drawings.

M. Fasteners: Shall match finish of hardware. Provide fasteners for all hardware at toilet rooms, custodian rooms, kitchen doors, and exterior doors: stainless steel for chrome, aluminum, or stainless finish hardware; brass or bronze for brass or bronze finish

hardware.

2.02 FINISH

- A. Unless otherwise specified, finish of hardware shall be dull chromium-plated BHMA 652 or oil-rubbed bronze BHMA 641 for steel-based metals, BHMA 626 or 613 for brass-based metals, except for kickplate, levers, escutcheons, push plates, continuous hinges, lock strike plates, and exit device touch bars, which shall be BHMA 630. Levers for locksets and exit devices shall be BHMA 630 or 613.
- B. Unless otherwise specified, overhead door closers and brackets shall be BHMA 689 or 690, to match other finish hardware in same room or space.

2.03 CYLINDERS AND KEYING

- A. Project shall be keyed in accordance with keying schedule, prepared and furnished by the OAR.
- B. Provide a cylinder security collar at each exterior door cylinder. Provide cylinder collars and spacers at all cylinders as needed to provide a neat, tight and secure fit of the cylinder to the locking hardware.
- C. Permanent Cylinders:
 - 1. Permanent cylinders shall be interchangeable core type, 7-pins maximum.
Permanent cylinders as manufactured by Best Access Systems shall be Owner furnished.
 - a. Change keys and master keys shall operate inside and outside cylinder on 2 cylinder locks, unless otherwise indicated.
- D. Key Control:
 - 1. Permanent cylinders and sample set of permanent keys shall be not used during the construction phase of the Project. Temporary construction cylinders and keys used for securing the Work is included as part of the Work of this section and will not be provided by the Owner.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Finish hardware shall be installed as specified in Finish Hardware Schedule.
 - 1. Placement of Hardware: Finish hardware shall be installed as indicated on hardware placement sheets attached to end of this section. Mounting height of latching hardware shall be 30" to 44" above the finished floor surface per CBC Section 1133B.2.5.2.
 - 2. Provide necessary screws, bolts, anchors, and fastenings, of required sizes and type for proper installation of hardware. Exposed screws shall have Phillips heads, and wood screws shall be fully threaded.
 - 3. Fitting: Hardware shall be accurately fitted and, with exception of prime-

coated butt or continuous hinges, bar-type coordinators, and flat astragals, shall be removed before finish painting is installed. Upon completion of finish painting and/or sealing, permanently install the hardware.

4. Anchorage of Hardware: Hardware fastened to concrete, masonry, or gunite construction, shall be provided with drop-in expansion anchors by "Red Head Multi Set II" or "Rawl Steel". Pilot holes of suitably lesser diameter shall be drilled prior to the insertion of wood and sheet metal screws.
5. Door escutcheons and push plates shall be installed with stainless steel or bronze, oval, "Phillips Head", fully threaded screws, not less than 3/4 inch - No. 6.
6. Exit devices shall be mounted with non-ferrous sex nuts and fully threaded machine screws, except where through bolts engage outside trim of locking case.
7. Mullion strike shall be installed with fully threaded machine screws.
8. Door closer shall be installed for maximum degree of opening of each door.
9. Following shall be installed with sex nuts and fully threaded machine screws.
 - a. Door closers.
 - b. Door pulls.
10. Install exterior doorstops as required. On new concrete, stops shall be installed with 1/4-20 screws. On asphalt concrete, stops shall be installed with 1/4-20 screws to an anchor plate set in a concrete monument. Anchor plate shall be Trimco 1268, or equal. Floor stops shall not be located in the path of travel and shall be located no more than 4 inches from walls.
11. Kickplate:
 - a. Kickplates shall be installed with screws at each corner, and screws evenly spaced along each side not more than 3 inches apart on centers.
 - b. Except on wood doors, screws shall be undercut pan head.
12. Thresholds shall be installed with 1/4-20 screws, Pour-Roc, and coped to trim.
13. Sound Seals and Weatherstripping / Gasketing:
 - a. A mounting screw shall be installed within 2 inches of cuts or corners of weatherstripping and/or gasketing.
 - b. Sound seals and weatherstripping and/or gasketing shall be installed with No. 8 - 3/4 inch Tek Phillips pan head screws.

3.02 ADJUSTING AND CLEANING

- A. Before Substantial Completion, hardware shall be cleaned and inspected. Where hardware is deemed defective, repair or replace as required.
- B. Door Closers: Final adjustments shall be performed before Substantial Completion,

with mechanical system balanced and in operation.

3.03 EXAMINATION

- A. Upon completion of installation, verify correct installation of hardware, according to reviewed Hardware Schedule and Keying Schedule. Verify that all finish hardware is in optimum working condition.

3.04 PROTECTION

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

3.05 FINISH HARDWARE SCHEDULE

HW-01

PAIR DOOR No. 3 EXTERIOR

PROVIDE NEW HOLLOW METAL DOORS, FRAMES AND HARDWARE.

2	EA	CONTINUOUS HINGE	FM-HD	628	PEM
1	EA	DOUBLE BOLT	3900	630	TRI
1	EA	EXT STORERM LOCK	L9080D 06A L283-50	630	SCH
1	SET	TEMP & PERM'T CORES	CB807, + TEMP CORE	626	FAL
1	EA	DOOR PULL	VR900LLP	630	IVE
1	EA	ASTRAGAL	357SP SNB		PEMKO
1	EA	TOP DRIP	346 4"MDW		PEMKO

HW-02

SINGLE DOORS No. 1 & 2 EXTERIOR

PROVIDE NEW HOLLOW METAL DOORS, FRAMES AND HARDWARE

1	EA	CONTINUOUS HINGE	FM-HD	628	PEM
1	EA	DOUBLE BOLT	3900	630	TRI
1	EA	EXT STORERM LOCK	L9080D 06A L283-50	630	SCH
1	SET	TEMP & PERM'T CORES	CB807, + TEMP CORE	626	FAL
1	EA	DOOR PULL	VR900	630	IVE
1	EA	TOP DRIP	346 4"MDW		PEMKO

END OF SECTION

SECTION 09220

PORTLAND CEMENT PLASTER AND METAL LATH

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Lath and Portland cement plaster and stucco as indicated.
- C. Related Sections:
 - 1. Section 06100: Rough Carpentry.

1.02 DESIGN REQUIREMENTS

- A. Provide pre-formulated products that require only addition of clean water for mixing.

1.03 SUBMITTALS

- A. Shop Drawings: Submit elevations and details indicating locations and types of components, splices, connections and accessory items. Indicate locations and types of framing substrates.
- B. Material Samples: Submit 48 inch x 48 inch Samples of each stucco and Portland cement plaster texture for review. Samples shall be representative of texture, color, and proposed workmanship. Maintain reviewed Samples on Project site for reference.
- C. Product Data: Submit manufacturer's catalog data for each material and component proposed for installation.
- D. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.04 QUALITY ASSURANCE

- B. Comply with the following as a minimum requirement:
 - 1. ANSI A42.3 Lathing and Furring for Portland Cement Based Plaster, Exterior and Interior.
 - 2. Federal Specifications (FS):
 - a. UU-B-790a - Grade D Building Paper, Vegetable Fiber: (Kraft Waterproofed, Water Repellent and Fire Resistant).

- b. QQ-L-101a - Federal Specification for Lath, Metal and other Metal Plaster Bases.
3. ASTM Standards:
- a. ASTM A 570 - Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.
 - b. ASTM A 611 - Steel, Cold-Rolled Sheet Carbon, Structural Quality.
 - c. ASTM A 641 - Zinc-Coated (Galvanized) Carbon Steel Wire.
 - d. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated by the Hot-Dip Process.
 - e. ASTM C 150 - Portland Cement.
 - f. ASTM C 206 - Finishing Hydrated Lime.
 - g. ASTM C 841 - Installation of Interior Lathing and Furring.
 - h. ASTM C 897 - Aggregate for Job Mixed Portland Cement Based Plasters.
 - i. ASTM C 926 - Application of Portland Cement Based Plaster.
 - j. ASTM C 933 - Welded Wire Lath.
 - k. ASTM C 1047 - Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - l. ASTM C 1509 - Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - m. ASTM E 11 - Wire-Cloth Sieves for Testing Purposes.
- C. Exterior and Interior Lath: Where lath is fastened to horizontal wood supports, comply with CBC requirements.
- D. Plaster: Conforming to general requirements of Stucco Manufacturers Association - Specifications and Standards for Manufactured Stucco Finishes.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect metal lathing and plastering materials before, during and after installation. In event of damage immediately provide required repairs and replacements.
- B. Deliver and store Portland cement materials on the Project site in a manner to provide protection from exposure and damage by moisture. Pile materials to permit easy access for proper inspection and identification of each shipment. Stockpile adequate supplies of sand on the Project site to permit sampling and testing before installation. Store to avoid inclusion of foreign material.

- C. Deliver stucco to the Project site in manufacturer's sealed and labeled packages.

PART 2 - PRODUCTS

2.01 LATH AND ACCESSORY MATERIALS

- A. Each bundle of lath shall be sealed with a metal tag bearing the lath designation, weight and manufacturer's name.
- B. Expanded Metal Lath: ASTM C 841, small diamond mesh expanded metal lath, 3.4 pounds per square yard, expanded from steel sheets with hot-dip galvanized coating G60 in accordance with ASTM A 653. Lath shall be self-furring type for installation over sheathing, flat type for installation over spaced framing; and 3/8 inch ribbed lath for soffits and ceilings.
- C. Backing for Metal Lath: Reinforced, laminated water resistant paper backing conforming to Fed Spec UU-B-790A (1), manufactured by Fortifiber Corp. Super Jumbo Tex, USG, Inryco or Western Metal Lath. Paper backings shall provide flame spread rating of 25 or less when tested according to ASTM E 84 and shall bear UL label. Furnish for exterior plastering (except on soffits and ceilings), and for mortar-set ceramic wall tile.
 - 1. Furnish paper Grade D, 60 minute rating, on wood studs without sheathing, and on plywood sheathing.
 - 2. Furnish Grade B, 16-hour rating, on gypsum sheathing.
- D. Corner and Strip Reinforcing Lath: Flat or shaped lath reinforcing units, galvanized metal or wire lath types, no less than 2.5 pounds per square yard, outstanding legs minimum of 2 inches for wire lath and 3 inches for metal lath when formed for angle reinforcing. Furnish galvanized type for installation with galvanized metal lath.
- E. Plastering Accessories: Minimum 26 gage galvanized steel with expanded wings. PVC and zinc alloy are not permitted. Furnish casing beads, expansion screeds, foundation screeds, ventilating screeds and other items as indicated or required.
 - 1. Exterior Expansion Screeds: Sizes and profiles indicated or required, furnished with expanded wings unless otherwise indicated or required by installation.
 - 2. Drip Screed: Similar to Superior No. 10.
 - 3. Casing Beads: Milcor, Superior, USG, or equal, similar to Milcor Type 66 by 7/8 inch high for exterior plaster.
 - 4. Exterior Corner Reinforcement: Woven wire type with longitudinal wires, galvanized.
 - 5. Ventilating Screeds: Alabama Metal Industries, or equal, soffit vent screed, perforated web type, with integral plaster grounds.

- 6. Foundation Weep Screeds: Alabama Metal Industries, or equal, integral plaster ground and weep screed.
- F. Screws: USG Type S and Type S12, "ClimaSeal" finish.
- G. Wire for fastening lath to metal framing, fastening lath together and fastening corner beads, metal grounds and base screeds to lath and framing shall be 18 gage, galvanized conforming with ASTM A 641.
- H. Nails: 11 gage roofing nails, 7/16 inch head, barbed, diamond point, zinc-coated, 1-1/2 inch long for horizontal application; 1 inch long for vertical application. Furnish watered furring nails for fastening lath to wood framing.

2.02 PLASTER MATERIALS

- A. Exterior Stucco: As manufactured by California Stucco, LaHabra, Highland Stucco, or Merlex Stucco, Inc. Furnish formulations requiring only addition of water for installation. Sand shall pass the No. 20 sieve. Mix and sand shall provide the specified finish. Furnish integral colored stucco in color as selected by Architect.
- B. Portland Cement: ASTM C 150, Type II, low alkali.
- C. Hydrated Lime: ASTM C 206, Type S.
- D. Finish Coat Plaster: Highland "Exterior Stucco," or equal, factory formulated blend of portland cement, hydrated lime, aggregates and color, requiring addition of water only at the Project site.
- E. Water: Clean, potable and from domestic source.
- F. Waterproofing Admix: Red Label Suconem by Super Concrete Emulsions Ltd., AntiHydro, or equal.
- G. Plaster Bonding Agent: "PlasterWeld", manufactured by Larsen Products Co., Jessup, MD, Upco Bonding Adhesive No. 705, or Merlex Stucco "Acrylex".
- H. Sand: Washed natural sand conforming to ASTM C 144, except gradation of sand shall be as follows:

Percentage retained, each sieve, by weight:

<u>Sieve Size</u>	<u>Maximum</u>	<u>Minimum</u>
No. 4	0	0
No. 8	10	0
No. 16	40	10
No. 30	65	30
No. 50	90	70
No. 100	100	95

- I. Base Coat Reinforcement: Alkali resistant fiberglass shorts, 1/2 inch chopped strands, Type AR, manufactured by OCF, PPG Industries, or equal.

J. Plaster Patching Materials:

1. Bonding Agent: Acrylic resin type, Acryl 60, LHP Bonder, or equal.
2. Patching Plaster: Manufactured by Merlex Stucco, Inc., Orange, CA, or equal. Furnish fast setting, compatible with existing plaster materials, "Exterior Pronto Patch," Portland cement base coat material, requiring only addition of water. Material shall provide initial set within 20 minutes, and final set within one hour.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that overhead or concealed Work is finished, completed, tested and inspected as required before starting Work of this Section.

3.02 LATH INSTALLATION

- A. General: Where exterior and interior lath is fastened to horizontal wood supports, the current edition of the CBC shall be complied with. Refer to Section 01420: Testing and Inspection.

B. Exterior Lathing, General:

1. Application of Metal Lath: Metal lath or wire fabric lath shall be installed in accordance with the provisions of CBC current editions. Lath shall be furred out from vertical supports or backing not less than 1/4 inch.
2. Self-furring lath meets furring requirements. Furring of expanded metal lath is not required on supports providing a bearing surface width of 1-5/8 inch or less.
3. Where external corner reinforcement is not installed, lath shall be furred out and carried around corners, extending and fastened to at least one support.
4. A weep screed shall be provided at or below foundation plate line on exterior stud walls. Screed shall be installed a minimum of 4 inches above grade and shall be of a type permitting water to drain to exterior of building. Weather-resistant barrier and exterior lath shall cover and terminate on attachment flange of screed.

3.03 INSTALLATION-WEATHER BARRIER MEMBRANE

- A. Install one layer of underlayment over areas to receive lath with weather barrier membrane. Install horizontally with each course weatherlapped 2 in. over layer below. Over wood based sheathing, install a second layer with laps offset from the first layer.

- B. Install lath over underlayment in accordance with manufacturer's instructions.

- C. Install single ply self-adhesive waterproofing membrane per manufacturer's

recommendations in areas indicated on the Drawings.

3.04 PLASTER APPLICATION - GENERAL

- A. Install plaster in conformance with ASTM C 926.
- B. Install each plaster coat to an entire wall or ceiling panel without interruption to avoid cold joints and abrupt changes in uniform appearance of succeeding coats. Wet plaster shall abut existing plaster at naturally occurring interruptions in plane of plaster (such as corner angles, openings and control joints) wherever possible. Cut joining, where necessary, square and straight and at least 6 inches away from a joining in preceding coat.
- C. Provide sufficient moisture in plaster mix or by curing methods to permit continuous and complete hydration of cementitious materials, considering climatic and Project site conditions.
- D. Provide sufficient time between coats to permit each coat to cure or develop enough rigidity to resist cracking or other damage when next coat is installed.

3.05 EXTERIOR PLASTERING

- A. Concrete surfaces, except where noted as "Exposed Concrete" or "Painted Concrete," shall be finished with stucco dash finish coats, as specified.
- B. Preparation of Surfaces:
 - 1. Exterior concrete and masonry surfaces to be plastered shall be free of oily or waxy substances, and loose or foreign material. Uniformly spray with nozzle-type water spray at least 12 hours before installation of plaster.
 - 2. Concrete and masonry surfaces to receive 5/8 inch thick Portland cement plaster shall be treated with bonding agent. This surface preparation shall not be installed instead of a brown coat of plaster.
 - 3. Concrete surfaces to receive stucco dash finish shall be lightly sandblasted to provide a roughened surface.
 - 4. Verify that lath has been installed securely and that grounds, screeds, casing beads and other accessories are straight, in correct position, and securely fastened in place.
- C. Number of Coats and Thickness: Exterior plaster shall be portland cement as follows with minimum thickness from face of supports or surfaces to finish face of plaster as follows:
 - 1. Lathed Surfaces: 3 coats, scratch, brown and finish, 7/8 inch thick, one inch thick where required by CBC.
 - 2. Stucco Dash Finish Coats: 2 coats, 1/8 inch thick.
 - 3. Concrete and Masonry Base: 2 coats, brown and finish, 5/8 inch thick.

D. Proportions:

1. Proportion ingredients for Portland cement. Calibrated boxes are required to determine the accuracy of proportioning. Proportions shall adhere to current edition of CBC.
2. Dash Bond Coat: Mixed in the proportion of 1 cubic foot of standard portland cement to 1-1/2 cubic feet of sand.
3. Stucco Finish: Stucco shall be factory prepared, exterior type, colored stucco containing a portland cement base, required aggregates and mineral pigments. Colors shall be as selected by the Architect. Selected colors are not limited to standard stock colors and certain Work, such as ceilings, soffits and walls, may be finished in non-standard colors as selected.

E. Mixing: Provide stucco mix, plaster and aggregate in proportions specified, furnishing only sufficient water to obtain proper consistency before installation. Do not mix any more material at any time than can be installed within 1/2 hour after mixing. Do not allow material to remain in mixer or mixing boxes overnight. Maximum allowable slump shall be 2-1/2 inch, based on a 2 inch x 4 inch x 6 inch slump cone.

F. Application:

1. Dash Bond Coat: Dash on surface, leave undisturbed, and maintain damp for at least 24 hours following installation.
2. Scratch Coat: Install with sufficient material to completely cover laths and scratch across supports.
3. Brown Coat: Rod to a straight, true, even surface and float to receive finish coat.
4. Stucco Finish Coat: Install in 2 coats to a total thickness of 1/8 inch, each coat covering surface uniformly. First coat shall be installed to form texture pattern and second coat shall provide uniform color and texture.
 - a. First coat shall be installed by providing several passes with nozzle to completely cover surface.
 - b. The second coat shall be installed by doubling back same day, when first coat is sufficiently dry.
 - c. Over concrete surfaces, second coat shall be installed 24 hours after installation of first coat. In warm weather, first coat shall be cured by light water spray after material has set.
 - d. Protection: Protect those surfaces, which are not to receive dash finish coats. Such surfaces shall be shielded and shall have any sand left from dashing operation removed.

G. Curing Exterior Plaster: Adhere to current edition of CBC for curing requirements.

- H. Option for Machine Application, Scratch and Brown Coats: Instead of hand installed plaster, the furnishing of plastering machines for interior or exterior scratch and brown coats is permitted. Machine installation shall be in accordance with the following:
1. Qualifications: Provide proper equipment and apparatus.
 2. Apparatus: Pump shall be equipped with an air pressure gage and required safety devices. Hoses and connections shall be tight and pressure shall be maintained constant.
 3. Tests: Tests for determining proper consistency of plaster mix shall be taken at nozzle using slump cone method. Tests shall be observed by the IOR at least twice each day and as often as deemed necessary. Perform required tests and maintain an accurate log of such tests to ascertain compliance with material slump requirements. Material slump shall not exceed 2-1/2 inches at nozzle. Furnish an adequate number of standard 2 inch x 4 inch x 6 inch slump cones for testing. Cones shall be on the Project site before Work is started and at all times during performance of the Work of this section.
 4. Proportion and Application: Proportioning, mixing, number of coats and thickness shall be same as specified for hand application. Cement aggregate and water shall be mixed to plaster machine. Plaster mix shall be projected into and conveyed through a hose to the nozzle at end of hose and deposited by pressure in its final position ready for manual straightening and finishing.
 5. Follow-Up: Perform scoring operation of plaster, based on settings and drying conditions at time of installation. Curing shall be as previously specified.
 6. Protection: Before installing any plaster, thoroughly protect other adjacent Work.

3.06 INTERIOR PLASTERING – NOT USED

3.07 QUALITY CONTROL

- A. Finish interior and exterior plaster to a uniform texture, free of imperfections and flat within 1/8 inch in 5 feet. Form a suitable foundation for paint and other finishing materials. Avoid joining marks in finish coats.

3.08 TESTING

- A. Samples of sand shall be obtained at the Project site. Tests may be performed as deemed necessary by the IOR.
- B. Provide a supply of 6 inch x 4 inch x 2 inch cones for slump testing of Portland cement plaster. Samples of plaster taken at nozzle shall have a maximum slump of 2-1/2 inches. Plaster material not complying with this requirement shall be deemed as defective Work.

3.09 REPAIR REQUIREMENTS FOR DAMAGED PLASTER

A. Plaster Detached from Framing:

1. Remove loose and broken plaster.
2. Repair or replace damaged water-resistant backing and lath in compliance with specified standards.
3. Remove stucco finish from surrounding area in the same plane by sandblasting.
4. Install a scratch coat and a brown coat mixed with liquid bonding agent instead of water to the areas devoid of plaster.
5. Install a coat of liquid bonding agent to entire wall plane.
6. Install a 1/8 inch thick stucco finish coat to entire wall plane and match existing texture and color.

B. Cracked Plaster - Unpainted:

1. Remove loose material from crack with a wire brush.
2. Remove stucco finish from entire wall plane by sandblasting.
3. Fill crack with slurry of stucco and liquid bonding agent.
4. Install a coat of liquid bonding agent to entire wall plane.
5. Install 1/8 inch thick stucco finish to entire wall plane and match existing texture and color.

C. Cracks Larger Than 1/2 inch - Painted:

1. Remove loose material from crack with a wire brush.
2. Fill crack with slurry of one part plastic portland cement to 3 parts masonry/stucco sand and liquid bonding agent to match existing texture of adjacent surface.
3. Paint entire wall plane, color to match existing.

D. Where patching of plaster over existing lath is feasible, fasten loose lath and install new lath with nails at 6 inch centers. Where metal is furnished, lap new lath over existing 6 inches and tie at 6 inch centers. Install paper backings as required, shingled into existing. Spray existing gypsum lath with water over a period of several hours to moisten it thoroughly. Install a bonding coat to the cut edges of existing plaster and plaster as specified above. Work deemed to be defective, shall be removed and replaced as required.

E. Patching of Holes, Cracks, and Gouges: Holes, cracks, gouges, missing sections, and other defects in existing improvements shall be patched. For holes over 1 inch in size,

cut small sections of lath and place in opening attached to existing material. Install 3 coats of plaster. For holes one inch and smaller, install bonding agent to existing surfaces and neatly fill hole with plaster, installing necessary coats to match adjacent surfaces, eliminate cracks and match existing surface texture. Cracks, gouges, and other defects shall be filled with plaster or spackle as required and neatly finished to match adjacent existing improvements.

3.10 CLEANING

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

3.11 PROTECTION

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

END OF SECTION

SECTION 09250
GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Gypsum board systems and accessory components as indicated.
- C. Related Sections:
 - 1. Section 06100: Rough Carpentry.

1.02 SYSTEM DESCRIPTION

- A. Design Requirements: Provide systems capable of resisting deflection as required by CBC and authorities having jurisdiction.
- B. Regulatory Requirements: Comply with CBC requirements for design and installation.

1.03 SUBMITTALS

- A. Material Samples: Submit 18 inch x 18 inch Samples of the texture coat of gypsum board panels with edges taped.
- B. Product Data: Submit manufacturer's catalog data for each product proposed for installation.

1.04 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
 - 1. ASTM C 36 - Gypsum Wallboard.
 - 2. ASTM C 840 - Application and Finishing of Gypsum Board.
 - 3. ASTM C 841 - Installation of Interior Furring.
 - 4. ASTM C 1002 - Steel Drill Screws for the Application of Gypsum Panel Products.
 - 5. ASTM C 1047 - Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - 6. NFPA or UL requirements for fire-rated assemblies per ASTM E119.

7. Fire Resistance Rated Assembly Characteristics: Provide materials and construction identical to those tested in accordance to ASTM E 119 by an independent testing and inspection agency acceptable to authorities having jurisdiction.
 - a. Fire Resistance Ratings: Indicated by design designations from UL “Fire Resistance Directory”.
8. GA 214 - Gypsum wallboard finish shall conform to requirements of GA 214, and as specified herein. Levels required for the Work are described as follows:

LEVELS OF GYPSUM BOARD FINISH					
Level	Joints	Interior Angles	Accessories	Fasteners	Surface
1	Tape set in compound	Tape set in joint compound			Tool marks and ridges acceptable
2	Tape set in joint compound and one separate coat of joint compound	Tape embedded in joint compound and wiped to leave a thin coat of compound over tape, and one separate coat	Covered by one separate coat of joint compound	Covered by one separate coat of joint compound	Free from excess joint compound. Tool marks and ridges acceptable.
3	After taping, cover with two separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 3 separate coats of joint compound	Smooth and free of tool marks and ridges *
4	After taping, cover with 2 separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 3 separate coats of joint compound	Smooth and free of tool marks and ridges *
5	After taping, cover with 2 separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 3 separate coats of joint compound	Skim coat of joint compound applied to entire surface. Surface free from tool marks and ridges. *

*At completion of specified taping and finishing, install one coat of high solids primer as specified hereafter.

B. Qualifications:

1. Installer: Minimum 5 years experience in installing and finishing gypsum board.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, factory sealed packages, containers or bundles bearing brand name and name of manufacturer.
- B. Materials shall be kept dry. Gypsum wallboard shall be neatly stacked flat; avoid sagging and damage to edges, ends and surfaces.
- C. Fire-rated materials shall have fire classifications numbers attached and legible.
- D. Provide all means necessary to protect gypsum board systems before, during, and after installation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Gypsum Board:

- 1. Type X (fire-resistant), 5/8 inch thick 48 inch wide, up to 16 feet long conforming to ASTM C 36 with long edges tapered.
- 2. Water resistant, WR, 5/8 inch thick, 48 inch wide, up to 16 feet long conforming to ASTM C 630 with long edges tapered.

GYPSUM PANEL SYSTEM				
Panel	Fasteners	Jt. Tape	Jt. Treat.	Panel Source
5/8" SHEETROCK regular, FIRECODE Core, or FIRECODE C Core Gypsum panels	Wood: 1 3/8" drywall nails or 1" 8-18x.323 drywall screws. Steel: 1" 8-18x.323 Type S or S-12 drywall screw.	SHEETROCK paper tape regular or Heavy	SHEETROCK Setting Type, Lightweight Setting, SHEETROCK Taping, Topping, or All-Purpose, SHEETROCK Ready-Mixed Taping, Topping, or All-Purpose, or SHEETROCK Lightweight All-Purpose or Ready-Mixed - Plus 3	United States Gyp. Co. 125 S. Franklin St. Chicago, IL 60606 1-800-289-4874
5/8" Georgia Pacific, Type X, Type T, or Type TG-C (Fire-Rated)	Wood: 1 3/8" drywall nails or 1" 8-18x.323 drywall screws. Steel: 1" 8-18x.323 Type S or S-12 drywall screw.	SHEETROCK paper tape regular or Heavy	Same as above	Georgia Pacific
5/8" Gold Bond regular, Fire-Shield or Fire-Shield C gypsum wallboard	Wood: 1 1/2" drywall nails or 1 1/4" Rock-On drywall screws. Steel: 1 1/4" Rock-On Type S or S-12 drywall screw.	ProForm Joint Tape, ProForm Multi-Flex Tape Bead or Sta-Smooth HS Tape.	ProForm Multi-Use Joint Compound, All Purpose, Lite, Triple-T, Topping, or Easy Finish All Purpose, Light Weight, Topping, or Sta-Smooth, Lite, or HS Joint Compound.	Gold Bond National Gypsum Co. 2001 Rexford Rd Charlotte, NC 28211

B. Fastenings:

1. ASTM C 1002 Type W 1-1/4 inch long for wood framing (for single-layer panels). Screws shall be furnished with a corrosion-resistant treatment.

C. Metal Trim: ASTM C 1047, fabricated from minimum 26 gage galvanized, treated for adhesion of joint compound and paint, and with slotted, drilled or punched perforations in flanges or special joint compound attached paper-faced beads as manufactured by USG, Beadex or National Gypsum. Trim units shall be of size and type to fit gypsum board construction and shall include corner beads, casings, edge trim and other shapes indicated and required.

D. Finishing Materials:

1. High solids primer to be SHEETROCK Brand First Coat manufactured by USG or High-build primer by Sherwin Williams.
2. Texture coat finish material shall be manufactured by the U.S. Gypsum, Hamilton, or Highland Stucco and Lime Products, Inc.

E. Sheathing and Backing Board: Provide one of the following, as indicated:

1. Cementitious Backing Panels: Water-resistant cementitious panels reinforced with a fiberglass scrim, complying with ANSI A118.9.

CEMENT TILE BACKER				
Panel	Fasteners	Jt. Tape	Jt. Treat.	Panel Source
5/8" DUROCK Cement Board	Wood: 1 1/2" gvanized roofing nails or 1 1/4", 1 5/8", or 2 1/4" DUROCK No. 8 wood screws. Steel: 1 1/4" or 1 5/8" DUROCK No. 8 screws.	DUROCK glassfiber tape	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1 acrylic latex modified dry-set mortar or ANSI A118.4 Latex portland cement mortar.	United States Gyp. Co. 125 So. Franklin St. Chicago, IL 60606 1-800-289-4874
5/8" Wonderboard Cement Backerboard	Wood: 1 1/2" galvanized roofing nails or 1 1/4" SuperiorBilt Concrete Backerboard screws. Steel: 1 1/4" SuperiorBilt Concrete Backerboard screws.	2" glassfiber tape (Alkali resistant)	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1 acrylic latex modified dry-set mortar or ANSI A118.4 Latex portland cement mortar.	Custom Bldg Products Seal Beach, CA 1-800-272-8786
5/8" Hardy Board Cement Board	Wood: 1 1/2" galvanized roofing nails or 1 1/4", 1 5/8" Rock-On Type-S screws. Steel: 1 1/4" or 1 5/8" Rock-On Type S-12 screws.	glassfiber tape (Alkali resistant)	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1 acrylic latex modified dry-set mortar or ANSI A118.4 Latex portland cement mortar.	

2. Screws for board attachment: ASTM C 1002.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Metal Trim:

1. Provide corner beads at outside corners and angles, metal casing where gypsum board terminates at uncased openings, metal edge trim where board edges abut horizontal and vertical surfaces of other construction.
2. Install trim in accordance with manufacturer's directions and fasten to framing with proper fasteners through flange perforations. Install trim in longest practical pieces.

B. Gypsum Board:

1. Install gypsum board in conformance with ASTM C 840.
2. Gypsum board shall be cut by scoring and breaking or by sawing, working from face side. Where board meets projecting surfaces it shall be scribed and neatly cut. Unless conditions require otherwise, gypsum board shall be installed first to ceilings, then to walls. End joints shall occur over a support. Install panels of maximum practical length so a minimum number of end joints occur.
3. End joints shall be staggered and joints on opposite sides of a partition shall be arranged to occur on different studs. Joint layout at openings shall be installed so no end joints will align with edges of openings.
4. Except where specified otherwise, fasteners shall be spaced not less than 3/8 inch from edges and ends of gypsum board. Do not stagger fasteners at adjoining edges and ends.
5. Install gypsum board vertically or horizontal as permitted by specific UL Design at walls. Fasten board with drywall screws spaced not to exceed 8 inch on centers around perimeter of boards and 8 inches on centers on intermediate studs. Space screws at 8 inches on centers along top and bottom runners. Screws shall be driven to provide screwhead penetration just below gypsum board surface without breaking surface paper. Where electrical outlet and switch boxes are indicated, provide adjustable attachment brackets between studs.
6. Install gypsum board to ceiling framing with long dimension at right angles to furring channels, or wood framing members, and fasten with specified drywall screws or nails spaced 6 inch to 7 inch on centers across board. Screws or nails shall be not less than 1/2 inch from side joints and 3/8 inch from butt end joints. Abutting end joints shall occur over furring channels and end joints of boards shall be staggered. Support cutouts or openings in ceilings with furring channels.
7. Install access doors, furnished under another section, in correct location, plumb, or level, flush with adjacent construction, and securely fastened to framing.

3.02 TOLERANCES

- A. Install gypsum board flat within 1/8 inch in 10 feet.

3.03 JOINT TREATMENT AND FINISHING

- A. Conform to GA 214-M and the following.
- B. All Levels: Install tape bedding compound, tape, and finishing cement on joints in wallboard as required for specified levels of finish.
- C. Levels 2 through 5:
 - 1. Install joint cement and finishing cement over screw heads. Treat all inside corners with joint cement, tape, and finishing cement. Treat outside corners with corner beads and finishing cement.
 - 2. Provide metal casing beads at all edges of gypsum wallboard, which abut ceiling, wall, or column finish, and elsewhere as required, such as openings, offsets, etc. Install all exposed joints, trims, and attachments non-apparent following installation of paint or other finishes. If the joints and fasteners are visibly apparent, correct defects as required.
 - 3. Seal the raw edges of plumbing openings and boards that have been cut to fit with sealing compound brushed on.
 - 4. When entire installation is completed and before installation of finish materials by other trades, correct and repair broken, dented, scratched or damaged wallboard.
- D. Levels 3 and 4: Install one coat of high solids primer over entire surface.
- E. Level 5: Install one coat of skim coat over entire surface, followed by one coat of high solids primer over entire surface.

3.04 REQUIRED LEVELS OF FINISH

- A. Unless otherwise indicated or specified, levels of finish required shall be as follows:
 - 1. Level 1: Plenum areas above ceilings, insides of shafts, and other concealed areas.
 - 2. Level 2: Water-resistant wallboard backing for tile.
 - 3. Level 3: Backing for adhered acoustic tile. Also, provide where textured finish is indicated.
 - 4. Level 4: Exposed painted wallboard in classrooms, utility rooms, and similar spaces not requiring Level 5 finish.
 - 5. Level 5: Exposed, painted wallboard in offices and corridors.

3.05 TEXTURE COAT

- A. Spray install texture coat to interior gypsum board surfaces which are scheduled to receive a painted finish, except in food preparation areas.
- B. Texture coat shall provide a uniform splatter pattern finish with an 80 percent minimum coverage of surface.
- C. Provide protection from spray for interior surfaces of electrical boxes and wiring.

3.06 CLEAN-UP

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

3.07 PROTECTION

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

END OF SECTION

SECTION 09652

VINYL COMPOSITION TILE

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Vinyl composition tile flooring as indicated.
- C. Related Sections:
 - 1. Section 09658: Rubber Base.

1.02 DEFINITIONS

- A. Pop-up: A pop-up is defined as any surface deviation or looseness of substrate that is equal to or greater than 1/64 (0.015625) inch above the concrete floor level, regardless of the size.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation directions. Submit technical data and installation instructions for each adhesive material. Submit list and Product Data of recommended finish materials.
- B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care, and cleaning of vinyl composition tile.
- C. Samples: Submit Samples of vinyl composition tile in each available color and pattern. Following color selections, submit full size Samples of each selected color and pattern. Submit pint cans of each type of adhesive.
- D. Maintenance Materials: Before Substantial Completion, deliver one unopened container of each color and pattern of vinyl composition tile in each color and pattern installed. Label each container indicating locations installed. Include unopened cans of adhesives adequate to install the maintenance materials.
- E. Installer's Experience Qualifications: Submit list of not less than 5 projects, extending over period of not less than 5 years, indicating installer's experience record. Submit letter from manufacturer indicating manufacturer's approval for installer of the products.

1.04 QUALITY ASSURANCE

- A. Qualifications of Installer: Minimum 5 years experience in successfully installing the same or similar flooring materials.

- B. Comply with the following as a minimum requirement:
 - 1. All materials shall be ADA compliant. Tile shall have a coefficient of friction of at least >0.6 per ASTM C1028 (under wet conditions).
 - 2. ASTM E 84: Class A Flame Spread Rating of 25 or less.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Materials shall be stored at not less than 70 degrees F for not less than 48 hours before installation.

1.06 PROJECT CONDITIONS

- A. Ventilation and Temperature: Verify areas that are to receive new flooring are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for Project site installation conditions.

1.07 WARRANTY

- A. Manufacturer shall provide a 2 year material warranty.
- B. Installer shall provide a 2 year labor warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Armstrong Contract Interiors, Lancaster PA 17604.
- B. Azrock, Domco Inc., USA.
- C. Or equal.

2.02 MATERIALS

- A. Vinyl Composition Tile: Conform to ASTM F 1066, Composition 1, asbestos free, Class 2 (through pattern), 12 inch by 12 inch by minimum 1/8 inch thick, as colors and patterns as indicated on Drawings.
- B. Crack Filler and Leveling Compound: Cementitious type, shall be Durabond's Webcrete # 95, Ardex SD-F, Armstrong S-194 or as recommended by flooring manufacturer.
- C. Concrete Primer: Non-staining type recommended by manufacturer of vinyl composition tile.
- D. Adhesive: Water based, low odor type formulated specially for installation with vinyl composition tile, and manufactured or recommended by manufacturer of vinyl composition tile.

- E. Reducer Strips: Tapered rubber not less than one inch wide, and thickness to match tile.
- F. Moisture Detection Equipment: Calcium chloride testing system, consisting of pre-packaged anhydrous calcium chloride crystal test kits, and an electronic gram weight scale measurable in 1/10 grams. Equipment shall be manufactured by one of the following:
 - 1. Sealflex Industries, Inc., 2925 College Avenue, Suite B-4, Costa Mesa, CA 92626.
 - 2. Vaprecision Professional Emission Testing Systems, 2941 West Mac Arthur Blvd., Suite 138, Santa Ana, CA 92704.
- G. Underlayment: One of the following, grades stamped on panels as indicated.
 - 1. Underlayment A-C Exterior, Sanded Face.
 - 2. Underlayment B-C Exterior, Sanded Face.
 - 3. C-C Plugged Exterior, Sanded Face.
 - 4. Underlayment C-C. Plugged Exterior, Sanded Face.
- H. Floor Finish: One, or combinations of the following:
 - 1. Super Polymer 85, manufactured by Maintex, City of Industry, CA.
 - 2. Butcher's Mainstay Floor Finish, manufactured by Waxie Stationary Supply, San Diego, CA.
 - 3. Polymer L. A. manufactured by Alkot Industries, Tarzana, CA.
 - 4. Armstrong S-485 Floor Sealer.
 - 5. Armstrong S-495 Floor Sealer with solids of 16 percent or better.
 - 6. Armstrong S-480 Floor Finish with a minimum of 18 percent solids.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate with related Work to assure level, smooth, and clean finish surfaces to receive vinyl composition floor tile.

3.02 EXAMINATION

- A. Field verify all dimensions and other conditions affecting this Work before commencing the Work of this section.
- B. Before the Work of this section is commenced, examine surfaces to receive vinyl composition tile and correct deficiencies before commencing the Work of this section.

PREPARATION

A. Concrete Slabs:

1. Do not start preparation until adjacent concrete floor slabs are at least 90 days old.
2. Leveling: Check sub-floors for true to level and plane within a tolerance of 1/8 inch in 10-feet. Test floor areas both ways with a 10-foot straightedge and repair high and low areas exceeding allowable tolerance. Pop ups shall be hammered out and floor filled with a cementitious leveling compound. Remove high areas by power sanding, stone rubbing or grinding, chipping off and filling with leveling compound, or equivalent method. Fill low areas with leveling compound. Repair and level the surfaces having abrupt changes in plane, such as trowel marks or ridges, whether or not within the allowable tolerance. Clean areas where repairs are performed.
3. Cleaning: After leveling, clean substrates of all deleterious substances and foreign matter.
4. Cracks or Depressions: Fill voids with cementitious leveling compound of the type recommended by flooring manufacturer for the specific Work conditions.
5. Moisture Testing: Test new and old concrete slabs for adequate dryness. Testing shall conform to ASTM F 1869, and the following. Minimum testing requirements are 3 calcium chloride tests for the first 1,000 square feet of floor area, and one for each additional 1,000 square feet or fraction thereof. Unless more stringent requirements are recommended by flooring manufacturer, maximum allowable moisture release at time of flooring installation shall be 3 pounds per 24 hours per 1,000 square feet. Provide report of test as specified above. For each test, perform the following steps:
 - a. Weigh the sealed dish of crystals immediately prior to exposure. Record starting weight, date, and time.
 - b. Open kit and set crystal dish on clean concrete surface. Immediately install plastic dome over the dish. Confirm the dome is gasketed to the concrete and is airtight.
 - c. Leave test to absorb moisture for 60 to 72 hours. Maintain room temperature above 55 degrees F for duration of test.
 - d. After exposure, remove and discard housing. Replace dish lid and tape shut. Weigh the sample within one hour of removal from floor.
 - e. Compute the vapor emission in pounds, indicate location of test and vapor emission on report.
 - f. Delay application of flooring until sub-floors are sufficiently dry according to flooring manufacturer's recommendations, or perform remedial measures as recommended by flooring materials manufacturer.

3.04 INSTALLATION OF TILE

- A. Color and pattern: Install tiles in the pattern indicated on Drawings. If no pattern is indicated, request from architect tiles shall be installed in 3 colors color.
- B. Special designs: Floor with special designs shall be installed as indicated on Drawings or as required by the Architect.
- C. Install vinyl composition floor tile when ambient temperature is 70 degrees F or higher.
- D. Install the tile adhesive in a thin film evenly with a notched trowel. Trowel notches shall be as recommended by flooring manufacturer.
 - 1. Mix adhesive in accordance with manufacturer's instructions. Provide all safety precaution during mixing.
 - 2. Install adhesive only in the area that can be covered by flooring material within the adhesive manufacture's recommended working time.
 - 3. Remove adhesive that has dried or filmed over.
 - 4. Adhesive application rate shall be as required to avoid telegraphing trowel lines to the surface after maintenance coatings are applied. Adjust tile runoff during installation if necessary.
- E. Provide reducer where floor covering edges are exposed, such as at center of the door or where floor coverings terminate.
- F. Install vinyl composition tile in accordance with manufacturer's recommendations. Tiles shall fit snugly at wall. Closely trim to pipes, jambs, outlets, and similar conditions.
- G. Install tiles symmetrically about centerlines of areas progressing toward walls. Adjust border tiles as required. Tiles shall be straight and joints close. Tile shall be cut to fit snugly at doorframes, and walls.
- H. Mechanically cut flooring material to produce square true edges.
- I. As floor tile is installed, the floor shall be rolled with a clean, 150-pound roller in both directions.

3.05 CLEANING, WAXING, AND COMPLETION

- A. Keep all flooring surfaces clean as installation progresses.
- B. Clean flooring when sufficiently seated and remove foreign substances.
- C. Finish vinyl composition tile with 2 coats of sealer, and 4 coats of wax applied in accordance with manufacturer's instruction. Coats shall dry for a period of time recommended by the manufacturer. The last coat of floor wax shall be burnished in accordance with manufacturer's written instructions.

- D. Clean adjacent surfaces of adhesive or other materials. Replace damaged or defective Work to the specified condition.

3.06 CLEAN UP

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

3.07 PROTECTION

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

END OF SECTION

SECTION 09658

RUBBER BASE

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Topset coved rubber base for installation with hard surface flooring.
 - 2. Straight rubber base for installation with carpet and soft surface flooring.
- C. Related Sections:
 - 1. Section 09652: Vinyl Composition Tile.
 - 2. Section 09681: Carpet

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation directions. Submit technical data and installation instructions for each adhesive material.
- B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care and cleaning of base.
- C. Samples: Submit Samples of cove and straight top set base in each available color. Following color selections, submit Samples, not less than 12 inches long of each selected color and type. Submit pint cans of each type adhesive.
- D. Maintenance Materials: Before Substantial Completion, deliver at least 50 lineal feet with 5 end stop units and 5 outside corner units of each color of rubber base installed. Deliver the materials in unopened factory containers or in sealed cartons with labels identifying the contents, matching installed materials. Include unopened cans of adhesives adequate to install the maintenance materials.

1.03 QUALITY ASSURANCE

- A. Qualifications of Installer: Minimum 5 years experience in successfully installing the same or similar flooring materials.
- B. Comply with the following as a minimum requirement:
 - 1. ASTM E 84: Surface Burning Characteristics of Building Materials.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Materials shall be stored at not less than 70 degrees F for not less than 48 hours before installation.

1.05 PROJECT CONDITIONS

- A. Ventilation and Temperature: Verify areas that are to receive rubber base are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for site installation conditions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Burke/Mercer Flooring Products, 2250 S. Tenth Street, San Jose, CA 95112.
- B. R.C. Musson Rubber Co., 1320 Archwood Avenue, Akron OH.
- C. Flexco Company, P.O. Box 553, Tuscumbia, AL 35674.

2.02 MATERIALS

- A. Rubber base: Conform to ASTM F 1861; Group 1, solid (homogeneous); Type TS, thermoset vulcanized rubber; Style A, straight; and Style B; 4 inch high unless otherwise indicated, integral colors as selected, non-shrinking, 1/8 inch thick, with matching molded inside corners and end stops.
- B. Base Adhesive: Water based, low odor type formulated specially for use with rubber base, and manufactured or recommended by manufacturer of rubber base.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate the Work of this section with other sections to provide a level, smooth and clean finish surfaces to receive rubber base.

3.02 EXAMINATION

- A. Field verify dimensions and other conditions affecting the Work of this section before commencing the Work of this section.
- B. Before Work is started, examine surfaces that are to receive rubber base. Deficiencies shall be corrected before starting the Work of this section.

3.03 PREPARATION

- A. Do not start preparation until adjacent concrete floor slabs are at least 90 days old and finish flooring is installed.

- B. Install rubber base when ambient temperature is 70 degrees F or higher.

3.04 INSTALLATION

- A. Install cove base at all hard floors, including resilient flooring, concrete, and wood. Install straight base at carpet and other soft floors, unless otherwise required.
- B. Securely fasten cement base to backing in long lengths in accordance with manufacturer's recommendations. Lay out lengths so that not less than 18 inches long filler pieces are provided. Assure that top and toe continuously contact the wall and floor, and that all joints are tight. Install factory formed internal and external corners, and end stops where cove base ends at jambs and offsets.
- C. Base and outside corners shall be rolled with a seam roller before adhesive sets.

3.05 CLEANING

- A. Maintain surfaces of base clean as installation progresses. Clean rubber base when sufficiently seated and remove foreign substances.
- B. Clean adjacent surfaces of adhesive or other defacement. Replace damaged and/or defective Work to the specified condition.

3.06 CLEAN UP

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

3.07 PROTECTION

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

END OF SECTION

SECTION 09900
PAINTS AND COATINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of the General and Supplementary Conditions and Division 01 apply to this section.
- B. Section Includes:
 - 1. Interior and exterior painting.
- C. Following items shall not be painted:
 - 1. Brass valves, chromium or nickel-plated piping and fittings.
 - 2. Flexible conduit connections to equipment, miscellaneous name plates, stamping and instruction labels and manufacturer's data.
 - 3. Mechanical and electrical utility lines, piping and heating and ventilation ductwork in tunnels, under-floor excavated areas or crawl spaces, attic spaces and enclosed utility spaces.
 - 4. Chain-link fence with a galvanized finish, unless otherwise noted.
 - 5. Structural and miscellaneous steel, which will not be exposed in final construction, shall have no finish other than one coat of shop primer.
 - 6. Hardboard covering on tops and backs of counters.
 - 7. Brass, bronze, aluminum, lead, stainless steel and chrome or nickel-plated surfaces.
 - 8. Non-metallic walking surfaces unless specifically shown or specified to be painted.

1.02 SYSTEM DESCRIPTION

- A. Regulatory Requirements:
 - 1. Paint materials shall comply with the Food and Drug Administration's (F.D.A.) Lead Law and the current rules and regulations of local, state and federal agencies governing the use of paint materials.

1.03 SUBMITTALS

- A. List of Materials: Before submittal of Samples, submit a complete list of proposed paint materials, identifying each material by distributor's name, manufacturer's name, product name and number, including primers, thinners, and coloring agents, together with

manufacturers' catalog data fully describing each material as to contents, recommended installation, and preparation methods. Identify surfaces to receive various paint materials.

B. Material Samples: Submit manufacturer's standard colors Samples for each type of paint specified. Once colors have been selected, submit Samples of each color selected for each type of paint accordingly:

1. Samples of Paint and Enamel must be submitted on standard 8 ½" x 11" Leneta Opacity-Display Charts. Each display chart shall have the color in full coverage. The Sample shall be prepared from the material to be installed on the Work. Identify the school on which the paint is to be installed, the batch number, the color number, the type of material, and the name of the manufacturer.

2. All materials and color Samples shall be reviewed before starting any painting.

C. For transparent and stained finishes, prepare Samples on same species and quality of wood to be installed in the Work, with written description of system used.

1.04 QUALITY ASSURANCE

A. Certification of Materials: With every delivery of paint materials, the manufacturer shall provide written certification the materials comply with the requirements of this section.

B. Coats: The number of coats specified is the minimum number. If full coverage is not obtained with the specified number of coats, install additional coats as required to provide the required finish.

C. Install coats and undercoats for all types of finishes in strict accordance with the recommendations of the paint manufacturer.

D. Paint materials shall comply with the following as a minimum requirement:

1. Materials shall be delivered to Project site in original unbroken containers bearing manufacturer's name, brand number and batch number.

2. Open and mix ingredients on premises in presence of the IOR.

1.05 DELIVERY, STORAGE AND HANDLING

A. Storage and Mixing of Materials: Store materials and mix only in spaces suitable for such purposes. Maintain spaces clean and provide necessary precautions to prevent fire. Store paint containers so the manufacturer's labels are clearly displayed.

1.06 SITE CONDITIONS

A. Temperature: Do not install exterior paint in damp, rainy weather or until surface has thoroughly dried from effects of such weather. Do not install paint, interior, or exterior, when temperature is below 50 degrees F, or above 90 degrees F, or dust conditions are unfavorable for installation.

1.07 WARRANTY

- A. Provide a 3 year material and labor warranty.

1.08 MAINTENANCE

- A. Provide at least one gallon of each type, color and sheen of paint coating installed. Label containers with color designation indicated on Drawings.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

- A. Furnish the products of only one paint manufacturer unless otherwise specified or required. Primers, intermediate and finish coats of each painting system must all be the products of the same manufacturer, including thinners and coloring agents, except for materials furnished with shop prime coat by other trades.
- B. Factory mix paint materials to correct color, gloss, and consistency for installation to the maximum extent feasible.
- B. All paint materials to be minimum "Architectural Grade".
- C. Gloss degree standards shall be as follows:

HIGH GLOSS	70 and above	EGGSHELL	30 to 47
SEMI-GLOSS	48 to 69	SATIN	15 to 29

2.02 MANUFACTURERS

- A. Acceptable manufacturers, unless otherwise noted:
 1. Dunn-Edwards Corporation Paints
 2. Frazee Paints & Wallcoverings
 3. Vista Paints

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine surfaces to receive paint finish. Surfaces which are not properly prepared and cleaned or which are not in condition to receive the finish specified shall be corrected before prime coat is installed.
- B. New woodwork shall be thoroughly cleaned, hand sandpapered, and dusted off. Nail holes, cracks or defects in Work shall be filled. On stained woodwork, fill shall be colored to match stain. Filling shall be performed after the first coat of paint, shellac or varnish has been installed.

- C. Plaster surfaces except veneer plaster shall be allowed to dry at least 3 weeks before painting. Veneer plaster shall be allowed to dry sufficiently to receive paint as determined by moisture meter tests.
- D. Metal surfaces to be painted shall be thoroughly cleaned of rust, corrosion, oil, foreign materials, blisters, and loose paint.
- E. Do not install painting materials to wet, damp, dusty, dirty, finger marked, rough, unfinished or defective surfaces.
- F. Concrete surfaces shall be dry, cleaned of dirt and foreign materials and in proper condition to receive paint. Neutralize spots demonstrating effects of alkali.
- G. Mask off areas where necessary.

3.02 APPLICATION

- A. Backpainting: Immediately upon delivery to the Project site, finish lumber and millwork shall be backpainted on surfaces that will be concealed after installation. Items to be painted shall be backpainted with priming coat specified under "Priming".
- B. Priming: New wood and metal surfaces specified to receive paint finish shall be primed. Surfaces of miscellaneous metal and steel not embedded in concrete, and surfaces of unprimed plain sheet metal Work shall be primed immediately upon delivery to the Project site. Galvanized metal Work and interior and exterior woodwork shall be primed immediately after installation. Priming of surfaces and priming coat shall be as follows:
 1. Knots, Pitch and Sap Pockets: Shellac before priming.
 2. Exterior Woodwork: Prime with one coat of exterior waterborne emulsion wood primer.
 3. Interior Woodwork: Where indicated to be painted, prime with one coat of waterborne wood primer.
 4. Stain: Woodwork indicated to receive a stain and varnish finish shall be stained to an even color with water borne stain. On open-grained hardwood, mix stain with paste filler and completely fill pores in wood.
 5. Galvanized Metal Work: Clean oil, grease and other foreign materials from surfaces. Install vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.
 6. Unprimed Iron, Steel, and Other Uncoated Metals: Where specified to be painted, prime with one coat of metal primer.
 7. Shop Primed Metal Items: Touch up bare and abraded areas with metal primer before installation of second and third coats.
 8. Coats shall be installed evenly and with full coverage. Finished surfaces shall be free of sags, runs and other imperfections.

- C. Allow at least 24 hours between coats of paint.
- D. Rollers shall not be used on wood surfaces.
- E. Each coat of painted woodwork and metal, except last coat, shall be sandpapered smooth when dry. Texture-coated gypsum board shall be sanded lightly to remove surface imperfections after first coat of paint has been installed.
- F. Each coat of paint or enamel shall be a slightly different tint as required. Each coat of paint, enamel, stain, shellac, and varnish will be examined by the IOR before next coat is applied. Notify the IOR that such Work is ready for inspection.
 - 1. Tinting Guideline: The first coat, primer/undercoat(s) to be untinted or tinted up to 50% lighter or darker (at the discretion of the installer) than the finish coat. The second coat (or third coat if a seal coat and undercoat have been specified) is to be factory tinted in the range of 10% to 15% lighter or darker (at the discretion of the installer) than the finish coat. The final coat is to be factory tinted to the required color selected. These tinting guidelines shall be provided on all surfaces receiving paint..
- G. Do not "paint-out" UL labels, fusible links and identification stamps.

3.03 CLEANING

- A. Remove rubbish, waste and surplus material and clean woodwork, hardware, floors and other adjacent Work.
- B. Remove paint, varnish and brush marks from glazing material and, upon completion of painting Work, wash and polish glazing material both sides. Glazing material, which is damaged, shall be removed and replaced with new material.
- C. Clean hardware and other unpainted metal surfaces with recommended cleaner. Do not furnish abrasives or edged tools.

3.04 SCHEDULE

- A. Interior:
 - 1. Woodwork, Painted: 3 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Interior enamel, semi-gloss or gloss as indicated.
 - 2. Miscellaneous Woodwork: 4 coats. Wood items including, but not limited to: wood base and shoe, chair rails, counter tops and locker room benches.
 - a. First Coat: As specified in this section under Priming.
 - b. Second, Third and Fourth: Exterior varnish, gloss.
 - 3. Casework: Interior surfaces of casework (except plastic laminate-faced casework) including top, edges and underside of shelving, poles, surfaces of

drawers (except fronts), interior surfaces of mailbox pigeonholes, and particle board.

- a. First Coat: Waterborne stain.
 - b. Second and Third Coats: Satin varnish.
4. Plaster: 4 coats.
- a. First Coats: Pigmented wall sealer.
 - b. Second coat: Enamel under coater.
 - c. Third and Fourth Coats – Interior enamel, semi-gloss or gloss as indicated.
5. Gypsum Board: 4 coats.
- a. First Coat: Drywall sealer.
 - b. Second Coat: Enamel under coater.
 - c. Third and Fourth Coats: Interior enamel, semi-gloss or gloss as indicated.
6. Concrete: 3 coats.
- a. First: Concrete sealer.
 - b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.
7. Concrete Block: 3 coats.
- a. First: Concrete block filler.
 - b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.
8. Metal: Shall be cleaned, pre-treated and painted with 3 coats. Items to be painted include, but are not limited to: exposed structural and miscellaneous steel, metal doors and frames, ladders, table and bench legs.
- a. First Coat: Metal primer.
 - b. Second and Third Coats: Interior gloss enamel, except metal doors and frames which shall be semi-gloss or gloss to match adjacent wall.

B. Exterior:

1. Woodwork: 3 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Exterior house and trim enamel.

2. Plaster and Stucco: 2 coats.
 - a. Exterior 100 percent acrylic.
3. Concrete: 3 coats.
 - a. First Coat: Concrete sealer.
 - b. Second and Third Coats: Exterior 100 percent acrylic.
4. Concrete Block: 3 coats.
 - a. First Coat: Concrete block filler.
 - b. Second and Third Coats: Exterior 100 percent acrylic.
5. Metal: 3 coats. Shall be cleaned and pre-treated. Items to be painted include, but are not limited to: steel columns and miscellaneous steel items, gravel stops, metal doors and frames, hoods and flashings.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Exterior gloss enamel.

3.05 PROTECTION

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

3.06 CLEANUP

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

END OF SECTION

SECTION 09910

PAINTING OF EXISTING FACILITIES

PART 1 - GENERAL

1.01 REGULATIONS AND CODES

- A. The Rules and Regulations of the State Of California relating to the Safety of Design and Construction of Public School Buildings, entitled "California Administrative Code, Title 21, Public Works, Sub-Chapter 1, Division of Architect" and the Building Code of Laws of the political subdivision having jurisdiction are made applicable to the work of the Contractor.

1.02 SPECIFYING BY REFERENCE

- A. Specifying by reference to any provisions, conditions, materials, work or anything relative to any part thereof in other parts of the contract or in the reference documents shall have the same force and effect as if the said provisions had been repeated word for word at the place where the reference is set out. Therefore the materials and/or work, and/or quality thereof, and/or work thereof mentioned or described in the provisions so referred to shall be furnished, and/or performed by the Contractor as a part of his/her work.

1.03 PROTECTION

- A. The Contractor shall replace and secure at the end of each working day all protective security grilles. Every bolt must be replaced properly using a washer, cut smooth and filed down. Problem grilles may be removed and replaced by the District at the District Representative's discretion.
- B. All fire alarm boxes, fire sprinkler heads, smoke detectors and intrusion alarm systems must be uncovered and available to perform the function that it was designed for each and every night.
- C. All pressure relief grilles with barometric damper leading to a corridor or an exterior must be masked off before spraying and then uncovered immediately after spraying.
- D. Should any damage occur as a result of the Contractor's work, his/her employee or equipment, to any property other than the District's, the Contractor shall replace the damaged article or repair the damage to the satisfaction of the District. This shall include over-spray on private vehicles.

1.04 SCAFFOLDING

- A. Scaffolding erected by the Contractor shall be made available to the District, without cost, to make repairs. The District will coordinate its work with that of the Contractor's to avoid delays in his/her work.

1.05 MOVING EQUIPMENT

- A. The Contractor shall do all handling/moving of equipment and replacement of the same, except as otherwise specified by the District at the discretion of the District Representative.
- B. All such materials shall be moved before painting is begun in any room or space. Movable cases and all equipment against walls or surfaces to be painted shall be moved by the Contractor and be returned and/or reinstalled by him/her in their original locations after painting has been completed.

1.06 MISCELLANEOUS

- A. The Contractor will not be required to provide sanitary facilities.
- B. A Contractor that schedules work on an approved overtime period and then fails to have workers at the scheduled site will be billed for the District employee's time. The rate will be 1-1/2 times the employee's hourly rate of pay, for each hour (4 hour minimum).
- C. Work on this project may require the Contractor to perform work on Saturdays, Sundays and/or at times other than normal working hours.
- D. The Contractor and/or sub-contractor shall submit a "Daily Personnel Report" to the District Representative on a daily basis.
- E. The Contractor must have and use, on the work site, dustless sanding and cleaning equipment.
- F. The Contractor will not use school phones except in cases of an emergency.
- G. After the painting is completed, the Contractor must free the sash and leave it in an easy operating condition. Two (2) months after the completion of the project, the District Representative will arrange a date/time when the Contractor must return to the site, check and free all sash that s/he painted so it is in an easy operating condition.
- H. The Contractor shall provide and maintain all necessary or required barriers, guards, lights, warning signs, etc. for the complete protection of everything as directed by the District representative. The Contractor is required to provide free access to all doors and openings. The Contractor shall not store equipment or material near openings or traffic lanes that might prove hazardous during an emergency.

1.07 DEFINITIONS OF WORK

- A. All work shall include all labor, material, equipment and scaffolding required for the cleaning and preparation of surfaces to receive the painters finish and for all painting and varnishing, as herein specified. The Contractor shall perform all work unless specifically noted.
- B. "Paint and refinish the Interior of the Building" shall mean all rooms within the building and all parts of each room in conformance with all requirements specified herein. This includes all ceilings, closets, adjoining rooms, and interior surfaces.
- C. "Paint and refinish stucco" shall mean all exposed repaired surfaces in conformance with all requirements specified sub-section. This includes all stucco, concrete, block and brick previously painted unless otherwise noted. This may include partition walls.
- D. The painting shall include the complete preparation and finish or refinishing in accordance with the requirements specified herein. Drywall shall be treated the same as specified for plaster.
- E. Guarantee-Warranty: The Contractor warrants and guarantees that all work executed and materials furnished under the contract shall be free from defects of materials and work for a period of three (3) years from the date of acceptance of completion of the contract.
- F. Wherever woodwork is specified to be refinished, it will include wood finish member (trim), movable cabinets with doors and center cut doors, windows and sash, screen doors, screens, sash poles.
- G. Whenever "Paint or Enamel" is referred to in these specifications, it shall be taken to mean all types of waterborne materials and water reducible materials.
- H. Whenever "edges" are referred to in these specifications, it shall be taken to mean all edges, (which include tops and bottoms).
- I. GLOSS degree STANDARDS shall be as follows:

HIGH GLOSS	70 and above	EGGSHELL	30 to 47
SEMI-GLOSS	48 to 69	SATIN	15 to 29
- L. Work shall be done by skilled and experienced painters in a first class and professional manner. All painters must wear presentable white uniforms.
- M. To insure a consistently uniform horizontal, vertical and curved surface, with a maximum deflection of 1/8th inch in a five foot span, a brown scrub coat may be required. Also, along with the assurance for a uniform color of the dashed texture, a fog coat may be necessary as deemed by the District Representative.

- N. All glass on the exterior shall be traced neat and clean with approximately, but no more than 1/16" overlay. Any paint specks, smears or splatters shall be immediately removed and the surface thoroughly cleaned.

1.08 INSPECTION

- A. The District Inspector will plan a work schedule with the Administrator or his/her representative providing areas for work to be performed. Work in the area provided shall be completed before proceeding to the next scheduled area. Care must be exercised by the Contractor so as to cause the minimum of inconvenience and danger to students and faculty.
- B. The Contractor must schedule all work through the Inspector. The Inspector will divide the work into sections. Each section must be completed and a final inspection of that section will be performed by the Senior Paint Inspector before proceeding to next section.

1.9 MATERIALS

- A. All materials used in the work must be in accordance with the "Approved List of Paint Materials" and with the paint manufacturers, whose products have been tested and approved. The use of materials shall be limited to one manufacturer for any given portion of the contract. Adulteration of these materials is strictly prohibited.
- B. Materials shall be delivered to project site in original unbroken containers bearing the manufacturer's name, brand number and batch number.
- C. Materials shall be delivered in a timely manner to insure uninterrupted progress of the work.
- D. All materials shall be opened and mixed on the premises in the presence of the District Representative. Rejected materials shall be immediately removed from the premises.

1.10 CERTIFICATION

- A. With every delivery of coating materials, the dealer shall certify on a form, to be supplied by the Facilities Services Division, that the materials comply with the requirements of these specifications. Upon completion of the work the Contractor must certify on a form supplied by the District that all fire retardant paint specifications have been complied with. All certifications will be given to the District Representative assigned to the Contract.
- B. The Paint Manufacturer shall submit a complete list of proposed paint materials to the District for approval. Identifying each material with the manufacturer's name, number and type of surfaces to receive the individual finishes.

1.11 COLORS AND THE NUMBER OF PAINT COATS

- A. The colors of all coatings shall be as directed by the District Representative. Three coats of paint must be applied as follows: The first coat, primer/undercoat – untinted or tinted up to 50% lighter or darker (at the discretion of the Contractor) than the finish coat. The second coat is to be factory tinted in the range of 10 % to 15 % lighter or darker (at the discretion of the Contractor) than the finish coat. The third coat is to be factory tinted to the approved color selected. These tinting guidelines shall be used on all surfaces receiving paint. Allowances shall be made for coloring so that ceilings, beams, dados, walls, woodwork, etc. can be finished in more than one color. Color combinations in rooms and for surfaces shall be varied in accordance with the colors selected by the District Representative.
- B. If the last coat is not a uniform surface in color and free from defects, then the Contractor must apply to the entire surface as many coats as is necessary to remedy the problem. This requirement supersedes all other specifications listed throughout.
- C. Any number of colors may be used on any portion of the work. The District reserves the right to change the colors before the work is started in an area or on a particular surface.
- D. Various colors may require more coats of paint than specified in these specifications for complete coverage. The Contractor is responsible for consulting the color letter, knowing the color to be used and being aware of the color to be covered, so s/he can bid accordingly.
- E. All ceilings shall be white, unless otherwise directed by the District representative. This includes classrooms, storage rooms, offices, etc.

1.12 SAMPLES

- A. Before any coating is applied, the Contractor must submit to the District Representative samples of each color to be used on this contract. Samples will be made as hereinafter specified. When the samples are approved, instructions will be given to the Contractor so the approved colors can be used as directed. If more than one (1) batch of material and color is to be used, samples from each batch shall be submitted.
- B. Paint and Enamel Spray-Outs
 - 1. Samples of Paint and Enamel must be submitted shall have the color in full coverage. The sample shall be prepared using the material from the batch to be used on the actual job. Identify paint is to be used, the batch number, the color number, the type of material, the name of the manufacturer and the name of the Contractor.
- C. The Contractor must furnish samples of all colors to the District Representative. The approved samples will be kept on the job until the painting is completed. The

Contractor shall be responsible for the finish color on the wall or surface to be painted. Where different materials of the same color are specified to be applied on the same, or adjoining surfaces, the final color match must match the pre-approved color sample on those surfaces. The Contractor shall also check and be responsible for all color matches on the original and subsequent batches and shipments.

- D. All materials and color samples shall be approved before a job start meeting will be scheduled.

PART 2 – PREPARATION OF SURFACES

2.01 CONTRACTOR MUST REMOVE AND REINSTALL

- A. The Contractor shall remove coat/hat hooks, name plates, label frames, sash lifts, sash locks, pencil sharpeners, flag brackets, drawer handles/locks, curtain/window drapes, switch/receptacle plates, removable bulletin boards, mirrors, maps and thermometers, and reinstall all of the above after the painting is completed.
- B. The Contractor shall remove exposed nails, hooks, tacks, screws, staples and pins in the surface to be painted and patch the holes with an approved material. Remove obsolete screen/grille hangers/fasteners and then patch the holes with an approved material.
- C. The Contractor shall remove and reinstall all Venetian blinds and channels, insuring security latches are secure.
- D. The Contractor shall replace map and picture hooks as directed by the District Representative.
- E. All paper labels shall be soaked off and all glue residue from the tape removed.
- F. The Contractor shall remove metal or plastic room numbers and letters, and, after the painting is complete, clean and reinstall them neatly.
- G. All sash locks shall be reset in accordance with the instructions for locking doors and windows each night.
- H. The Contractor shall remove and reinstall all protective security grilles. The protective security grilles shall be reinstalled in the same manner they were installed prior to removal.

2.02 DISTRICT MAY REMOVE AND REPLACE

- A. Computers, computerized system electric clocks, speakers and thermostats may be disconnected and reconnected by the District.

2.03 REPLACEMENT SCREWS AND HARDWARE

- A. All hardware shall be replaced using new screws, of the same diameter, but one size longer than those removed. Existing screws may be used if screw holes are plugged with wood in order to make the hardware secure. All screws used must be of finish design and material to match the hardware on which they are used.
- B. The Contractor must remove all paint from all hardware, including paint from previous painting.

2.04 PAINT DEFECTS

- A. All painted, enameled or varnished wood, metal and/or plaster surfaces must have all checked, alligatored, cracked, blistered, defaced (including paint spots on varnished woodwork) and scaled material removed down to the original unfinished surfaces. Where any of the above mentioned defects occur, the entire piece of trim or material shall have the finish removed; in the case of a door, the finish on the entire surface of the door shall be removed. All surfaces shall then be hand sanded and dusted clean to remove all loose materials.

2.05 H.E.P.A. MACHINE SANDING

- A. All checked, cracked, blistered, scaled loose, and/or alligatored paint on all wood and metal surfaces on the exterior or interior of all buildings and appurtenances shall be machine sanded to a smooth solid surface, dusted clean and then painted as specified. All power sanding must be done with an approved H.E.P.A. vacuum sander and must be used only when school is not in session, and students and staff are not on site.

2.06 REMOVAL OF PAINT FROM DOORS

- A. All doors painted with rollers leaving a coarse texture finish must have the finish removed. All doors with graphics and/or designs shall have the finish removed at the District Representative's direction. The removal of paint must be done when school is not in session.

2.7 WASHING, CLEANING AND REMOVING WAX

- A. Prior to applying a coating, all surfaces must be thoroughly washed with a strong solution of an approved cleaner, rinsed with clean water, hand sanded and dusted off. All waxed surfaces must have the wax completely removed, then washed and rinsed off.
- B. Woodwork must be hand sanded smooth after each and every coat, except the last coat. All coats shall be free from dust, dirt or other imperfections.
- C. Steel sash and aluminum sash to be painted must be steel-wooled and dusted off. Sash putty shall be hand sanded smooth and dusted off.

2.8 SASH PUTTY

- A. Loose sash putty may be removed and replaced by the District at its discretion. All rough, uneven or otherwise deteriorated sash putty shall be sanded smooth or reputtied by the Contractor.

2.9 PUTTY

- A. Holes, open joints of siding, woodwork and sash glazing shall, after the surrounding areas have been prepared as specified above, be knife puttied. On stained woodwork, putty must be colored to match the stain. Puttying shall be done after the first coat of paint or varnish has been applied. Latex caulking compound may be used on open joints and woodwork. Putty and/or caulking shall be spot primed before the finish coat is applied. Putty or latex caulking shall not be used on handball walls or basketball backstops.

2.10 SPACKLE ON SIDING AND WOODWORK

- A. Checked and cracked portions of siding and woodwork (after the surrounding areas have been prepared as specified above) shall be primed, smoothed with an approved exterior spackling compound and then sanded smooth when dry. All spackled areas must be spot primed. Spackle shall not be used on handball walls or basketball backstops.

2.11 CRACKS AND VOIDS

- A. Voids between wall and ceiling surfaces and wood or metal trim or scribed edges where finish exists or is specified to be applied and including all picture molding, must be thoroughly filled with putty, spackling compound or latex caulking compound.
- B. All areas where the finish plaster coat is loose must have that portion removed to a solid surface. All surfaces that are broken, cracked, or damaged and areas where the finish plaster coat has been removed must be coated with Weld-Crete as manufactured by Larsen Products Corporation or equal. The surface will then be given a cement plaster finish coat consisting of one-part Plastic Portland Cement to three parts sand to match the existing finish. All cracks shall be "V-ee'd" out, filled, finished flush with and textured to match the adjoining surfaces, per the District Representative's approval.
- C. Neutralize all walls showing the effects of alkali.

2.12 CAULKING SASH, DOOR FRAMES

- A. All caulking that will interfere with the proper application of the waterproof coating shall be removed. Caulk around door and window frames, flashing, vents, separations between the masonry/stucco and adjoining surfaces, etc., with a caulking compound

recommended by the manufacturer of the coating to be used. Caulking and filling shall be done with sufficient pressure to force the material to the base of the opening.

2.13 REPAIR OF MASONRY/STUCCO AND CONCRETE REPAIR CRACKS

- A. Hairline cracks: Two coats of the elastomeric coating will bridge hairline cracks.
- B. Small to medium cracks and imperfections: The elastomeric coating will fill and span cracks up to 1/32 inch. A credit card width or greater crack must be treated with an elastomeric sealant (recommended by the paint manufacturer) prior to applying the elastomeric coating.
- C. Medium to large cracks and imperfections: Cracks from 1/32 inch to 1/8 inch shall be treated with a brush-grade elastomeric sealant applied in a 2 inch wide band; crowned at the center and feathered at the edges to conceal the repair.
- D. Large cracks: Cracks 1/8 inch to 1/2 inch shall receive a urethane sealant (recommended by the paint manufacturer), “rake out” the crack to conform to the manufacturer’s specifications and applied as directed for medium to large cracks.
- E. Cracks, holes and damaged spots larger than 1/2 inches: Damaged areas must be given a cement plaster finish coat consisting of one-part plastic Portland cement to three-parts masonry/stucco sand to match the existing finish. When finished, it must be flush with and match the existing texture of the adjoining surface.
- F. Texture match: All crack repairs must be finished to match the texture of the adjoining surfaces, per the District Representative’s approval. Hand held stucco hopper guns may be used. Exercise care to ensure that all areas finished by hand held stucco machines match in color, texture and thickness to the adjoining surfaces. A bonder must be used (Thorobond, Weldcrete or equal).

2.14 MISCELLANEOUS PREPARATION

- A. All base and base shoe must have the existing finish removed down to the original surface and then be finished as specified under “Enamel Finish” except all varnished base and base shoe must have the existing finish removed down to the original surface and then be finished under “Stain and Varnish Finish.”
- B. The finish coat on both sides of interior wall transoms must match adjacent walls.
- C. The Contractor shall remove all stains from all varnished surfaces before refinishing.
- D. Metal clad panels doors and frames must have all holes and major dented places filled with an approved exterior spackling compound, sanded smooth with the existing surfaces and dusted off.

- E. Interior masonry and/or concrete surfaces not having an existing painter's finish must be thoroughly cleaned of all traces of alkali by washing all surfaces with a solution composed of one pound of zinc sulphate to one gallon of water, then rinsed with clean water. The interior surfaces shall be allowed to dry for 48 hours or at the discretion of the District Representative and then finished as specified for unpainted plaster.

2.15 REPAIR SPALLING CONCRETE

- A. The Contractor shall remove all surface contamination, broken and spalled concrete to a sound concrete base. The concrete shall be removed to a depth of one-half (1/2) inch minimum around the rebar. The sides of the areas to be repaired shall be straight, not tapered or sloped.
- B. All spalled or loose concrete must be removed using a electric or compressed air chipping hammer.
- C. The Contractor must clean all exposed rebar by sandblasting, remove all debris/dust and treat all steel with a sealant (Sika Top/110 Armatec or approved equal) compatible to the patching materials the same day. The District representative must approve the sealant application prior to any patching materials being applied.
- D. The Contractor shall repair concrete to match the existing concrete surfaces using Sika Top 123 Gel Mortar or approved equal.
- E. All sealant and patching materials must be applied by qualified personnel adequately trained in their application.

PART 3 – LEAD

3.01 GENERAL

- A. All lead abatement/management shall be done in compliance with all Federal, State, County and local laws.
- B. All previously painted surfaces will be assumed to contain lead unless otherwise specified in a lead report.
- C. The Contractor shall abate or manage lead-containing materials when required for proper completion of the project in accordance with the contract documents.

3.02 – LEAD BASED PAINT ENCAPSULATION

- A. Each room or section, as directed by the District Representative, to be encapsulated must first be thoroughly vacuumed with H.E.P.A. vacuums to remove any present contaminants.

- B. All encapsulated surfaces shall have the entire surface painted as specified for that surface in Part 4.
- C. If the finish is from a different manufacturer, a letter is required from the encapsulate manufacturer agreeing that the finish is compatible with the encapsulate. This letter must be given to the District Representative prior to the finish being applied.
- D. Each coat shall receive the required drying time as recommended by the manufacturer.

PART 4 - INTERIOR AND EXTERIOR PAINTING INCLUDING MASONRY/STUCCO

4.01 MIXING AND APPLICATION

- A. Paint and enamel shall not be applied to wet, damp, dusty, rough or defective surfaces.
- B. Surfaces to be finished and each coating shall be separately inspected by the District Representative and checked for mill thickness. The requirements are (2) mills each coat wet and/or three (3) mill dry after three (3) coats. Notice that such work is ready for inspection shall be given to the District Representative. Should such notice not be given before the succeeding coat is put on, the finish applied must be removed or an additional coat shall be applied, as directed by the Representative. At least one (1) day must intervene between coats for exterior work or as directed by the District Representative for thorough drying.

4.02 PAINT ROLLERS, BRUSH AND SPRAY

- A. Paint rollers may be used on interior plaster, drywall, masonry/stucco and plywood surfaces, nap not to exceed one half (1/2) inch in length, or as directed by the District Representative.
- B. The first coat on wood overhang and ceilings must have the material applied by roller and then must be brushed out in a professional manner to leave the surface free of imperfections. The finish coat may be sprayed.
- C. All other surfaces must have all coatings applied with brushes of the proper size, consistent with professional work.
- D. Spray work shall be permitted only on radiators, acoustic plaster, acoustic tile, fiberboard, masonry/stucco or as directed by the District Representative.

4.03 COLORED VARNISH

- A. The use of colored varnish is strictly prohibited.

4.04 PRIMING

- A. New and/or unpainted materials/surfaces and those from which the paint finish have been removed down to the original wood or metal surfaces shall be thoroughly primed as follows:

Woodwork: Wood must be sealed or primed with a non-water borne material on both sides and all edges. Wood completely sealed with a non-water borne material shall be top coated with a water borne material as specified herein. The finish material (water borne) must be compatible with the non-water borne primer per the manufacturer's recommendations. Hardwood must be thoroughly filled and stained to an even color.

Galvanized Metal: Clean all oil and foreign material from surfaces and then apply a primer for galvanized metal following the manufacturer's recommendations. All metal primers must have a five (5) day curing time before recoating. This includes conduits mounted on masonry/stucco.

Ferrous Metal: Prime all ferrous metal with an approved primer for ferrous metal.

Non-Ferrous Metal: Prime all non-ferrous metal, unless otherwise specified, with an approved non-ferrous metal primer.

Aluminum: Prime with an approved metal primer as per the manufacturer's recommendations.

4.05 EXTERIOR WOODWORK

- A. Woodwork, hardboard, plastic impregnated plywood, asbestos board (if painted), and/or Cemesto Board shall be prepared as specified herein. Where the paint finish has been removed, the areas shall be built-up to match the adjoining surfaces with an exterior primer. Then all surfaces, unless otherwise specified, shall be given the number of coats of paint as detailed under "Colors and Number of Paint Coats."

4.06 DOORS

- A. Painted or refinished exterior wood, metal and/or doors must be finished on both sides and all edges with three coats of paint consisting of the first coat of primer, the second coat and third coat of exterior high gloss enamel.
- B. Where doors open into rooms or spaces having different finishes, the communicating doors must have all edges finished as directed by the District Representative.

4.07 WINDOW STILES AND PARTING BEADS

- A. All pulleys, stiles, parting beads, heads and jambs, must have the paint spots removed and be given one coat of a clear penetrating stain or opaque stain as approved by the District Representative. This stain must be applied after the sash and frames are painted.

4.08 SASH PUTTY

- A. Sash putty and caulking compound shall be painted with the same number of coats as specified for woodwork.

4.9 MISCELLANEOUS EXTERIOR SURFACES

- A. Freestanding interior surfaces of display cases, storage/supply cabinets, including both sides and all edges shall be prepared and primed as specified under "Doors." They shall receive the number of coats of paint as detailed under "Colors and Number of Paint Coats."

4.10 SPRAYING MASONRY/STUCCO

- A. The masonry/stucco material must be a 100 % acrylic paint, color as directed. The material must be applied in strict conformity to the manufacturer's directions. There must be at least 24 hours drying time between the first coat which shall be factory tinted 10 % to 15 % lighter or darker in color (at the discretion of the Contractor) than the finish coat. The manufacturer shall thoroughly acquaint himself/herself with the conditions of the surfaces to be refinished and provide the Contractor with written specifications for the job including the special primers or additives needed for adhesion sealing of the first coat of paint and/or general performance of materials. The finished surface must be uniform and free of imperfections. Each coat applied to the surface must be sprayed using the "Cross-Off" method of application by spraying horizontally with a 50% overlap on returns and doubling back with a vertical stroke with a 50% overlap on returns.
- B. After painting of the masonry/stucco, replace (stencil) the security numbers per the plot plan. See the District representative for locations.

4.11 INTERIOR WOODWORK

- A. All wood surfaces shall be prepared to receive the new finish as specified under "Preparation of Surfaces" and "Priming."

4.12 AREAS NOT INCLUDED

- A. There are certain areas that are not included in the contract. In every case where a room or space is noted to be refinished, the door(s) opening into that room or space shall be refinished on both sides and all edges, except the exterior side of a door opening to the outside.

4.13 CABINETS

- A. Cabinets without doors, cabinets with glass doors and pegboard doors shall have the interiors finished to match the surrounding or adjacent work, unless the interior has a stained finish.

- B. Cabinets having solid panel doors must have the exposed parts of the cabinet and all surfaces of the doors finished to match the room finish. Shelf edges shall be finished the same as the room finish.

4.14 PICTURE MOLDS

- A. Picture molds shall be painted with the same number of coats of paint as the adjacent walls and will be the same color as the adjacent walls, unless called out differently in the color letter.

4.15 ENAMEL FINISH: INTERIOR WOODWORK

- A. Interior woodwork having an existing enameled finish must have the areas where the painter's finish has been removed and where spackling has been done in repairing defects in the surface, built-up with undercoat. All wood surfaces shall then be given one coat of undercoat, a second coat and third coat of finish paint to match the room finish. The paint shall be applied as specified under "Colors and Number of Coats."

4.16 NEW, STAINED OR UNFINISHED

- A. After the wood has been primed as specified under "Priming," new, stained (not varnished) or unfinished wood to be enameled shall be given three coats. The first coat of enamel undercoat, the second and third coats of gloss or semi-gloss enamel as specified.

4.17 VARNISH REMOVED

- A. Where the existing varnish has been removed and the woodwork has been specified to be enameled, the woodwork shall be primed as specified under "Priming" and then given three coats. The first coat of enamel undercoat, the second and third coats of gloss or semi-gloss enamel as specified herein.

4.18 STAIN AND VARNISH FINISH

- A. Interior woodwork having a stain and varnish finish must have the areas where the painter's finish has been removed, build-up to match the adjoining finish with stain, filler for open wood grained wood and varnish. Then all of the exposed surfaces of the woodwork shall be given two coats of interior gloss varnish, and one coat of interior varnish, stain finish or as specified herein. Between coats of varnish, the surfaces must be sanded with #240 sandpaper or steel-wooled and dusted clean to remove all foreign material, subject to the approval of the District Representative. Ink must be removed with Graffiti Gobbler ink remover or equal before staining.

4.19 PLYWOOD WALLS

- A. The interior plywood walls having an existing stain finish must have the exposed plywood joints machine sanded to remove all projecting edges and prepared as follows:
1. Voids between wall surfaces and wood or metal trim or battens, and nail holes must be thoroughly filled with putty, caulking, or an approved exterior spackling compound, sanded smooth when dry and dusted clean.
 2. The walls must be sanded smooth, brushed off and finished with three coats of paint. The first coat of enamel undercoat, the second and third coats of semi-gloss enamel.
 3. UNSTIPPLED plywood walls shall receive a coat of texture material as recommended by the manufacturer. This texture material must be pre-approved. A 3' x 3' sample of texture material shall be applied to the wall for approval by the District representative. This 3' x 3' sample must be approved by the District representative before application to wall surfaces.

4.20 INTERIOR PLASTER AND DRYWALL WORK - WALLS, CEILINGS, ETC.

- A. Where ceilings are specified to be painted, beams, cornices, coves/ornamental features, staff work, plaster grilles, etc. shall be included.
- B. Where walls are specified to be painted, columns, staff work, piers, returns, reveals, soffits of stairs, both sides of stair railings, soffits/reveals of windows and other openings shall be included.
- C. Where a room is designated to be painted that has a single restroom/storeroom, it is to include that restroom/storeroom unless otherwise noted.
- D. Grease, ink spots and marks of indelible pencils shall be completely removed by the use of water and abrasive soap powder without injury to the finished surface.
- E. The first coat may be thinned, if necessary, as per the paint manufacturer's recommendation with a thinner prepared specifically for the material used. All coats shall be flowed on freely. The first coat must be prepared so as to stop all suction, and should any dead spots appear, they shall be touched up before the next coat is applied. The last coat shall be a uniform surface, free of all defects.

4.21 ENAMEL FINISH

- A. All unpainted plaster surfaces to receive an enamel finish, must receive four (4) coats of paint. The first coat of pigmented sealer, the second coat of enamel undercoat, the third and fourth coats of gloss or semi-gloss enamel as specified herein.
- B. All previously painted interior surfaces must have all patching and all places where the painted finish has been removed, built up with one coat of a pigmented sealer. Then

the entire surface including the patching shall be given one coat of an enamel undercoat, a second and third coat of gloss or semi-gloss enamel as specified herein.

4.22 AREAS REQUIRING ENAMEL

A. Interior and Exterior Enamel – Gloss

Woodwork, walls and ceilings (except acoustic tile or acoustic plaster or as otherwise specified herein) in the following areas:

Miscellaneous

Rooms-

Toilet rooms, custodian closets and storerooms

B. Interior and Exterior Enamel – Semi-Gloss

Woodwork, walls and ceilings (except acoustic tile or acoustic plaster or as otherwise specified herein) in the following areas:

All walls and surfaces in rooms or areas specified to receive an enamel finish and not herein specified to receive a Gloss Enamel finish, shall have a finish coat of Semi-Gloss Enamel.

4.23 UNPAINTED METAL

- A. Unpainted bronze, brass, copper work, window grilles, stairways, handrails, chain-link fences, stainless steel, open metal shelving, porcelain metal faced cabinets and aluminum will not be painted, unless otherwise specified.

4.24 PAINTED METAL

- A. Exposed miscellaneous, sheet metal work, guards, steel sash, etc. shall have the surfaces thoroughly cleaned and prepared as specified herein. The areas from which the original painter's finish has been removed shall be spot primed with metal primer to match the adjoining surfaces and then all surfaces shall be given a prime coat of metal primer, second and third coats as specified herein. All copper pipe shall be painted with one coat of enamel undercoat per the manufacturer's recommendation, a second and third coat of enamel as specified herein.

4.25 METAL COVERED DOORS

- A. Metal Covered Doors: All bare metal must be primed with an approved metal primer. The door(s) and all edges shall then be painted with one coat of enamel undercoat, a second coat and third coat of exterior gloss enamel as specified herein.

4.26 LIGHT FIXTURES

- A. Interior light fixtures (other than plated or bronzed) and bells must be primed and then painted with two coats of an enamel to match the adjoining surface. Identification plates must have all paint removed and be kept clean.
- B. All metal stacks and kilns must, after proper preparation, receive two coats of aluminum paint or an approved heat resistant material. The minimum required heat resistant coating shall be rated to not less than 700 degrees Fahrenheit.
- C. Cafeteria equipment: All metal work in the cafeteria, kitchen and serving counters in the student and faculty dining rooms having an existing aluminum paint finish must be thoroughly cleaned as specified and given two coats of an aluminum paint.

4.27 ELECTRICAL CABINETS

- A. The front side of the doors and the exposed lip around the doors to the electrical cabinets in finished areas must be finished the same as the walls.

4.28 HARDWARE AND AUTOMATIC DOOR CLOSERS

- A. Any hardware having a painted finish must have all paint removed. Door closers must be finished with a leather brown or aluminum paint. Aluminum paint shall be applied in toilet rooms and the like. Leather brown (N-2501) paint shall be used in all other areas. In any and all cases where both sides of the doors are specified to be painted, the door closers shall be included.

4.29 FINAL CLEANING

- A. Glass, polycarbonate and fiberglass on the interior and exterior where the painting has been done shall be cleaned of all paint and varnish, unless otherwise specified. Glass and fiberglass and polycarbonate that is scratched or damaged by the painter's work, or while cleaning, must be replaced with the same material, quality and design to match the original.
- B. Before applying the finish coat of material to exterior sash with security grilles, the Contractor shall clean all window panes with an approved cleaner before applying the enamel.

END OF SECTION

SECTION 10100

VISUAL DISPLAY BOARDS AND PANELS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Wall mounted markerboards of size indicated on Drawings.
 - 2. Horizontal sliding markerboards and map rail of size indicated on Drawings.
 - 4. Tackboards.
 - 5. Bulletin boards; cork tackboard panel.
- C. Related Sections:
 - 1. Section 09100: Metal Support Assemblies.

1.02 SUBMITTALS

- A. Shop Drawings: Shop Drawings to indicate gages, profiles, sections of materials, details of construction, hardware, methods of attachment and/or anchoring, as applicable for specified materials.
- B. Samples: Submit the following:
 - 1. 3 inch x 5 inch markerboard Samples, provide manufacturer's full range of colors.
 - 2. Tackboards:
 - a. Panel: 2 (two) 1' x 2' IPS Panels.
 - b. Fabric Submittal for Color Selection: Submit 2 (two) sets of fabric manufacturer's standard tip cards showing full range of colors, textures, and patterns available.
- C. Product Data: Submit manufacturer's technical data, product specifications, installation instructions, and other pertinent information as applicable for each product or material specified.
- D. Test Reports: Submit certified laboratory test reports as applicable to indicate compliance with specified requirements.

1.03 QUALITY ASSURANCE

- A. Manufacturer shall have been regularly engaged in the business of manufacturing markerboards for at least 5 years.
- B. Comply with requirements and recommendations of applicable portions of Porcelain Enamel Institute - PEI 2.

1.04 PRODUCT HANDLING

- A. Deliver materials to the Project site with manufacturer's labels intact and legible.
- B. Provide all means necessary to protect markerboards before, during and after installation.

1.05 JOB CONDITIONS

- A. Sequencing, Scheduling:
 - 1. Coordinate with related Work of other sections including gypsum board and tackboards.
 - 2. Do not install markerboards until paint is installed to surfaces concealed behind them.

1.06 SPECIAL PROJECT WARRANTY

- A. Manufacturer shall provide a 50 year material warranty.

1.07 EXTRA MATERIALS

- A. Fabric: Furnish five percent (5%) of gross wall system area for each color, pattern, and type of fabric used. Pack for storage with protective covering and label.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS (MARKERBOARDS)

- A. Claridge Inc., or approved equal.

2.02 SYSTEM PERFORMANCE

- A. System shall be comprised of factory assembled markerboards, in configurations and sizes indicated on the Drawings or as specified herein.
- B. Laminations of panel components shall be by face sheet manufacturer.

2.03 MATERIALS

- A. Wall-Mounted Markerboards: Claridge Series 5, Type A, as a standard of quality:

1. Dry markerboards shall be porcelain enamel steel manufactured to exceed the performance specifications for porcelain enamel S104 of the Porcelain Institute. Markerboards shall be capable of supporting papers by means of magnets. The writing surface shall resist wear and damage from shock and abrasion and shall not dent, shatter or crack. The surfaces shall retain original color, writing, and erasing qualities and shall not become glossy or shiny in normal use. The gloss variation of a surface shall not exceed 3 units when measured by a 45 degree gloss meter in accordance with the Porcelain Enamel Institute Bulletin 1-18 Gloss Test for Porcelain Enamels and ASTM C 346.
2. Steel: Base metal shall be high quality enameling iron or steel of low metalloid and copper content, especially manufactured and processed for temperatures over 1,400 degrees F. used in coating porcelain on steel units for Architectural purposes; minimum 24 gage.
3. Facing Surfaces:
 - a. Board surfaces shall consist of the following:
 - 1) Primer coat, 0.0025 inch minimum thickness.
 - 2) Vitreous-porcelain writing surface coating of 0.0025 inch minimum thickness.
 - 3) The reverse side of the steel base sheet shall receive a ground coat of 0.0005 inch thickness and a spray coat of silicon.
 - 4) The panel edges at butt joints shall be porcelain enamel.
 - 5) Fuse cover and ground coats to the steel at the manufacturer's standard firing temperature, but at least 1,250 degrees F.
2. The dry markerboard surfaced steel shall be factory laminated to 7/16 inch thick fiberboard core. A moisture blocking backing sheet shall be provided.
 - a. Fiberboard Core shall be #45 pound particle board.
 - b. Moisture Barrier Backer Sheet shall be minimum .015 aluminum or 28 gauge galvanized steel. Backer sheet shall be factory laminated to the core under pressure.
5. Lamination: The surface facing and the backing shall be bonded to the core material by means of a special flexible adhesive developed for this purpose with no unbonded area. The face and back shall not be removable without rupturing the core material. Panels shall not delaminate under normal use.
6. Joints: Where vertical joints occur, a 14 gage continuous concealed steel spline shall be fitted tightly into grooves in the core material. Factory rabbet to produce a smooth butt joint. Do not furnish exposed trim.
7. Edge Trim:
 - a) Alloy 6063-T5, extruded, anodized satin finish aluminum.

8. Chalktray: Furnish manufacturer's standard continuous flat-ribbed or box-type aluminum chalktray with stained front and cast plastic end closures for each chalkboard and markerboard.
 - a. Extend chalktray to end of both vertical edges of the board.
 - b. On flat-rib tray, provide 3/4 inch radius on corners and polish at ends.
9. Map Rail: Furnish map rail at the top of each unit, complete with the following accessories:
 - a. Display rail: Provide continuous cork display rail two inch wide, as indicated, integral with the map rail. Extend display rail to end of both vertical edges.
 - b. End stops: Provide one end stop at each end of the map rail.
 - c. Map hooks: Provide 2 map hooks with flexible paper holder clips for each 8 feet of map rail or fraction thereof.
 - d. Roller Map Bracket: Provide 2 for each 8 feet of map rail or fraction thereof

C. Wall Mounted Horizontal Sliding Markerboards – Double Panel

1. Frame/Track & Chalktray: Heavy-duty aluminum wall frame fabricated with 3"x1 1/2" LC-2 Frame channels and interior fitting C-clip wall channels.
 - a. Top Roller Supported Trolley System / Top Carrier : NACO "T-1" guide track with 2 #7000-15 adjustable ball bearing carriers per panel.
 - b. Bottom Guide: Inner and Outer Boards with NACO C4 Channel + rubber bumpers at ends.
 - c. CR-4 Chalktray attached to bottom horizontal frame.
2. Sliding Markerboard: 24 ga. porcelain enamel steel on 7/8 inch thick paper honeycomb with 0.015 aluminum backing and NACO C-8 Trim at perimeter and nylon guides at guide channel edge.
 - a. Markerboard facing color: #6100H White, unless otherwise indicated on Drawings.
 - b. Pulls: Ives No. 230, or equal. Provide 2 per panel at jambs.
3. Fixed (Wall Mounted) Markerboard: 24 ga. porcelain enamel steel on either 7/16" fiberboard core or 7/8 inch thick paper honeycomb with 0.015 aluminum backing and NACO C-8 Trim
4. Map Rail, surface mounted 2"width: NACO MR-3, with insert and end stops, or equal.

- a. Combination Maphook/Clip: NACO H-2, or equal. Provide 2 for each 8 feet of map rail or fraction thereof.
 - b. Roller Map Bracket: NACO RB-2, or equal. Provide 2 for each 8 feet of map rail or fraction thereof.
- D. Tackboards:
- 1. Tackwall panels shall be by Fabricmate, or equal.
 - 3. Tackwall panels shall consist of single-face layer of cloth-backed vinyl film, framed in high-impact plastic to secure the fabric; weight of vinyl film to be 20 oz. per lineal yard. Panel edges shall be beveled and wrapped; ends shall be square and unwrapped. Color as selected by Architect.
 - a. Vinyl film shall comply with FS CCC-W-408 A, Type 1; backing shall comply with FS LLL-1-535B, Class A. Finished panel shall have a Fire Hazard Classification of Class II in accordance with ASTM E 84 tunnel test, as administered by California State Fire Marshal approved testing laboratory.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install markerboard, trim, map rail and marker tray in accordance with manufacturer's directions and reviewed Shop Drawings. Fasteners for assembly of trim and frame units shall be truss head aluminum or stainless steel self-tapping screws with double cadmium-plated finish.
- B. Install panels after finish painting of wall surfaces has been completed and paint is cured. Install panels level, plumb and neatly assembled. Before Substantial Completion, trim shall be completely cleaned of dirt, finger-marks, or other foreign material.
- C. Install panel guides, spacers, and panels at media wall cabinets as indicated.

3.02 CLEANUP

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

3.03 PROTECTION

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

END OF SECTION

SECTION 10400

IDENTIFICATION DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Interior room signs, interior directional signs, geometric restrooms signs, occupant load signs, evacuation plans, exterior regulation signage, exterior directional signage, menu boards.

1.02 DEFINITIONS

- A. Accessible Route: A continuous unobstructed path that complies with ADA, CBC and ANSI A 117.1.
- B. Characters: Letters, numbers, punctuation marks, and typographic symbols.
- C. Circulation Path: An exterior or interior way of passage from one place to another for pedestrians, including, but not limited to, walks, hallways and courtyards.
- D. Common Use: Interior and exterior rooms, spaces, or elements made available for the occupancy by students, staff, or others visiting or utilizing facilities.
- E. Facility: Portions of buildings, structures, site improvements, complexes, equipment, roads, walks, passageways, parking lots, or other real or property located on a Project site.
- F. ISA: International Symbol of Accessibility
- G. Pictogram: A pictorial symbol, which is recognized as representing activities, facilities, or concepts.
- H. Sign: An Architectural element composed of displayed text, symbolic, tactile or pictorial information.
- I. Space: A definable area, such as a room, toilet room, hall, assembly area, entrance, storage room, alcove, courtyard or lobby.
- J. Tactile: An object that can be perceived through the sense of touch.

1.03 SYSTEM DESCRIPTION

- A. All signage shall conform to CBC Sections 1115B.5, 1117B.5 and 1103.2.4. Tactile exit signage shall be provided per CBC 1003.2.8.6.
- B. Parking Lot Entrance Signs and Accessible Parking Space Identification Signs:

1. Parking lot entrance signs shall comply with CBC, warning that cars parked in parking spaces reserved for people with disabilities will be towed.
2. Parking spaces reserved for people with disabilities shall be identified with a reflective sign featuring the ISA, which shall comply with CBC. Van accessible spaces shall be identified with the term "Van Accessible." (CBC 1129B.5)
3. Reserved parking spaces shall also be identified by the ISA at the foot of the space in compliance with CBC. (CBC 1129B.5.1-2). Access aisles shall be striped as required. (ANSI 117.1).

C. Circulation Path Signs:

1. Circulation path signs leading from public right of ways, public transportation, and/or parking lots that are not accessible or do not lead to accessible entrances to the building, shall be located at decision points directing people with disabilities to the accessible routes and/or entrances. Signs shall include the ISA. (ANSI 117.1. 703.7) Such signs shall be installed so those steps will not have to be retraced. (CBC 1117B.5.7).
2. Tactile exit signage shall be provided per CBC 1003.2.8.6 adjacent to doors that are provided with lighted exit signs..

D. Building Entrance Signs:

1. Accessible building entrances shall be identified with the ISA. (CBC 1117B.5.7). Inaccessible entrances shall have a sign, which includes the ISA, directing to the nearest accessible entrance this sign shall be placed at the last decision point before reaching the inaccessible entrance. (CBC 1117B.5.7). Building entrances shall have a sign stating "No Smoking", in accordance with California statute prohibiting smoking in public buildings.
2. When classrooms or other functional spaces have individual entrances from the exterior of the building, or from a courtyard, and such entrances are accessible, one sign can be placed on each exterior elevation stating "All rooms have accessible entrances." The ISA shall be included on such signs, which shall also include the phrase, "No smoking in the building."

E. Room Identification Signs:

1. Each permanent rooms and space identified by a sign shall have a sign installed adjacent to the door it identifies, with raised characters and Braille, in conformance with ANSI 117.1 (703.2 or 703.3). This includes entrances to rooms and spaces, which are entered, by an exterior entrance or by a door off an interior corridor or courtyard. (CBC 1117B.5).
2. Restroom identification signs shall include a gender pictogram in a 6-inch high field. Pictogram field shall be located above the raised character and Braille text on the tactile sign, which is to be located adjacent to the door in conformance with ANSI 117.1 (703.2 or 703.3, CBC 1117B.5) Restrooms shall be identified as follows:

- a. WOMEN.
 - b. MEN.
 - c. RESTROOM (for unisex, single person restrooms).
3. A geometric sign placed on the door shall also identify each restroom. The sign for women and girls' restrooms is a circle. The sign for men and boys' restrooms is a triangle. Unisex restrooms are identified by a triangle on and within the boundary of a circle. (CBC 1115B.5) Accessible restrooms shall include the ISA, (CBC 1117B.5.1.1), a minimum of 4 inches high, centered on the geometric sign on the door.
 4. If there is not adequate space for a sign immediately adjacent to the door, and the door opens inward, the gender pictogram, the ISA, and the raised characters and Braille can be included on the geometric sign installed on the door. In the case of restrooms with no doors, but only shielded entrances, the geometric sign can also include the required elements and be installed adjacent to the entrance.

F. Directional Signs for Accessible Elements:

1. Directional signs for inaccessible restrooms shall be installed at decision points directing disabled people to accessible restrooms. Signs shall include the ISA along with appropriate text and /or arrows, in conformance to ANSI 117.1 (703.4 and 703.7).
2. In building of 2 or more stories, where the elevator is not visible from the main circulation route, directional signs with the word "Elevator", an appropriate arrow, and the ISA shall be mounted at each decision point, in conformance to ANSI 117.1 (703.4 and 703.7).
3. In building with inaccessible exits, directional signs with the word "Exit", an appropriate arrow, and the ISA shall be mounted at each decision point. (ANSI 117.1 703.4 and 703.7, CBC 1133B.1.1.1.1 Exception 2).
4. Signs indicating the provision of special equipment for the hearing impaired (i.e. TTY phone, volume control phones and Assistive Listening Systems) shall include the appropriate Symbols of Accessibility in conformance to ANSI 117.1 (703.7), shall include brief text and /or arrows to direct people to this equipment in conformance to ANSI 117.1 (703.4), and shall be mounted at appropriate decision points and above the equipment itself so they are visible when the equipment is in use by others. (CBC 1117B.2.8, 1117B.2.9.3, 1104B.2.5)

1.04 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating sizes of signs and lettering, construction details, anchoring details, layout, and quantities.
- B. Material Samples: Submit colors and textures Samples of materials to be furnished for signs.

1.05 QUALITY ASSURANCE

- A. Comply with ICC/ANSI A117.1. American National Standard. Accessible and Usable Buildings and Facilities.
- B. Qualifications:
 - 1. Tactile signs: Manufacturers shall have been regularly engaged manufacturing Braille and raised character identifying devices for minimum of 5 years.
 - 2. Non-tactile signs: Manufacturers shall have been regularly engaged in manufacturing signs for minimum of 5 years.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Provide all means necessary to protect signs.

PART 2 - PRODUCTS

2.01 BRAILLE AND RAISED-CHARACTER (TACTILE) SIGNS

- A. For the purpose of establishing quality, the following products, manufactured by H. Toji and Company, Style 3.4, or equal:
 - 1. Exits (BT Standard).
 - 2. Named rooms with no number (BT Standard EL).
 - 3. Numbered rooms with no name (BT Standard).
 - 4. Numbered rooms with a name (BT Standard Window).
 - 5. Restrooms (BT Standard).
- B. Raised Characters: Raised 1/32" min. 5/8" to 2" High.
 - 1. Edges of characters beveled or rounded. (ANSI 117.1 703.2 and 703.3)
 - 2. Minimum of 1/8 inch between the top surfaces of adjacent characters measuring between the 2 closest points. (ANSI 117.1 703.2 and 703.3)
 - 3. Choice of one in coordination with District Representative of the following typestyles with proportions that comply with ANSI 117.1 703.2 and 703.3 and CBC 1117B.5.3, whichever is more stringent:
 - a. Futura.
 - b. Gill Sans.
 - c. Helvetica Regular.

- d. Optima.
- e. Stone Sans Semibold.
- f. Univers.
- g. Vag Rounded.

C. Braille: Grade 2 Contracted

- 1. Rounded or domed dots in accordance with ANSI 117.1 (703.5).
 - a. Dots to be 1/10 inch. on center in each cell with 2/10" space between cells measured from second column of dots in the first cell to first column of dots in second cell.
- 2. Specifications in accordance with CBC (1117B.5.2) and ANSI 117.1. (703.5), whichever is more stringent.
 - a. Dots to be raised min. 1/40" above background.
- 3. No indication of capital letters except for proper names, individual letters or acronyms, or beginnings of sentence in accordance with ANSI 117.1 (703.5).

2.02 PARKING LOT SIGNS

A. Tow-Away Signs:

- 1. 18 inches x 24 inches x 0.080 inch aluminum, rounded corners. White reflective graphics on dark blue reflective background. Character styles and proportions shall comply with ANSI 117.1 (703.4) and shall be a minimum of one inch high. H. Toji and Company 4.603, or equal.
- 2. Sign shall be installed on a wall or pole at each entrance to the parking lot or lots on the Project site.

B. Accessible Parking Identification Signs:

- 1. 12 inches x 18 inches, 0.080 inch aluminum, rounded corners. White reflective graphics on dark blue reflective background. ISA shall be minimum 8 inches high. Van accessible spaces shall include the words "Van Accessible" below the pictogram on the same sign, or a separate sign with the words shall be installed below the ISA sign. H. Toji and Company Style 4.601, 4.602, or equal.
- 2. Sign shall be installed on a wall or a pole at the head of each accessible parking space. Signs in the public way shall be installed with the bottom edge of the sign a minimum of 80 inches above the pavement or ground. Signs in a planting area, parking strip or on a wall shall be installed with the bottom edge of the sign a minimum of 60 inches above the pavement or ground; comply with ANSI A117.1.

2.03 EXTERIOR DIRECTIONAL AND INFORMATIONAL SIGNS

A. Accessible Path of Travel Signs:

1. 0.080 inch aluminum rounded corners; white on dark blue background; non-glare, high contrast signs. ISA minimum 4-1/2 inches high, conforming to ANSI 117.1-1198 (703.7). Text to conform to ANSI 117.1 (703.4). H. Toji and Company Style 3.1, or equal.
2. Sign to be mounted on post or wall with the lower edge of the sign between 48 inches and 60 inches above the ground or surface.

B. Other Informational and Directional Signs: Signs to be non-glare and high contrast. Text to conform to ANSI 117.1 (703.4). H. Toji and Company Style 3.1, or equal.

2.04 ENTRY SIGNS

A. ISA and No Smoking sign:

1. Glass entry doors: Reverse cut white vinyl ISA and No Smoking symbol, minimum 4-1/2 inches high. Under the No Smoking symbol, the words "No Smoking", minimum 1/2 inch high white Sans Serif upper and lower case characters. H. Toji and Company Style 3.002, or equal.
2. Solid entry doors: 0.063 aluminum sign, rounded corners. Blue background. White ISA and No Smoking symbol, minimum 4-1/2 inches high. Under the No Smoking symbol, the words "No Smoking," minimum 1/2 inch high white Sans Serif upper and lower case characters. H. Toji and Company Style 3.100, or equal.
3. Signs shall be installed or mounted with bottom edge of sign between 48 and 60 inches from finish floor or ground surface. Sign may be mounted on window or exterior wall immediately adjacent to door or on door itself.
4. Directional sign (for inaccessible entry): 0.063 aluminum sign, rounded corners. Dark blue background with white graphics. ISA and appropriate text and/or arrow directing to nearest accessible entry, compliant with ANSI 117.1 (703.4 and 703.7). H. Toji and Company Style 3.1, or equal.
5. Signs shall be installed on a post or wall at the final decision point between the inaccessible and the accessible entrance, so those steps do not have to be retraced. Install the sign on a wall or post so the bottom edge is between 48 and 60 inches from the ground or surface.

2.05 GEOMETRIC RESTROOM DOOR SIGNS.

- ### A. Signs shall comply with CBC (1115B.5). Geometric signs shall be 1/4 inch thick, fabricated of a non-glare material which shall contrast with the restroom door (light to dark, or dark to light). Circle shall be 12 inches in diameter; stand-alone triangle shall have equal sides 12 inches in length. Triangle placed on circle shall not protrude outside of circle. When restroom or other sanitary facility is accessible, ISA shall be placed in the center of the geometric sign. Non-tactile text, such as "Staff Only", may be added to the sign.

- B. Signs shall be installed on the door leading into the restroom or other sanitary facility, centered on the door, and with the center of the sign 60 inches from the finish floor

PART 3 - EXECUTION

3.01 GENERAL

- A. Non-glare (non-reflective) materials shall be furnished for signs, which identify, direct to, or give information about facilities and their use. Parking, traffic signs, and exterior safety signs may be furnished with reflective materials. Identification sign for accessible parking spaces shall be furnished with reflective materials.
- B. Characters shall have a minimum of 70 percent contrast with their backgrounds on signs which identify, direct to, or give information about facilities and their use.
- C. Character styles, proportions and sizes on signs shall comply with ANSI 117.1 (703.4.2.) and CBC 1117B.5.3, whichever is most stringent. Characters required to be tactile shall comply with ANSI 117.1 (703.2.4 and/or 703.3.3) and CBC 1117B.5.3, whichever is most stringent.
- D. Braille translations of room and space identifications shall be Grade 2 and Braille cells and dots shall comply with CBC, (1117B.5.2).
- E. Pictograms and Symbols of Accessibility shall comply with the standards in ANSI A117.1. (703.6 and/or 703.7).
- F. Restrooms shall be identified with a geometric symbol on the door, which complies with CBC (1115B.5).
- G. Signs required by the State Fire Marshal shall comply with CBC.

3.02 METHODS OF INSTALLATION

- A. Interior Identification Signs and Interior Directional Signs:
 - 1. Fasten to wall with 4 tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.
 - 2. When concealed installation is specified, install backplate to wall as above. Fasten sign to backplate with very high-bond double-faced tape.
 - 3. For installation on glass, fasten sign to glass with very high bond double faced tape. On opposite side of glass, anchor matching backplate to glass with very high-bond double-faced tape.
- B. Geometric Signs: Geometric toilet room signs shall be fastened to doors with 3 tamper-proof oval-head counter-sunk screws.
- C. Exterior Post Mounted Directional Signs: Install by post mount. Size of required footing shall be as indicated.
- D. Exterior Wall Mounted Identification Signs and Directional Signs:

1. Aluminum signs: Fasten to wall with 4 tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.
2. Acrylic signs: Install backplate to wall as above. Fasten sign to backplate with very high-bond double-faced tape and silicone.

E. Exterior Building Sign:

1. Each letter shall be furnished with a minimum of 3 cast mounting lugs on backside, drilled and tapped to receive installation bolts.
2. Letters shall be installed according to manufacturer's method PMC-1. Letters shall be installed 3/4 inch away from wall surface, by an aluminum sleeve spacer.

3.03 CLEANUP

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

3.04 PROTECTION

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

END OF SECTION

SECTION 10520
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Fire Extinguishers
- C. Related Sections:
 - 1. Section 06100: Rough Carpentry.
 - 2. Section 09250: Gypsum Board.

1.02 SUBMITTALS

- A. Shop Drawings: Indicate materials, sizes, anchorage, and installation details.
- B. Product Data: Submit manufacturer's product literature, indicating product characteristics.
- C. Material Samples: Submit manufacturer's standard cabinet color Samples for selection by Architect.

1.03 QUALITY ASSURANCE

- A. Installer shall be manufacturer trained and certified to install the Work of this section.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's wrapping to protect items.
- B. Store items in a dry, enclosed area.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHER

- A. Location: Fire extinguishers shall be installed where indicated on Drawings or as required by authorities having jurisdiction.
- B. Manufacturer: Fire extinguishers shall be manufactured by one of the following:
 - 1. Potter-Roemer

2. J. L. Industries
 3. Larsen's Manufacturing
 4. Modern Metal Products, by Muckle
 5. Waltrous
- C. Fire Extinguisher Type: Provide a legally appropriate rechargeable fire extinguisher for every fire extinguisher cabinet and as otherwise indicated.
1. Classrooms, Corridors, Administration and Special Use Rooms [Cabinet mounted]:
Type ABC multi-purpose dry chemical with UL rating 2A:10B:C, 5 lb. size, also with red glossy polyester coated steel cylinder, pressure gauge, hose and horn. Maximum Height: 15 ¼". Maximum Cylinder Diameter: 4 ½".
- D. Fire Extinguisher Requirements:
1. Design Specification:
 - a. Finish: Corrosion and impact resistant red epoxy.
 - b. Valve Stem Assembly: Metal, reusable, connects to cylinder by threaded pipefitting, aluminum or steel siphon tube, and shatter resistant plastic face gauge.
 - c. Gauge to Indicate: "Recharge," "fully charged (195 PSI)," and "over charge."
 - d. Pull Pin: Metal, reusable and securely fastened to unit with metal, aluminum chain or very heavy plastic line approximately 4 ½" long.
 - e. Mechanical Operation: Pistol grip, heavy duty metal handle (plastic not permitted), and shall be operated by a grip and squeeze lever.
 2. Manufacturer Identification/Information: Manufacturer's name, date manufactured, model number, U.L. approval seal and/or number, contents operating instructions, etc. shall be identified on the Fire Extinguisher.
 3. Warning and First Aid Label: Fire extinguisher must indicate all standard warnings concerning breathing, eyes, skin and ingestion. Provide emergency and first aid procedures.
 4. Property Identification: Label affixed at front of unit, size 2" x 4", shall read "PROPERTY OF ROSEMEAD SCHOOL DISTRICT".
 5. Repair Parts: The manufacturer and/or their representative shall maintain within the Los Angeles Metropolitan Area an adequate stock of replacement parts, available for immediate delivery.
 6. Warranty:

- a. Manufacturer shall provide a 5 year material warranty.
 - b. Installer shall provide a 5 year labor warranty.
- 7. Material Safety Date Sheet: Provide an MSDS sheet with every shipment as set forth in the California Labor Code, Section 6390.
 - 8. Latching and locking hardware to be operable with a single effort by lever-type hardware, panic bars, push-pull activating bars or other hardware designed so as not to require the ability to grasp the opening hardware and not require a force greater than 5 lbs.
 - 9. Force required to activate controls shall not exceed 5 lbs.
 - 10. Be recessed or semi-recessed in order not to protrude more than 4 inches from face of wall. Mounted between 15-48 inches A.F.F. for forward approach. Mounted between 9-54 inches A.F.F. for side approach.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall be in accordance with manufacturer's recommendations.
- B. Cabinets shall be installed plumb and level, where indicated on Drawings, at heights required by authorities having jurisdiction.

3.03 PROTECTION

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

3.04 CLEANUP

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

END OF SECTION

SECTION 11131
PROJECTION SCREENS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Projection screens as indicated.
- C. Related Sections:
 - 1. Electrical: Division 16.

1.02 SUBMITTALS

- A. Shop Drawings: Submit details for installation, attachment, and electrical requirements.
- B. Product Data: Submit manufacturer data indicating model and size of units.
- C. Installation Instructions: Submit manufacturer's installation instructions.

1.03 QUALITY ASSURANCE

- A. Coordinate installation of ceiling mounted recessed screens with ceiling installation.
- B. Conduct a pre-installation meeting on Project site to review procedures, details and interfacing with adjacent materials and finishes.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Protect screens from damage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Specification is based on products manufactured by Da-Lite Screen Company. The following products may be submitted:
 - 1. Draper Screen Company.
 - 2. Stewart Film Screen.

2.02 MANUALLY OPERATED / SURFACE MOUNTED PROJECTION SCREENS

- A. Projection screens shall be ceiling or wall mounted, pull down roller type, with non-gloss matte white surface. Projection surface shall be flame and mildew resistant and

shall be furnished with a 2 inch black masking border. Screens shall be provided with pull strings or rings. Unless otherwise indicated, size shall be:

1. General Classrooms, if Drawings note surface mounted: 70" x 70" Da-Lite Model C.
- B. Screens shall be furnished with universal mounting brackets for attachment to wall or ceiling.
- C. Aluminum sash pole with hanger, Trimco model 3525 x 352 by Triangle Brass Manufacturing, or equal.

2.03 MANUALLY OPERATED / RECESSED MOUNTED PROJECTION SCREENS

- A. Projection screens shall be designed for ceiling recessed installation, pull down roller type, with non-gloss matte white surface. Projection surface shall be flame and mildew resistant and shall be furnished with a 2 inch black masking border. Screens shall be provided with pull strings or rings. Unless otherwise indicated, size shall be:
 1. General Classrooms, if Drawings note recessed installation: 70" x 70" Da-Lite Advantage Manual with CSR (Controlled Screen Return).
- B. Screens shall be furnished with a universal mounting brackets for attachment to wall or ceiling.
- C. Aluminum sash pole with hanger, Trimco model 3525 x 352 by Triangle Brass Manufacturing, or equal.

2.04 ELECTRICALLY OPERATED / SURFACE MOUNTED PROJECTION SCREENS

- A. Electrically operated screens shall be contained in housing designed for surface mounting on ceilings as indicated on Drawings. Screens shall be furnished with a flame and mildew resistant, non-gloss matte white surface with 2 inch black masking border. Unless otherwise indicated, size shall be:
 1. Art, Computer, Science Classrooms and Libraries, if Drawings note surface mounted installation: 70" x 70" Da-Lite Cosmopolitan Projection Screen.
- B. Screens shall be electrically operated 115 volt, 60 Hz, 3.5 amp, and shall be furnished with a 3 wire quick reversal motor, especially designed for purpose, to be ball bearing and oiled for life.
- C. Automatic thermal overload cutout and integral interlocking gears. Preset but accessible limit switches to automatically stop screen surface in up and down positions.
- D. Case shall be of rigid metal construction. Motor compartment shall be metal lined. A section of bottom of case shall be furnished with piano type hinges and connected to drive mechanism so that it opens and closes automatically with lowering and raising of screen. Case shall be provided with a shop applied primer coat.
- E. Provide screens complete with 3-position control switch in box with cover plate. Screens shall bear UL label.

2.05 ELECTRICALLY OPERATED / RECESSED MOUNTED PROJECTION SCREENS

- A. Electrically operated screens shall be contained in housing designed for surface mounting on ceilings as indicated on Drawings. Screens shall be furnished with a flame and mildew resistant, non-gloss matte white surface with 2 inch black masking border. Unless otherwise indicated, size shall be:
 - 1. Art, Computer, Science Classrooms and Libraries, if Drawings note recessed mounted installation: 70" x 70" Da-Lite Boardroom Electrol Projection Screen.
 - 2. Lecturer Rooms: 8'x8' Da-Lite Boardroom Electrol Projection Screen.
- B. Screens shall be electrically operated 115 volt, 60 Hz, 3.5 amp, and shall be furnished with a 3 wire quick reversal motor, especially designed for purpose, to be ball bearing and oiled for life.
- C. Automatic thermal overload cutout and integral interlocking gears. Preset but accessible limit switches to automatically stop screen surface in up and down positions.
- D. Case shall be of rigid metal construction. Motor compartment shall be metal lined. A section of bottom of case shall be furnished with piano type hinges and connected to drive mechanism so that it opens and closes automatically with lowering and raising of screen. Case shall be furnished with a shop applied primer coat.
- E. Provide screens complete with 3-position control switch in box with cover plate. Screens shall bear UL label.

2.06 LARGE ELECTRICALLY OPERATED PROJECTION SCREENS

- A. Electrically operated screens shall be contained in housing designed for surface mounting on ceilings as indicated on Drawings. Screens shall be furnished with a flame and mildew resistant, non-gloss matte white surface with 2 inch black masking border. Unless otherwise indicated, size shall be:
 - 1. Multipurpose Rooms, small, with automated ceiling closure: 87" x 116" Da-Lite Boardroom Electrol Projection Screen.
 - 2. Multipurpose Rooms, large, with automated ceiling closure: 105" x 140" Da-Lite Boardroom Electrol Projection Screen.
 - 3. Auditorium, small, with closure doors: 9' x 12' Da-Lite Boardroom Electrol Projection Screen.
 - 4. Auditorium, small, without closure doors: 9' x 12' Da-Lite Professional Electrol Projection Screen.
 - 5. Auditorium, large, with closure doors: 12' x 16' Da-Lite Executive Electrol Projection Screen.
 - 6. Auditorium, large, without closure doors: 12' x 16' Da-Lite Professional Electrol Projection Screen.
- B. Screens shall be electrically operated 115 volt, 60 Hz, 3.5 amp, and shall be furnished with a 3 wire quick reversal motor, especially designed for purpose, to be ball bearing

and oiled for life.

- C. Automatic thermal overload cutout and integral interlocking gears. Preset but accessible limit switches to automatically stop screen surface in up and down positions.
- D. Case shall be of rigid metal construction. Motor compartment shall be metal lined. Case shall be furnished with a shop applied primer coat. When the automated ceiling closure system is noted, a section of bottom of case shall be furnished with piano type hinges and connected to drive mechanism so that it opens and closes automatically with lowering and raising of screen.
- E. Provide screens complete with 3-position control switch in box with cover plate. Screens shall bear UL label.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install screens according to manufacturer's installation instructions and Shop Drawings.
- B. Screens in Oral Arts Room shall be installed between proscenium wall and front curtain as indicated.
- C. Screens in the Assembly Rooms shall be installed with the offset mounting method unless otherwise indicated.
- D. The finished installation shall be free from damage, blemishes or other defects impacting appearance or operation, with operating panels in alignment with adjacent ceiling, and be uniform in plane and appearance.

3.02 CLEANUP

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

3.03 PROTECTION

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

END OF SECTION

SECTION 15010

BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. This section provides the basic mechanical requirements that apply to the Work of Division 15.
- C. Related Sections:
 - 1. Division 16: Electrical.
- D. Coordination:
 - 1. Coordinate related Work of Division 15: Mechanical.
 - 2. Coordinate related Work of other divisions.
 - 3. Coordinate scheduling to minimize operational disruption of existing facilities.
- D. Ordinances and Regulatory Requirements:
 - 1. Current federal Safe Drinking Water Act (SDWA) regulations require the furnishing of lead-free pipe, solder, and flux in the installation or repair of plumbing in non-residential facilities connected to public drinking water systems. Under this regulation, solders and flux are considered lead-free when they contain 0.2 percent lead or less. Pipes and pipe fittings are considered lead-free when they contain 8.0 percent lead or less.
 - a. Provide lead-free water pipe, solder, and flux materials that meet the standards as outlined by the federal SDWA regulations.
 - b. Collect pipe, solder, and flux material samples as required by the IOR. Test samples shall be delivered to an Owner designated testing laboratory for testing of lead content.
 - (1) Test samples for lead content by the atomic absorption spectrophotometry method.

- c. Materials found not conforming to SDWA regulations shall be deemed defective Work and shall be replaced with lead-free materials.
 - d. Comprehensive testing of the remaining materials for their lead content shall be performed as required by the IOR.
2. Workmanship, materials, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:
- a. AGA - American Gas Association.
 - b. AMCA - Air Moving and Conditioning Association.
 - c. ANSI - American National Standards Institute.
 - d. ASME - American Society of Mechanical Engineers.
 - (1) Boiler and Pressure Codes.
 - (2) Code for Pressure Piping.
 - e. ARI - Air Conditioning Refrigeration Institute.
 - f. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers.
 - g. ASTM - American Society for Testing and Materials.
 - (1) A-53 Specification for Welded and Seamless Pipe.
 - h. AWA - American Waterworks Association.
 - i. FM - Factory Mutual.
 - j. NFPA - National Fire Protection Association.
 - k. OSHA - Occupational Safety and Health Administration.
 - l. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Inc.
 - m. UL - Underwriters Laboratories.

3. Workmanship, materials, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:
 - a. UBC, UMC, and UPC - latest edition as adopted by the City of Los Angeles, the County of Los Angeles, and the State of California including amendments effective on the Effective Date of the Contract.
 - b. Title 8, California Administrative Code.
 - c. California Building Code (CBC).
 - d. Division of Industrial Safety - boiler and fire-pressured vessel safety orders.
 - e. Division of Industrial Safety - electrical safety orders.
 - f. OSHA - Occupational Safety and Health Administration.
 - g. Department of Health.
 - h. South Coast Air Quality Management District.
4. Specifications or Drawings shall be not construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.

E. Permits and Fees: Refer to the General and Supplementary Conditions.

F. Drawings and Specifications:

1. Contract Documents indicate extent and general arrangement of Work under Division 15. Architect may require adjustments to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.
2. Refer to Section 01100 to coordinate mechanical Work with Work of other Divisions.

G. Materials and Equipment:

1. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.

2. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.
3. For substitution of materials or products, refer to the General Conditions.

H. Submittals:

1. Provide submittals in accordance with Section 01300 and with specific requirements of Division 15, as applicable.
2. Submit materials for potable water systems as required by the IOR.
3. Submit the following:
 - a. A complete materials list of items to be furnished and installed under this Division.
 - b. Shop Drawings, as required.
 - c. Manufacturer's specifications and other Product Data required to demonstrate compliance with specified requirements.
 - d. Manufacturer's printed installation instructions
 - e. Catalogs.
 - f. Operating instructions.
4. When reviewed by the Architect, the above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.
5. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project, as required. Drawings prepared in AutoCAD Release 14 format may be provided by the Architect to serve as a background for the Shop Drawings. Shop Drawings shall indicate at a minimum:
 - a. Complete system layout of equipment, components, ductwork, and piping, indicating service clearances.

- b. Schedule and description of equipment, ductwork, piping, fittings, valves, dampers, and controllers.
- I. Protection, Care and Cleaning: In addition to storage criteria of the General Conditions, and provisions under Section 01500: Construction Facilities and Temporary Controls, the following shall be provided:
1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.
 2. Protect installed Work.
 3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.
 4. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.
 5. Do not store plastic pipe or materials in direct sunlight.
 6. Protect covering for bearings, open connections to tanks, pipe coils, pumps, compressors and similar equipment.
 7. Interior of ductwork shall be maintained free of dirt, grit, dust, loose insulation, and other foreign materials.
 8. Air handling equipment shall not be operated until building is cleaned and air filters are installed.
 9. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.
 10. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas. Refrigerant piping shall be cleaned as specified.
- J. Guarantees and Damage Responsibility:

1. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.
2. Unit heaters, unit ventilators, unit air conditioners and fans, and distribution systems shall be warranted by their manufacturers to operate without undue noise of more than 50 decibels on the A scale, measured 10 feet away from the unit unless otherwise specified. Perform adjustments or required corrective actions to meet these standards without reducing flow quantities specified in the Contract Documents.

K. Project Record Documents:

1. Comply with provisions of Section 01700: Contract Closeout.
2. Project Record Drawings: Provide a complete set mechanical, plumbing, fire protection and control system drawings in AutoCAD Release 14 or higher format, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full size reproducible plots on vellum and 3 sets of prints.
3. Before Final Completion, deliver corrected and completed prints to the OAR. Delivery of project record documents to the OAR does not relinquish responsibility of furnishing required information omitted from project record documents.

L. Preliminary Operation:

1. OAR may require any portion of mechanical Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.
2. Notify the IOR at least 24 hours in advance of lighting or re-lighting pilots.

M. Tests and Testing:

1. Tests shall be as required under the applicable sections of Division 15, including this section.
2. Tests required by other sections of the Contract Documents include the following:
 - a. Test and balance of mechanical equipment and systems.
(Section 01450: Test and Balance)
 - b. Hydrostatic test of boilers.

(Section 01450: Test and Balance)

- c. Test of smoke and/or fire detectors.
(Division 16: Electrical)
3. Additional tests may be required in the case of products, materials, and equipment if:
- a. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.
 - b. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.
4. Piping Tests:
- a. Perform tests required to demonstrate that operation of mechanical systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the IOR, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.
 - b. If required tests are not performed, Owner may provide in accordance with the Contract Documents.
 - c. Pressure gauges furnished in testing shall provide one-pound graduations; vacuum gauges shall provide one-inch mercury graduations. Air shall be bled from lines requiring hydrostatic or water tests.
 - d. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.
 - e. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.
 - f. Refrigerant piping may be tested with a halide detector or calibrated electronic testing equipment.

- g. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the IOR.
- h. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

5. Pipe Testing Schedule:

	<u>System Tested</u>	<u>Test Pressure (psig)</u>	<u>Test With:</u>
a.	Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10' of water, vertically	
b.	Hot water heating system piping and chilled water piping	150	Water
c.	Vacuum pump or condensate pump discharge and condensate return piping	150	Water
d.	Domestic water piping (metallic)	200	Water
e.	Gas piping (steel threaded or plastic)	60 (both tests)	Air
f.	Gas piping (steel welded)	100 (both tests)	Air
g.	Refrigeration suction		
h.	R-410A	150	Dry nitrogen
i.	Freon F-22	230	
j.	Refrigeration liquid and hot gas piping		

	R-410A	250	Dry nitrogen
k.	Freon F-22	300	Dry nitrogen

6. Equipment Performance Assurance Tests:

- a. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed, recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and/or materials shall be replaced or repaired as required.
- b. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of the start-up report for review by the Architect.
 1. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.
- c. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.
- d. Provide electric energy and fuel required for tests.
- e. Final adjustment to equipment or systems shall meet specified performance requirements.
- f. Equipment, systems, or Work deemed defective during testing shall be replaced and/or corrected as required. Test until satisfactory results are provided.

7. Specific Coordinated Plan for Test & Balance at Substantial Completion:

- a. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.
- b. Before Substantial Completion, mechanical equipment and systems shall be operated and tested for a period of at least 5 consecutive days to

demonstrate satisfactory overall operation of the installed systems. Tests shall include operation of heating, ventilating, and air conditioning equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified heating and cooling capacities.

- c. Tests shall commence after preliminary balancing, adjustments to equipment and systems have been completed, and operating equipment has been checked and thoroughly lubricated.
- d. Immediately before starting tests, air filter media shall be cleaned or renewed. Roll-type filters shall be advanced to provide new clean media. Cleanable type media shall be thoroughly cleaned and re-oiled with new, clean oil as recommended by manufacturer if they are of viscous impingement type. Disposable type filters shall be replaced with new filters. Replaceable media shall be replaced with new media.
- e. An accurate means of measuring air flow and temperatures shall be furnished to balance air supply, return, and exhaust systems so uniform temperatures occur in every room and design airflow is obtained through registers, diffusers, and grilles.
- f. Systems shall be adjusted to provide airflows indicated including maximum fresh air and maximum return air. Dampers shall be checked for proper settings and operation. Air and water inlet and leaving temperatures at coils shall be checked. Complete operational data including airflows, room temperatures, fan speeds, motor currents, plenum, and duct static pressures shall be tabulated.
- g. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with requirements specified in Section 15050: Basic Mechanical Materials and Methods.

N. Location:

1. Location of piping, apparatus, and equipment as indicated on Drawings is approximate and shall be altered to avoid obstructions, preserve headroom and provide free and clear openings and passageways.
2. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.
3. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.

4. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

O. Cutting, Notching and Backing:

1. Conform to California Building Code, Title 24, Part 2, Section 2320.A11.10, for notches and bored holes in wood; Section 1906A.3, for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.
2. Where pipes or ducts pass through, or are located within one inch of any construction element, install a resilient pad, 1/2 inch thick minimum, to prevent contact.
3. Furnish all necessary provisions for recesses, chases, accesses, and provide wood blocking and backing as necessary for proper reception and installation of mechanical Work.

P. Service Interruptions, Off-site, Gas and Water:

1. Schedule Work so there shall be no service interruptions of existing systems and/or systems during normal hours of operation of affected systems and/or facilities.
2. When service interruptions are mandatory, arrange in advance with the OAR as to time and date of such interruptions.
3. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

Q. Operation and Maintenance Manuals:

1. General: Submit 2 copies of operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return 3 copies of manuals. Manuals shall be bound in hardback, 3-ring, loose-leaf binders. Deliver manuals to the OAR. Submit an electronic copy of the entire manual in Adobe Acrobat (PDF file) format.
2. Contents of Manual:
 - a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.

- b. Manufacturer's operating instructions including, but not limited to, the following:
 - (1) Identification of components and controls.
 - (2) Pre-start checklist and start-up procedures.
 - (3) Normal operation settings and checklists.
 - (4) Pre-shut down checklist and shut down procedures.
 - (5) Trouble shooting checklist and guidelines.
 - (6) Recommendations for optimum performance.
 - (7) Warnings and safety precautions on improper or hazardous operational procedures or conditions

- c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 15 that includes the following as a minimum:
 - (1) Manufacturer's model, identification and serial numbers.
 - (2) Exploded view of assembly drawings identifying each component or part with the relevant part number.
 - (3) Directory of manufacturer's representatives, service contractors and part distributors.
 - (4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.

- d. Project Record Drawings: Complete set of mechanical, plumbing, fire protection and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD 14 or higher format complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.

- e. Test and balance reports: Submit as specified in Section 01450.

- f. South Coast Air Quality Management District (SCAQMD) permits to install and operate boilers, water heaters and other fuel burning

equipment and third-party source test reports as required by SCAQMD to allow start-up and operation of equipment.

- g. Los Angeles County industrial waste permits.
- h. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.
- i. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

R. Training of Owner Personnel:

- 1. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract as indicated in each section of Division 15.
- 2. Operational and maintenance training shall be conducted on the Project site.
- 3. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by the OAR.

END OF SECTION

SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. This Section prescribes basic materials and methods generally common to the Work of Division 15.
- C. Related Sections:
 - 1. Section 02318: Excavating, Backfilling and Compacting for Utilities.
 - 2. Section 15010: Basic Mechanical Requirements.
 - 3. Division 15: Mechanical.
 - 4. Division 16: Electrical.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01, Section 15010 and specific requirements of each section of Division 15.

1.03 QUALITY ASSURANCE

- A. Standards: Comply with applicable national, state, and local codes and standards: ASTM, ASME, ANSI. Federal Specifications, AWWA, SISPI, NFPA, FM, UL, CPC California Plumbing Code, CMC, AGA.
- B. Qualifications of Manufacturer: Products used in the Work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production as reviewed by the Architect.

1.04 COORDINATION

- A. Coordinate related Work in accordance with provisions of Section 01100: Coordination.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide the following products if they are indicated in the Contract Documents or if they are required for the proper installation, function or operation of equipment, systems or components indicated in the Contract Document.
- B. Provide the following products as a complete assembly with required accessories for a complete and functioning entity in compliance with governing codes and applicable standards as specified in Section 15010, manufacturer's instructions or as required.
 - 1. Omission of minor details in the Contract Documents does not waive and/or otherwise relinquish compliance with the above requirements.

2.02 MANUFACTURERS AND MATERIALS

- A. Air Compressor: (not used).
- B. Air Separators:

AS-1 Furnish as indicated on the Drawings, a Spirotherm, Bell and Gossett, or Wheatley air and dirt separation fitting on the hot water heating system, chilled water system, and condenser water system. Fittings shall be fabricated steel, rated for 150 psig design pressure and selected for less than one foot of water pressure drop and entering velocity not to exceed 4 feet per second at specified GPM. Performance curves from the unit manufacturer shall be furnished as part of the submittal for each unit. Units shall be furnished with internal copper coalescing medium to facilitate maximum air and dirt separation and suppress turbulence. Units shall be furnished with galvanized steel strainer and stainless steel collector tube. Provide integral high capacity float actuated air vent at top fitting of tank. Furnish cast iron float actuated air vent rated at 150 psig, threaded to the top of the fitting. Unit shall be furnished with the bottom of the vessel extended for dirt separation with the system connection nozzles equidistant from the top and bottom of the vessel and shall include a blowdown connection and valve.

Bell and Gossett

Spirotherm

Wheatley

C. Balancing Valves:

BBV-1 Dual purpose, balancing and shut-off:

Sarco	Homestead	Illinois
Type IBW	Fig 1112	Series 4000
w/handle		

BBV-2 Boiler blow-off (drain): Drain valves furnished with boilers shall be removed and replaced with the following; 2 inches and smaller.

Walworth	Homestead	Nordstrom
Fig. 1796	24212	142
and 1797F		

D. Ball Valves: Provide as required for service shut-off and isolation of equipment and devices or buildings and sections of buildings in addition to where indicated on Drawings.

1. Bronze, 2 inches and smaller:

BV-1 Class 150# SWP, 600 psi WOG, 2-piece construction, reinforced Teflon seats, adjustable packing gland, threaded ends:

Type of Service: Plumbing hot and cold water, air compressor, chilled water, condenser water and pump discharge (Provide at air compressor discharge line, discharge side of air receiver, compressed air outlets in shop buildings. Also, refer to GV-1 and GV-3.)

Hammond 8301; Stockham S-216-BR-R-T; American Fig. 2; Milwaukee BA 100; Nibco T-585-70

BV-2 Same as BV-1 except with extended soldered ends.
Also, refer to GV-2 and GV-4.

Hammond 8311; Stockham S-216-BR-R-S; American 2S; Milwaukee BA 150; Nibco S-585-70

E. Butterfly Valves: (Provide for shut-off in chilled water, condenser water and heating hot water systems.)

BFV-1 Centerline Series A, 150 psi tight shut-off, ASTM A 126

- a. Body: Wafer type, iron.
- b. Disc: Cadmium-plated ductile, iron for chilled water (bronze, or aluminum bronze for condenser water)
- c. Stem: Solid one-piece, 304 or 316 or 410 stainless steel.
- d. Seat and O-Rings: EPDM O-ring
- e. Upper and Lower Stem Bearings: Bronze or reinforced Teflon.
- f. Operators: Valves 6 inches and smaller, Victaulic No. 700 with lever handle. Valves 8 inches and larger, Victaulic No. 701 manual gear operator and disc position indicator.
- g. Manufacturers: Milwaukee, Centerline, Stockham, Crane, or DeZurik.

F. Check Valves: (Provide where backflow prevention is required at multiple parallel pump discharges, make-up water lines, etc.)

1. Bronze, 2 inches and smaller:

CHV-1 Class 125#, swing check, Teflon disc, threaded ends.

Type of Service: Plumbing hot and cold systems. (Provide at multiple hot and chilled water pump discharge lines, make-up water lines.)

Hammond IB940; Stockham B-320B; American 31F; Crane 1707; Milwaukee 509; Walworth 3406; Nibco T-413

CHV-2 Class 125#, swing check, Teflon disc, soldered ends.

Type of Service: Plumbing hot and cold water systems. (Provide on junior fire sprinkler systems less than 3 fire sprinkler heads, on wet standpipe systems.)

Hammond IB912T; Stockham B-310B; American 31FS; Crane 1707S; Milwaukee 1509; Walworth 3406J; Nibco S-413

CHV-3 Class 150#, swing check, bronze disc, threaded ends:

Type of Service: Condenser water system, chilled water system, pump discharge and low-pressure steam. (Provide on multiple chilled water and condenser water pump discharge lines, low-pressure steam boiler return lines from steam traps.)

Hammond IB946B; Stockham B-321; American 31FGY; Crane 137; Milwaukee 510; Walworth 3412; Nibco T-433

2. Iron 2-1/2 and larger:

CHV-4 Class 125#, IBBM, renewable seat and disc, bolted cap, threaded ends:

Type of Service: Plumbing hot and cold water systems and low-pressure steam systems. (Provide on multiple domestic hot and chilled water pump systems, multiple steam boiler return lines from steam trap.)

Milwaukee T-2973; Walworth 8928; Crane 372; Stockham G-927; Nibco T-918

CHV-5 Class 125#, IBBM, renewable seat and disc, bolted cap, flanged ends:

Hammond IR1124; Stockham G-931; American 35; Crane 373; Milwaukee F2974; Walworth 928F; Nibco F-918 B

CHV-6 Class 250#, IBBM, renewable seat and disc, bolted cap, flanged ends:

Hammond IR322; Stockham F-947; American 35-250; Crane 39E; Milwaukee F2970; Walworth 970F; Nibco F-968B

CHV-7 On pump discharge, Class 250#, wafer check, double disc, spring actuated:

Hammond IR9253; Stockham WG-970; Nibco W-910B

G. Earthquake Valve: (Provide at each gas meter.)

1. Schedule Numbers:

EQV-1 Mechanically triggered by seismic movement, complying with state of California seismic response specifications, UL listed and state certified. Size and pressure as required and/or indicated on Drawings. (Minimum 1/4 psi, maximum 10 psi). Earthquake valve shall shut off gas automatically during an earthquake to prevent an explosion and/or fire. Valve shall be Koso earthquake valve, or equal, providing the following features:

- a. Not sensitive to vibrations caused by passing trucks or accidental bumping.
- b. Sensitive to wide amplitude G's only. Preset at factory for the correct G-rating.
- c. Positive sealing from -10 degrees F. to 150 degrees F.
- d. Visual open-close indicator.
- e. Manual reset.
- f. Plumb line for mounting.
- g. Tripping mechanism has non-creeping rolling latch.

Install valve per manufacturer's recommendations only.

H. Compression or Expansion Tank:

ET-1 Pressurized, vertical, steel expansion tank for non-potable water systems with a replaceable, heavy duty, Butyl rubber bladder, 1 inch or 1-1/2 inches NPT system connection, 3/4 inch drain, 0.302 inch-32 standard automobile tire valve type charging connection, lifting rings and a floor mounting skirt for vertical installation. The tank must be constructed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code and stamped for 125 psi working pressure. The tank must be also rated for a continuous working temperature of 240 degrees F. Provide weather and rust resistant coating. (Provide at each chilled water or heating hot water system.)

Bell and Gossett Wheatley Taco Amtrol

ET-2 Pressurized, vertical, steel expansion tank for potable water systems with FDA approved, replaceable, heavy duty, butyl rubber blend diaphragm, polypropylene lined dome, 1/2 inch, 3/4 inch, 1 inch or 1-1/2 inches NPT system connection, 1/2 inch or 3/4 inch drain, 0.302 inch-32 standard automobile tire valve type charging connection, lifting rings and a floor mounting skirt for vertical installation. The tank must be constructed in accordance with Section VII of the ASME Boiler and Pressure Vessel Code and stamped for 125 psi working pressure. The tank must be also rated for a continuous working temperature of 240 degrees F. Provide weather and rust resistant coating. (Provide at each domestic hot water heater or system.)

Bell and Gossett Wheatley Taco Amtrol

I. Flow Control Valve; Automatic:

FC-1 To control flow rates with plus 5 percent accuracy. Device shall consist of inline pipe section with internal stainless steel variable self-positioning orifice assembly with built-in strainer. Device shall be factory set, tamper-proof and require no external adjustment. Provide 2 body pressure taps suitable for differential pressure connections. Body material shall conform to system piping material. The flow rate and pressure drop shall be stamped on a tag, which shall be chained and riveted to the device. (Provide for balancing purposes in chilled water or hot water heating systems at each heating or cooling coil.)

Griswold Controls, or equal.

J. Flow Control Valve - Manual:

FC-2 Flow control valves: Bell and Gossett Series CB circuit setter balancing valve, line size, with integral pointer (to register degree of valve opening) and differential pressure meter connections with built-in check valves. Armstrong Series CBV circuit-balancing valves, Illinois Series 6000. (Provide for balancing purposes in chilled water or hot water heating systems at each pump and air handling unit heating or cooling coil.).

K. Venturi Flow Measuring Device:

- FMD-1 Preso B-plus series, or equal, venturi type flow measuring device. Provide on the main heating hot water and chilled water lines and other locations as required for balancing, as indicated, between straight sections of pipe. Upstream pipe section shall be not less than 5 diameters in length and downstream section shall be not less than 2 diameters in length. Venturis shall be furnished complete with quick disconnect valves, safety shut-off with memory valves and attached metal identification tag.
- a. 2 inch or smaller shall be furnished with threaded connections.
 - b. 2-1/2 inches or larger shall be furnished with flanged connections.

L. Electronic Flow Readout Meter:

- FM-1 Flow meter shall combine the functions and ranges of several gages into a single board range meter. Meter shall function as a compound pressure gauge measuring the high side and low side pressure simultaneously and display each reading in sequence. Meter shall be furnished complete with a shut-off, bypass, and blow down valve network installed on a portable meter panel. A carrying case shall be provided with storage for accessories. Meter shall automatically select the proper range, compensate for temperature, and reset itself. Memory function shall store up to 90 sets of pressure and/or temperature. Pressure reading shall be accurate to plus or minus 2 percent of reading from 0.01 to 150 psi. Temperature readings shall be accurate to plus or minus 0.5 degrees F. and plus or minus 1.0 degree F. from minus 65 degrees F. to 250 degrees F. The flow metering device shall be Hydrodata Multimeter HDM 300 as manufactured by Shortridge Instruments Inc., or equal, and shall be furnished with pressure gauge, portable meter panel and with valve network, carrying case, battery charger, instruction manual and certificate of calibration, 2-6 by 1/2 inch OD pressure hoses with quick disconnects, two 8 foot by 1/4 inch OD drain hoses, and a set of adapters. (Provide where indicated on Drawings.)

M. Gate Valves: (Provide as required for service shut-off and isolation of equipment and devices or buildings and sections of buildings in addition to where indicated on Drawings.)

1. Bronze, 2 inches and smaller:

GV-1 Class 125#, 200 psi WOG, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Type of Service: Plumbing hot and cold water service. (Provide only where space above handwheel is limited.)

Hammond IB645; Crane 1701; Walworth Fig. 7; Milwaukee 105; American 3F; Stockham B-103; Nibco T-113

GV-2 Same as GV-1, except solder ends:

Type of Service: Plumbing hot and cold water service. (Provide in yard box, to each group of fixtures behind access panels, where valves are located near ceiling and beams, etc.)

Hammond IB647; Crane 1701S; Milwaukee 115; Walworth 4SJ; American 3FS; Stockham B-104; Nibco S-113.

GV-3 Class 125#, 200 psi WOG, rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Type of Service: Plumbing hot and cold water service, condenser water, chilled water and pump discharge. (Provide inlet and outlet connections to water heaters and pumps, make-up water lines to HVAC equipment, expansion tanks, hot water storage tanks, at water-cooled condensers, etc.)

Hammond IB640; Stockham B-100; American 4FG CL-150 Crane 1700; Milwaukee 148; Nibco T-111.

GV-4 Same as GV-3 except solder ends:

Type of Service: Plumbing hot and cold water service, condenser water, chilled water and pump discharge. (Provide where domestic cold water lines enters building, to each group of fixtures with exposed piping, at chillers, at water-cooled condensers, etc.)

Hammond IB635; Stockham B-108; American 4FGS; Crane 1334; Walworth 55SJ; Milwaukee 149; Nibco S-111.

GV-5 Class 125#, 200 psi WOG, rising stem, union bonnet, solid disc, threaded ends:

Type of Service: Hot water heating service and low-pressure steam service. (Provide at hot water heating boilers, hot water heating coils, low-pressure steam traps, low-pressure steam boiler supply headers, etc.)

Hammond IB617; Stockham B-105; Walworth 2; Milwaukee 152; Nibco T-124.

GV-6 Class 150#, 300 psi WOG, rising steam, inside screw, union bonnet, solid disc, threaded ends:

Type of Service: Condenser water, chilled water, pump discharge and low-pressure steam. (Provide at low-pressure steam boiler supply headers, low-pressure steam traps, pumps, chillers, condensers, etc.)

Hammond IB629; Stockham B-120; American 4FGV; Walworth 11; Milwaukee 151; Nibco T-134.

2. Iron, 2 1/2 inches and larger:

GV-7 Class 125#, O S and Y, IBBM, bolted bonnet, solid disc, flanged ends:

Type of Service: Heating hot water, chilled water, domestic hot and cold water, compressed air and low-pressure steam. (Provide at heating hot water boilers and low-pressure steam boiler supply headers, compressed air outlets, receiver tanks, hot water storage tanks etc.)

Hammond IR1140; Stockham G623; American 20F; Crane 465-1/2; Milwaukee F2885; Walworth 726F; Nibco F-617-0.

GV-8 Class 250#, O S and Y, IBBM, bolted bonnet, solid disc, flanged ends:

Type of Service: Medium pressure steam. (Provide for medium pressure steam supply header, at medium pressure steam return header, at medium pressure steam trap, etc.)

Hammond IR330; Stockham F-667; American 20-F-250; Crane 7-1/2E; Milwaukee F2844; Walworth 786F; Nibco F-667-0.

N. Globe Valves: (Provide for steam shut-off, combination balancing and shut-off and for balancing only where manual flow control valves such as circuit setters are not required or recommended for installation by the valve manufacturer.)

1. Bronze, 2 inches and smaller:

GLV-1 Class 125#, screw-in bonnet, Teflon disc, threaded ends:

Type of Service: Plumbing hot and cold water service, condenser water pump discharge and chilled water. (Provide on bypass line for water pressure reducing valve arrangement, on thermostatic mixing valve arrangement, etc.)

Hammond IB440T; Stockham B-13-T; Nibco T-211-Y.

GLV-2 Same as GLV-1, except solder ends:

Type of Service: Domestic hot and cold water, condenser water, chilled water and pump discharge. (Provide on bypass line for water pressure reducing valve arrangement, on thermostatic mixing valve arrangement, etc.)

Hammond IB418; Stockham B-14; Jenkins 1200; Nibco S-211-Y.

GLV-3 Class 150#, union bonnet, Teflon disc, threaded ends:

Type of Service: Heating hot water, compressed air, condenser water and chilled water pump discharge, and low-pressure steam. (Provide on bypass line for boiler water feeder, at strainer for PRV, at heating hot water strainer)

Hammond IB413T; Stockham B-22; American 10U; Crane 7TF; Milwaukee 590; Walworth 95; Nibco T-235-Y.

GLV-4 Class 150#, union bonnet, Teflon disc, soldered ends:

Type of Service: Condenser water, chilled water pump discharge and low-pressure steam. (Provide on bypass line for

low-pressure steam modulating valve to heat exchanger, on bypass line for boiler, water feeder, etc.)

Hammond IB423; Stockham B-24; Milwaukee 1590; Walworth 3095SJ; Nibco S-235-Y.

2. Iron, 2-1/2 inches and larger:

GLV-5 Class 125#, OS&Y, IBBM, renewable seat and disc, bolted bonnet, flanged ends:

Type of Service: Low-pressure steam. (Provide on bypass line for low-pressure steam modulating valve to heat exchanger, on bypass line for steam trap, etc.)

Hammond IR116; Stockham G-512; American 32; Crane 351; Milwaukee F2981; Walworth 906F; Nibco F-718-B.

GLV-6 Class 250#, OS&Y, IBBM, bolted bonnet, flanged ends:

Type of Service: Medium pressure steam and low-pressure steam. (Provide on bypass line for low-pressure steam modulating valve to heat exchanger, on bypass line for steam trap, etc.)

Hammond IR313; Stockham F-532; American 32-250; Crane 21E; Milwaukee F2983; Walworth 955F; Nibco F-768-B.

O. Heater Vent Pipe:

1. Schedule Number:

HVP-1 Shall be UL approved for service specified. Concealed heater vent pipe, including pipe in or through attic spaces, shall be Los Angeles City approved double wall metal vent pipe. For recessed wall heaters, furnish B.W. type. All others may be Type B, or B.W. Clearances must comply with Los Angeles City code and conditions of UL listing.

American Metal
Products Co., Inc.,
Ameri-Vent

Dura-Vent
Corp.,
Duravent

Hart and Cooley Mfg. Co.

Metalbestos

NOTE: Component parts of a vent assembly, including vent cap, shall be companion items of same manufacturer. Each item shall be UL-approved and listed.

P. Liquid Level Gauge:

LLG-1 Refrigerant type, carbon steel with stainless steel trim or all forged steel construction, back-seating standard design. Upper and lower valve furnished with ball check valves; 1/2 inch diameter glass on center. Four 3/16 inch diameter gage glass guard rods or slotted steel guard.

Peneberthy

Henry

Conbraco

Q. Magnetic Lever Valves:

MLV-1 Bronze, stainless steel and bronze trim, 2-way, packless normally closed, metal seat. (Provide for can washing installation.)

General Controls, K-10AA2030, or equal.

R. Piping:

1. Piping shall be continuously and permanently marked with manufacturer's name, type of material, size, pressure rating, and the applicable ASTM, ANSI, UL, or NSF listing. On plastic pipe, date of extrusion must also be marked.
2. Underground non-ferrous pressure pipes shall be installed with proper color tracer wires. Refer to color code provisions in Section 15075: Mechanical Identification.
3. Refer to Heating and Air Conditioning Piping Systems: Section 15180 for heating and chilled water piping and fittings.
4. Schedule Number: Description

P-1 Cast iron soil – Hubless, service weight, with stainless steel banded, hubless, coupling (PF-1). F S WW-P-401, conforming to CISPI 310-85 and LAPMO 1S 6-75. Manufactured by American Foundry, Tyler, or AB & I.

- P-3 Copper drainage tube, underground, type L hard, ASTM B 88, by Mueller Brass, Cerrobrass, or equal.
- P-4 Copper drainage tube, inside structure and above grade. Type DWV hard, ASTM B306, by Mueller Brass, Anaconda, Cerrobrass or Cambridge-Lee Halstead.
- P-6 Copper water tube, Type L hard, ANSI H23.1, ASTM B88, IAPMO IS. Mueller Brass, Cambridge-Lee Halstead, or equal.
- P-7 Copper water tube, Type K hard, ANSI H23.1, ASTM B88, IAPMO 1S, by Mueller Brass, Cerrobrass or Cambridge-Lee Halstead.
- P-8 Polyethylene plastic pipe, ASTM D1248 and D2513, standard dimension ratio. 11, rated at 80 psi working pressure at 73 degrees F. for 3 inches and smaller, SDR 11.5 rated at 76 psi at 73 degrees F. for 4 inches and above, butt or socket type fittings, joined by heat fusion, color orange or yellow, Plexco PE 2406, Phillips, or equal. Transition to anodeless steel riser at meter, regulator, or building wall. (Furnished for natural gas below grade only.)
- P-10 Steel, black, Schedule 40, ASTM A53A, Type E, ERW by US Steel, Laclede, or equal.
- P-11 Seamless copper tubing, tempered drawn, Type M, ASTM B88.
- P-14 PVC, thick wall, cast-iron OD sized, UL listed, AWWA listed, NSF listed, for fire mains, Class 200 with tracer wire, Blue Brute, or equal.

S. Pipe Fittings:

1. Schedule Number: Description

- PF-1 Cast iron, soil or waste, no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless steel clamps. F S WW-P-401, ASTM C564 and CISPI 310. P-1 American Foundry, Tyler, or equal.

PF-3 Cast brass drainage fittings ASA B 16.23, ASTM 145-4B Provide with copper drainage tube, P-3 and P-4. Mueller Brass, Nibco, Stanley Flagg or Lee Brass.

PF-6 Wrought copper - solder type ANSI B 16.22 Provide with P-6 by Mueller Brass, Nibco or Lee Brass and P-11.

Note: Pipe, solder, and flux shall be lead-free for drinking water. Flux shall be an-approved water-soluble material.

PF-7 Polyethylene plastic fittings, ASTM D 3261 and D 2683, standard dimension ratio 11, rated at 80 psi working pressure at 73 degrees F. for 3 inches and smaller, SDR 11.5 rated at 76 psi at 73 degrees F. for 4 inches and above, butt or socket type fittings, joined by heat fusion, color orange or yellow, Plexco, Phillips, or equal. (Provide with P-8)

PF-9 Malleable iron, Class 125, ANSI B 16.3, threaded or welded Schedule 40 black steel for 2 inches and below and welded for 2-1/2 inches and above. (Provide with P-10, by Stockham, Grinnell, or equal).

PF-11 Cast-iron OD sized, bell and spigot gasket joints.

PF-12 Steel butt weld type, ASTM A 234WPB. Provide with P-10.

T. Pipe Isolators:

PLA-1 Absorption pad shall be not less than 1/2 inch thick, unloaded. Pad shall completely encompass pipe.

Stoneman, Potter-Roemer,
Trisolator PR-Isolator

PLA-2 Plastic cushion to form an insulating liner and eliminate metal to metal contact when securing copper tubes and pipes in air conditioning and refrigeration insulation preventing galvanic erosion.

Hydra-Zorb Cushion Clamps, or equal.

U. Pressure Gauge: Aluminum or steel case, minimum 4-1/4 inches dial; pressure type or combination vacuum-pressure type, with provisions for field calibration. Dial indicator to indicate pressure in psi with accuracy to within plus or minus 0.5 percent of

maximum dial reading. Furnish gages with restriction screw, size 60, to eliminate vibration impulses. Black case and ring, bourdon tube of seamless copper alloy with brass tip and socket. Three way gauge cock, constructed of brass with stuffing box, 1/2 inch couplings, with fixed or movable cap nut to shut off pressure gauge.

PG-1 Pressure type, black drawn steel case, 4-1/2 inches glass dial, range approximately twice line pressure.

Marsh Keckley Terrice Weksler Weiss

V. Plug Valves:

PV-1 2 inches and smaller: Rockwell No.114, lubricated plug type, 200 lb., water operating gauge pressure iron body and plug, regular pattern, threaded, with indicating arc; by Walworth, Homestead, WKM, or equal.

PV-1. 2-1/2 inches and larger: Rockwell No.115 and No.165 lubricated plug type, 200 lb. water operating gauge. Iron body and plug, regular pattern, flanged, with indicating arc. Walworth, Homestead, WKM, or equal.

W. Safety, Relief Valves:

SRV-1 Combination temperature and pressure relief type. AGA approved. Set to open at 125 psi pressure.

Watts Cash-Acme
40L NCLX-1

SRV-2 Same as SRV-1, except provide on storage type water heater with anode in dip tube.

Watts Cash Acme
10 x L NCLX-1

SRV-3 Spring pop type, ASME and/or NB stamped and certified with manual lifting device for low-pressure steam boilers not exceeding 15 psig, and for hot water boilers and heaters operated at pressure not exceeding 160 psi or temperature not exceeding 250 degrees F. Outlet shall be one pipe size larger than inlet.

Crane Bailey Cash-Acme Keckley

SRV-4 Spring type, ASME and NB stamped and certified with manual lifting device for air or gas.

Bailey Cash-Acme Watts Keckley

X. Strainers:

STR-1 Description: Wye type with monel or stainless steel strainer cylinder (manufacturer's standard mesh), and gasketed machine strainer cap. Where indicated on Drawings, provide with valved (globe valve) blowout piping, same size as blowout plug.

2 inches and smaller: C.M. Bailey No.100-A, 250 lb., cast iron body, threaded, Keckley 'B'.

2-1/2 inches and larger: C.M. Bailey No.100-A, 125 lb., cast iron body, flanged.

C.M.Bailey Armstrong Muessco Keckley 'A'

STR-2 Y pattern cast iron bodies, 125 psi, monel screen. Open area at least twice the cross-sectional area of IPS pipe in which strainer is installed and may be woven wire or perforated type. Screwed ends for sizes up to 2 inches, flanged ends for 2 1/2 inches and larger perforations, in accordance with the following:

Steam service - 40 sq. mesh.

Other services - 16 sq. mesh.

Bailey No.100 Armstrong RP&C Keckley

STR-3 Flanged, bucket type, semi-steel body, 125 psi, stainless steel screen with 1/8 inch diameter perforations (mounted above grade for water service). All sizes.

Bailey No.1 Zurn 150 Series RP&C

Keckley GFV

Y. Temperature Control Valves:

TCV- 1 Valves, temperature control, automatic, electric, 2-way (hot or chilled water).

Motor-operated valve, bodies designed for 125 psig working pressure; single seated, straight through, globe type body, high

lift plug. Teflon packing, tight shut-off and screwed ends for valves 2 inches and smaller.

Operated by capacitor type motor, oil-immersed gear train and suitable bearings.

Honeywell Barber-Colman

TCV-2 Valves, temperature control, automatic, pneumatic, 2-way (hot or chilled water).

Diaphragm type, brass body construction, globe type with brass trim. Valve bodies 2 inches and smaller shall have screwed ends. Pneumatic actuator diaphragm suitable for 250 F maximum temperature.

Honeywell Johnson Robert Shaw
POWERS Leonard

TCV-3 Same as TCV-1 - except with American Standard B16.1 flanged ends and cast iron bodies, for valves 2-1/2 inches and larger.

Honeywell Barber-Colman Powers

TCV-4 Same as TCV-2, except with American Standard B16.1 flanged ends and cast iron bodies for valves 2-1/2-inches and larger.

Honeywell Johnson Powers
Robert Shaw Leonard

TCV-5 Valves, automatic, electric, 3-way control (hot or chilled water).

Packed type bronze body and trim. Metal-to-metal seats designed for tight shut-off. Constant total flow throughout full plug travel. Valve designed for 150 psig steam working pressure. Valve operated by spring return motor with gear train. Valves screwed for sizes 2 inches and smaller.

Honeywell Powers Barber-Colman
Leonard

TCV-6 Valves, automatic, pneumatic, 3-way control (hot or chilled water).

Diaphragm-type of metal construction, brass trim. Valves of single seat type with bronze discs especially designed for the control of water. Pneumatic actuator diaphragm suitable for 250 degrees F.

Honeywell Johnson Powers
Robert Shaw Leonard

TCV-7 Same as TCV-4, except with American Standard B16.1 flanged ends and cast iron bodies for valves 2-1/2 inches and larger.

TCV-8 Same as TCV-5, except with American Standard B16.1 flanged ends and cast iron bodies for valves 2-1/2 inches and larger.

Z. Thermometers (Industrial):

T-1 Straight type with fixed or ratable stem, extruded or cast brass or cast aluminum case and brass separable well 6 inches minimum scale, angle or straight type range 30 degrees - 240 degrees F.

Weksler Terrice Weiss

T-2 Round type 3-1/2 inches minimum dial range of 100 between 30 degrees and 155 degrees F., color coded red above 150 degrees F. Brass chrome plated case. (Provide at mixing valves.)

Ashcroft U.S. Gauge Marsh Weiss

AA. Thermometers (Remote):

T-3 Liquid-filled capillary type with bulbs as required for remote and insertion mounting dials of 3-1/2 inches minimum diameter, non-ferrous internal parts, external means for re-calibration, glass or plastic lens and steel or non-ferrous case suitable for wall, duct or panel mounting range 30 degrees - 240 degrees F. (Provide for measuring duct, plenum, and other air temperatures.)

Marsh Terrice U.S. Gauge Weiss

BB. Traps: (not used)

CC. Vent Assemblies: (not used)

DD. Valves (Air Vent):

VAV-1 Hot or chilled water air release valves shall be cast brass rated for 150 psig design pressure and 270 F operating temperature.

Spirotherm Bell & Gossett Taco

VAV-2 Hot or chilled water space heating system air valve, brass with nickel trim 1/4 inch connection, disc type for manual or automatic venting.

Hoffman 500 Spirotherm

VAV-3 Brass petcock, 1/4 inch connection by 1/4 inch copper tube to high point of coil or line by means of a tapped cap on top of 6 inches vertical nipple. Petcock to be installed approximately 5 feet-6 inches above finish floor.

EE. Vent Caps:

VC-1 Vandal-proof hood type, for plumbing vent lines.

Stoneman Engr. and Mfg.
Semco 1550

FF. Vacuum Valves: (not used)

GG. Protective Coating for Underground Steel Piping Applied to Underground Automotive:

HH. Pipe and Fitting Requirements Schedule:

1. Unless otherwise specified or indicated on Drawings, pipe and fittings shall be installed in accordance with the following table:

TABLE I
PIPE AND FITTING SCHEDULE

Use	Limits	Pipe	Fittings	Material
Domestic hot and Cold water, underground	Up To 5 inches	P-6	PF-6	"L" Copper pipe (No soft tubing)
Copper, underground only		P-7	PF-6	Furnish in hot soil
Cold water, underground	6 inches and over	P-14	PF-11	PVC
Domestic hot and Cold water, in building above ground	ALL	P-6	PF-6	"L" Copper Pipe (No soft tubing)
Drains From		P-11	PF-6	Copper

HVAC Equip.

<u>Use</u>	<u>Limits</u>	<u>Pipe</u>	<u>Fittings</u>	<u>Material</u>
Gas Natural	Underground	P-8	PF-7	Polyethylene
Gas Natural	Above ground	P-10	PF-9	Black Steel
Copper Drainage Tube (Underground)	Waste and Vent	P-3	PF-3	Copper (DWV)
Copper Drainage Tube (Above Ground)	Waste and Vent	P-4	PF-3	Copper (DWV)
Vents	New Building	P-1	PF-1	Cast Iron Hubless
Waste lines, Sanitary		P-1	PF-1	Cast Iron

2. For chilled water, condenser water, steam, hot water heating piping and fittings, refer to Section 15180: Heating and Air Conditioning Piping Systems.

II. Flanges:

1. Flanges shall be furnished and installed at each flanged connection of equipment, tanks, and valves. Faces of flanges being connected shall be furnished alike. Connection of a raised face flange to a flat-faced flange is not permitted. Flanges shall conform to following schedules:

<u>TYPE OF PIPE</u>	<u>FLANGE</u>
Screwed black or galvanized steel pipelines.	125 pound black cast iron screwed flange, flat faced.
Welded steel pipe, except high pressure steam lines.	150 pound black forged steel welding flanges, 1/16 inch raised face ASTM A 105, Grade II.
Copper and brass pipe or tubing.	150 pound cast bronze, flat-faced flange with solder ends.

2. Gasket material for flanged connections shall be full faced or ring type to suit facing on flanges and shall be furnished in accordance with following schedule:

<u>SERVICE</u>	<u>TYPE</u>
Cold water	1/16 inch thick neoprene
Hot water	1/16 inch Teflon

JJ. Unions:

1. Unions shall be furnished and installed in accordance with the following requirements (unless flanges are furnished) :

- a. At each threaded or soldered connection to equipment and tanks, except in freon or fuel gas, piping systems, whether indicated or not.
 - b. At downstream, threaded connection to each manually operated threaded valve and cock, and each threaded check valve, except those in freon piping systems, and except those in yard boxes or access boxes, whether indicated or not.
 - c. At each threaded connection to threaded automatic valves (except those in freon piping systems) such as reducing valves and temperature control valves, whether indicated or not.
2. Unions shall be located so that piping can be easily disconnected for removal of equipment, tank, or valve.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Provide all materials and equipment for the Work. Furnish and install necessary apparatus, parts, materials, and accessories.
- B. Pipe Installation:
 1. Install piping parallel to wall and provide an orderly grouping of proper workmanship.
 2. Piping shall clear obstructions, preserve headroom, provide openings and passageways clear, whether indicated or not. Verify the Work of other Divisions to avoid interference.
 3. If obstructions or the Work of other Divisions prevent installation of piping or equipment as indicated by the Drawings, perform minor deviations as required by the Architect.
 4. Install piping after excavation or cutting has been performed. Piping shall not be permanently enclosed, furred in, or covered before required inspection and testing is performed.

5. Exposed polished or enameled connections from fixtures or equipment shall be installed with no resulting tool marks or threads at fittings. Residue or exposed pipe compound shall be removed from exterior of pipe.
6. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members, provide such members with reinforcement steel straps of Kees Protecta-Plate, or equal.
7. Reduce fitting where any change in pipe size occurs. Bushings shall not be furnished unless specifically reviewed by the Architect, or indicated on Drawings.
8. Piping subject to expansion or contraction shall be anchored in a manner, which permits strains to be evenly distributed. Swing joints or expansion loops shall be installed. Seismic restraints shall be installed so as not to interfere with expansion and contraction of piping.
9. Immediately after lines have been installed, openings shall be capped or plugged to prevent entrance of foreign materials. Caps shall be left in place until removal is necessary for completion of installation.
10. Couplings shall not be installed except where required pipe runs between other fittings are longer than standard length of type of pipe being installed and except where their installation is specifically reviewed by the Architect.
11. Water piping shall be installed generally level, free of traps, unnecessary offset, arranged to conform to building requirements, clear of ducts, flues, conduits, and other Work. Piping shall be arranged with valves installed to provide for complete drainage and control of system. Piping shall not be installed which causes an objectionable noise from flow of water therein under normal conditions. Refer to Section 15010: Basic Mechanical Requirements.
12. Water lines may be installed in same trench with sewer lines, provided bottom of water line is 12 inches minimum above top of sewer line.
13. Hot and chilled water circulating piping installed for space heating or cooling shall pitch up to a high point at a slope of 1/4 inch in 10 feet in the direction of flow. Where supply and return lines are exposed, both lines shall pitch in same direction. Otherwise, where possible, lines shall pitch up toward compression tank.

14. Changes in pipe sizes shall be furnished with eccentric reducers, flat on top. Offsets to clear obstruction shall not be installed so as to produce air pockets.

C. Pipe Sleeves and Plates:

1. Provide and install pipe sleeves of Schedule 40 black steel pipe or Schedule 40 PVC plastic pipe in concrete or masonry walls, footings, and concrete floors below grade. Provide and install adjustable submerged deck type sleeves at locations where pipes pass through concrete floors, except concrete slab floors on grade, and at locations where soil pipe for floor type water closets passes through concrete floors. Provide and install sleeve of 26 gage galvanized sheet metal in other walls, partitions, and floors.
2. Sleeves shall provide 1/2 inch clearance around pipes (except plastic pipe shall have 1-inch clearance). Caps of deck type sleeves shall be removed just prior to installation of pipe. Area around sleeves shall be smooth and without high or low spots. Sleeves in walls shall not extend beyond exposed surface of wall. Sleeves in concrete floors and walls shall be securely fastened to forms to prevent movement while concrete is being placed.
3. Piping installed on a roof shall clear the roof surface by 10 inches minimum, with or without insulation. Bottom of individual fittings may infringe on 10 inches clear space but not groups of fittings or fittings located within 27 inches of each other.
4. Stiles shall be provided to facilitate crossing of piping when parallel piping runs are laterally greater than 12 inches out-to-out, or any pipe is higher than 18 inches, and more than 40 feet long or runs between 2 or more major pieces of equipment or housings greater than 20 feet apart. Stiles shall be not less than 20 inches wide with a minimum tread depth of 10 inches. Where stiles are required, they shall be located so greatest obstructed distance is 30 feet.
5. Where pipes pass through waterproofed walls, floors, or floors on grade, caulk with lead and oakum between pipe and sleeve to provide a waterproof joint. Where earth is in contact with pipe on both sides of a wall or foundation, the waterproof joint is not required. Commercial rubber compression units may be furnished instead of caulked sleeves if reviewed by the Architect.
6. A swing joint, or other required device, shall be furnished and installed in hot water lines with 10 feet of caulked or compression joint to allow for expansion.

7. Provide and install polished, chromium-plated cast brass set screw flanges when plumbing pipes pass through walls at plumbing fixtures, etc., as specified in Section 15400: Plumbing. Provide and install polished steel, chromium-plated split floor and ceiling plates at locations where pipes pass through walls, floors, ceilings, and partitions in finished portion, which neatly conceals pipe insert.
8. Pipe sleeves shall be provided where pipes intersect footings or foundation walls and sleeve clearances shall provide for footing settlement, but not less than one inch all around pipe.

D. Welding of Pipe and Qualifications of Welder:

1. Joints above grade or accessible conduit or tunnels in steel piping may be either welded or screwed unless specifically indicated otherwise on Drawings or specified. Joints in below grade steel piping, whether in insulation or not, shall not be welded, unless otherwise indicated.
2. Welded joints in pipe shall be continuous around pipe and shall comply with AISA B 31.1, unless otherwise specified.
3. Each pipe weld shall be stamped with welder's identification mark. Welding shall be performed by welders possessing a valid certificate of qualification for welding carbon steel welding pipe in horizontal position (2G) and horizontal fixed position (5G) in accordance with the requirements of Section IX of the ASTM code, by a Owner recognized, DSA approved testing laboratory.
4. Before any welder performs welding on the Work, furnish the IOR with a copy of welder's valid qualification papers and obtain verification. Welder qualification is not valid unless it has been issued while welder was performing work for current employer, and has performed type of work described by qualification in the preceding 3 months. (Reference: ASME Sec. VIII, U.W. 29, d).
5. Welding performed under these Specifications shall be subject to special tests and inspections including rigid Ultra Sonic Testing (UT) and radiographic inspection at random, in accordance with Technique for Radiographic Examination of Welded Joints (ASME Code for Unfired Pressure Vessels, Sec. VIII, U.W. 51), by an Owner recognized, DSA approved testing laboratory.

E. Unacceptable Welds and Repairs to Welding:

1. Welds containing any of the following types of imperfections shall be deemed defective Work:
 - a. Cracks of any type.

- b. Zones of incomplete (in excess of 1/32 inch) fusion or penetration.
 - c. Elongated slab inclusions longer than 1/4 inch.
 - d. Groups of slag inclusions in welds having an aggregate length greater than thickness of parent metal in a length 12 times the thickness of the parent metal.
 - e. Undercuts greater than 1/32 inch.
 - f. Overlaps, abrupt ridges or valleys.
- 2. When a defective weld is detected by examination as outlined above, 2 additional welds shall be radiographed at locations selected by the IOR. If the 2 selected welds demonstrate compliant welding, then the 2 tested welds shall be deemed to be in compliance. Welding revealed by radiographs to be defective Work shall be removed, repaired, and tested by radiograph.
 - 3. If either of the 2 selected welds demonstrates welding deemed to be defective Work, all welding in that portion of the Work shall be deemed defective Work and either: all welds shall be cutout, prepare new ends for welding and weld to comply with this Specification, or radiograph all welds, removing and repairing only such welding deemed to be defective Work.
 - 4. Repair welding shall be performed in a manner in full compliance with ASA B 31.0-1955. The welded joints or repairs shall be spot examined with UT or radiographic tests in accordance with foregoing requirements. (Reference, ASMA Boiler and Pressure Vessel Code Section VIII, U.W. 52.)
 - 5. The Owner shall cause to be performed additional random UT and radiographic examinations of welds. Owner shall be responsible for the costs of any UT and radiographic examinations found to be in compliance with specified requirements.
 - 6. Installer shall be responsible for the costs of UT and radiographic re-examinations of welds deemed defective Work and not in compliance with this Specification, and shall repair or replace said welds in accordance with specified requirements.
- F. Welding Rods: Submit a written list of materials and proposed type of welding rods for review by the Architect.
 - G. Backing Rings: Backing rings may be submitted for installation provided the Product Data is submitted with the material list.

H. Qualification Tests for Low-pressure Welding:

1. Tests shall be performed on 3 inches standard weight pipe ASTM A53, Grade A, and shall be welded by acetylene and electric arc. Each sample shall consist of 2 pieces, each 10 inches long, with 30-degree bevel at point weld.
2. Two 20-inch samples shall be performed in the 2G and two 20-inch samples in the 5G positions, with positions defined in Section IX, ASME code. Welds shall have the reinforcement ground or machined flush to the surface of the pipe before testing. Samples shall be tested as full section tensile.
3. Weld shall develop a load of 90 percent of 50,000 psi, i.e., 45,000 psi or shall develop a fracture in parent metal.
4. Each qualified welder shall carry an identification card listing welder's name, date of test, and type of welding tests passed; signed by the welder and the laboratory.
5. A valid certificate of qualification issued in compliance with requirements of Section IX of the ASME code shall qualify a welder for issuance of a certificate for low-pressure pipe welding.

I. Certificates of Qualification for Welding of Unfired Pressure Vessels:

1. Certificates of qualification shall be issued by a laboratory recognized by the Owner in compliance with the requirements of Section IX of the ASME code, Unfired Pressure Vessels. Qualifications shall be for both acetylene and arc welding of ASA Schedule 40 ASA A53, Type B or ASA Type B or ASA A120 Type B carbon steel welded pipe in the Horizontal Position (2G) and the Horizontal Fixed Position (5G) as defined by said code.

NOTE: Certificate described above is not valid unless it has been issued while welder was working for his current employer, and unless welder has performed type of work described by certificate in the preceding 3 months. Requirements for possession of a valid certificate shall not be waived for welders fabricating unfired pressure vessels when the Specifications require compliance with ASME code or when welding pipe carries working pressures greater than 75 psi and temperatures greater than 250 degrees F.

J. Pipe Joints and Connections:

1. Pipe and tubing shall be cut per IAPMO 1.S. Pipe shall have rough edges or burrs removed so that a smooth and unobstructed flow shall be provided.

2. Hot tapping of gas lines is strictly prohibited.
3. Threaded Pipe: Joints in piping shall be installed according to the following service schedule:
 - a. Refrigerant Piping Litharage and glycerine, or Expando, or equal.
 - b. Plastic Piping Teflon pipe joint compound tape.
 - c. Cleanout Plugs No compound shall be used. After inspection and test, plugs shall be removed, cleaned, greased, and replaced.
 - d. All other services Furnish sealant, suitable and as reviewed by the Architect.
4. Threads on pipe shall be cut with sharp, clean, unblemished dies and shall conform to ASA B 2.1 for tapered pipe threads.
5. Joint compounds shall be smoothly placed on male thread and not in fittings. Threaded joints shall be installed tight with tongs or wrenches and caulking of any kind is not permitted. Failed joints shall be replaced with new materials. Installation of thread cement or caulking to repair a leaking joint is not permitted.
6. Sharp-toothed Stilson, or similar wrenches, is not permitted for the installation of brass pipe or other piping with similar finished surfaces.

K. Copper Tubing and Brass Pipe with Threadless Fittings:

1. Silver brazed joints shall be installed for non-ferrous metallic refrigerant piping, non-ferrous metallic condensate piping and for attaching fittings to non-ferrous metallic piping for any service.
2. Silver brazing alloy shall conform to ASTM B260, Class BCUP-5. Surfaces to be joined shall be free of oil, grease, and oxides. Socket of fitting and end of pipe shall be thoroughly cleaned with emery cloth and wiped to remove oxides. After cleaning and before assembly or heating, flux shall be installed to each joint surface and spread evenly. Heat shall be applied in accordance with instructions in the Copper Tube Handbook issued by Copper Development Associates. Joints constructed of rough bronze fittings shall be provided as recommended by manufacturer.
3. Do not overheat piping and fittings when installing silver brazing.

4. Joints in non-ferrous piping for services not covered above, shall be installed with solder composed of 95-5 tin-antimony, ASTM B32, Grade 5A. Surfaces to be jointed shall be free of oil, grease, and oxides. Sockets of fitting and end of pipe shall be thoroughly cleaned with emery cloth to remove oxides. Solder flux shall be sparingly installed and solder added until joint is completely filled. Do not overheat. Excess solder, while plastic, shall be removed with a small brush in order to provide an uninterrupted fillet completely around joint. Random inspection of joints shall be conducted by IOR to ensure joints are lead-free.
- L. Ring-Type Pipe: Joints shall be installed in accordance with manufacturer's instructions with grooved couplings, fittings and rubber rings. Couplings and pipe shall be compatible and of the same manufacturer. Rings shall be accurately located and installed by grooves in coupling. Pipe shall be installed with zero deflection unless otherwise specified. Pressure pipe shall be furnished with thrust blocks at each offset point.
- M. Welded Pipe Joints:
1. Joints in welded steel pipelines shall be installed by oxyacetylene or electric arc process. Welding shall be continuous around pipe and provided as specified.
 2. Butt welds shall be of the single V-type, with ends of pipe and fittings beveled approximately 37-1/2 degrees. Piping shall be aligned before welding is started with the alignment maintained during welding.
 3. Welds for flanges and socket fittings shall be of the fillet type with a throat dimension not less than pipe wall thickness.
- N. Polyethylene (Plastic) Pipe:
1. Joints shall be installed by the heat fusion method, in accordance with manufacturer's recommendations and IAPMO installation standard IS 12, for natural gas.
 2. Pipe Riser at Meter, Regulator and Building Wall: Prefabricated, anodeless type, utilizing a grade level transition between underground polyethylene pipe and gas supply steel pipe of riser outlet, R. W. Lyall Co., or equal. Below grade to above grade transition shall be installed in a welded, epoxy coated, steel casing.

3. Connections to Existing Pipe Line or Branch:
 - a. Steel-to-plastic (PE): Provide manufacturer's prefabricated standard transition fitting, transition from epoxy-coated steel pipe to plastic, R. W. Lyall Co., or equal.
 - b. Plastic-to-plastic, PVC to PE: Provide manufacturer's prefabricated standard transition fitting, transition from PVC to epoxy-coated steel pipe to PE; R.W. Lyall Co., or equal.
 - c. Plastic-to-plastic, PE to PE: Provide manufacturer's standard fused tapping tee assembly with shut-off feature.
4. Provide PE reinforcing sleeves where PE pipe is fused to multi-saddles, service punch tee, reducing tees, transition fittings and anodeless risers.

O. Valves:

1. Valves shall conform to the requirements of this section:
 - a. Piping systems shall be furnished with valves at points indicated on Drawings and specified, arranged to provide complete regulating control of piping system throughout building and the Project site.
 - b. Valves shall be installed in a neat grouping, so that parts are easily accessible and maintained.
 - c. Globe valves of disc type shall be furnished with composition disc suitable for service on which installed.
 - d. Valves shall be full size of line in which they are installed, unless otherwise indicated on Drawings or otherwise specified, and shall be one of types specified.
 - e. Provide chain operators on valves 2 inches and larger located 7 inches or more above the servicing floor level.
 - f. Valves for similar service shall be of one manufacturer.
 - g. Except where otherwise specified, valves shall be Stockham, Crane, Jenkins, Milwaukee, Hammond or American.
2. Furnished hose bibs in dense garden areas shall be 3/4 inch in size with 1 hose bib in the lunch pavilion 1 inch in size. Other furnished hose bibs, unless

otherwise noted or specified, shall be 3/4 inch lock shield type. Bibs shall be furnished with vacuum breaker protection.

3. Safety valves and pressure relief valves shall have stamp of approval as required by ASME and shall be provided with annual test lever. Where a hot water storage tank is heated by means of a coil, pressure relief valve shall have a steam BTU discharge rating of the coil. Discharge pipe from safety or pressure relief valves shall be not less than one pipe size larger than inlet pipe size of valve. Discharge pipe shall terminate as indicated and shall be free of traps. In addition to locations specified, pressure relief valves shall be installed in the following locations:
 - a. On discharge side of each pressure-reducing valve.
 - b. On each water heater connected to a hot water storage tank and other pressure vessels.
 - c. On cold water line to each water heater or hot water storage tank when there is a check valve, backflow prevention valve or similar device between water heater or hot water storage tank and meter or relief valve at the pressure reducing valve assembly.
4. Temperature relief valves and combination temperature and pressure relief valves shall be as specified and furnished as set forth in this section. Discharge pipe from relief valves shall be not less than discharge area of valve or valves it connects, based on discharge area of valves, and shall terminate as indicated and free of any traps. Valves shall be installed at following locations:
 - a. A combination temperature and pressure relief valve or combination of valves on each hot water storage tank. Temperature sensing element shall extend into water inside tank.
 - b. A combination pressure and temperature relief valve on each water heater not connected to a storage tank. Temperature sensing element shall extend into water inside heater tank. This valve shall be required in addition to any relief valve installed on cold water line.
5. Manual air vent valve assemblies shall be installed at each high point of hot water space heating and chilled water piping systems. Valves shall discharge through 1/4 inch diameter copper tubing and drain to nearest floor sink. Automatic type air vent valve shall only be installed where specifically indicated. Radiator, convectors, and finned pipe convectors shall be fitted with packless radiator valves, angle or straight pattern. Each convector or radiator installed as part of a space hot water heating system shall be furnished with a manual-type air vent valve.

- P. Strainers: Strainers shall be installed on each water main downstream of the meter, above grade, when a pressure regulator assembly is not installed. Main strainer shall be of Y-flange type. On closed loop chilled and heating hot water systems pump systems, a strainer shall be installed at each pump inlet and upstream of each flow control valve assembly. The control valve assembly may include a modulating temperature control valve and a flow-limiting valve, manufactured by Griswold, AutoFlow, or equal.
- Q. Hangers and Supports:
1. Piping shall be securely fastened to building structure by approved iron hangers, supports, guides, anchors, and sway braces to maintain pipe alignment to prevent sagging and to prevent noise or excessive strain on piping due to uncontrolled or seismic movement under operating conditions. Hangers and supports shall conform to Manufacturer's Standardization Society Specification SP-69. Hangers shall be relocated as required to correct unsatisfactory conditions that may become evident when system is placed into operation. Appliances, heat exchangers, storage tanks, and similar equipment shall be securely fastened to structure in accordance with seismic requirements. Outdoor metal hangers and supports shall be hot-dipped galvanized steel, unless otherwise specified.
 2. Hose faucets, compressed air outlets, and similar items at ends of pipe branches shall be rigidly fastened to building construction near point of connection.
 3. Piping shall not be supported by wire, rope, wood, plumbers' tape, or other non-recognized devices.
 4. Hangers and supports shall be designed to support weight of pipe, fittings, weight of fluid and weight of pipe insulation, and shall have a minimum factor of safety of 5, based on ultimate tensile strength of material installed.
 5. Burning or welding of and/or on any structural member under load is not permitted. Field welding not specified on the Drawings or reviewed Shop Drawings is not permitted without review by the Architect and DSA.
 6. Burning holes in beam flanges or other structural members is not permitted without review by the Architect and DSA.
 7. Pipe hangers on piping covered with low temperature insulation shall be installed on outside of insulation and not in contact with pipe unless otherwise detailed on Drawings. Insulation shall be protected by 18 gage galvanized steel shield, with a minimum length of 10 inches, installed completely around pipe covering between covering and hanger. Installing hangers directly on pipe and

butting adjoining sections of insulation against hanger is permitted provided void and hanger rod are properly insulated and sealed so that no sweating occurs at hangers.

8. Hanger rods shall be fastened to structural steel members with suitable beam clamps. Clamps shall be Grinnell, Carpenter and Patterson, or Fee and Mason, as follows:
 - a. Grinnell I-beam, Figure 131, for maximum of 370 lbs.
 - b. Grinnell I or WF beam, Figure 218, for maximum of 1365 lbs.
 - c. Grinnell Channel Clamp, Figure 226 for maximum of 1140 lbs.
9. Hanger rods shall be fastened to concrete inserts in concrete slabs or beams. Inserts shall be Grinnell, Carpenter and Patterson, or Fee and Mason, as follows:
 - a. Grinnell, Figure 285 for maximum of 400 lbs.
 - b. Grinnell, Figure 282 for maximum of 1140 lbs.
10. For fastening to wood ceilings, beams, or joists, furnish Grinnell figure 128 or 202 pipe hanger flange fastened with drive screws. Under wood floors, 3/8 inch hanger rods shall be hung from 2 inch x 2 inch x 1/4 inch angle clips 3 inches long, with 2 staggered 10d nails, clinched over joist.
11. 3/8 inch hanger rod sizes inch for copper, iron, or steel pipe sizes 1/2 inch through 2 inches, 1/2 inch for pipe sizes 3 inches, 4 inches and 5 inches, 5/8 inch for pipe size 6 inches, and 3/4 inch for 8 inches and 10 inches pipe.
12. Turnbuckles, if furnished, shall provide a load carrying capacity equal to that of the pipe hanger with which they are being installed.
13. Pipe hangers shall be of same size, or nearest larger manufactured size available, as pipe or tubing on which they are being installed.
14. Hangers, clamps, and guides furnished for support of non-metallic pipe shall be padded with 1/8 inch thick rubber, neoprene, or soft resilient cloth.
15. Where special pipe-supporting requirements in the Specifications conflict with any standard requirements specified herein, the Specification requirements shall govern.
16. Vertical Piping:

- a. Vertical pipe risers shall be securely supported with riser clamps of recognized type. Risers in reinforced concrete buildings shall be furnished with extension clamps fastened to pipe above each concrete floor slab with extended arms of clamp to rest on slab. Clamps shall be provided with lead or Teflon liners when installed on copper tubing. Clamps shall be plastic-coated when installed on non-ferrous pipe or tubing.
- b. Copper tubing in sizes 1-1/2 inches and larger and steel pipelines passing up through building shall be supported at each floor of building or every 15 feet whichever is less.
- c. Copper tubing sizes 1-1/4 inches and smaller shall be supported at not intervals not more than 6 feet on center. Special provisions shall be installed for vertical lines subject to expansion and contraction caused by operating temperature differences.
- d. Vertical cast iron pipelines shall be supported from each floor and at its base. Malleable iron or steel pipe clamps with minimum thickness of 1/4 inch shall be furnished and fastened around pipe for support.

17. Horizontal Piping:

- a. Pressure piping on roofs shall be supported from stands, trapezes, or structures so that the bottoms of pipes clear the roof surface by 10 inches.
- b. Insulated steam, space heating hot water, insulated condensate lines, insulated domestic hot water supply and return piping shall be supported with Grinnell figure 212 steel hangers with welded eye rods to permit hinge movement at point of attachment of hangers. Hinge movement at point of support shall be provided by welded eye linked rods Grinnell figure 278X.
- c. Domestic cold water piping, chilled water supply and return piping, condenser water piping, insulated refrigerant piping, gas piping, compressed air piping, cast iron soil piping, galvanized steel vents, waste and downspout piping and glass may be supported with Grinnell

figure 260 or figure 269 hangers with rods, turnbuckles and inserts suitable for above hangers.

- d. Maximum hanger and support spacing shall conform to following schedule for horizontal piping installed above grade.

HANGER AND SUPPORT SPACING SCHEDULE

<u>Type of Pipe</u>	<u>1-1/2" Pipe or Smaller</u>	<u>2" Pipe or Larger</u>
Steel; lightweight, rolled edges, grooved	7'	10'
Steel Pipe (except gas lines)	8'	10'
Copper Tubing	6'	10'
Steel Pipe, gas	6'	10'
IPS Brass Pipe	8'	10'
Cast Iron Soil Pipe		5' Maximum and at each joint.

- 18. A hanger or support shall be installed close to the point of change in direction of a pipe run, in either a horizontal or vertical plane.
- 19. When practicable, supports and hangers for cast iron soil pipe shall be installed as close as possible to joints and when hangers or supports are not located within one foot of a branch line fitting, an additional hanger or support shall be installed at fitting.

R. Flashings:

- 1. Each pipe, duct, or gas-fired equipment vent passing through roof shall be installed with waterproof flashing.
- 2. Flashing or flanges on pipes, vents, and ducts passing through a tile or slate roof shall be constructed of sheet lead. Flashing for pipes and heater vents passing through roofs other than tile or slate shall be galvanized sheet metal or aluminum. Flashing and flanges for ducts through roofs other than tile or slate and through exterior walls shall be same material and gage as duct. Flanges and flashing shall be installed waterproof at point of connection with pipe or duct.
- 3. Lead flashing and flanges shall be constructed of 4 pound sheet lead with burned joints. Flange of lead flashing or lead flange on a duct shall extend out

onto roof a minimum of 12 inches from pipe or duct. Lead flashing shall extend up the pipe or duct not less than 7 inches.

4. Sheet metal flashing shall be constructed of 24 gage galvanized sheet steel. Flanges on these flashings shall extend out onto roof a minimum of 10 inches from pipe or duct. Flanges on ducts through exterior walls shall extend out from duct a minimum of 2-1/2 inches. Flanges on gas-fired equipment single-wall vents shall be of ventilated type. Type B gas vents through a roof shall be furnished with non-ventilated flashing as per National Fire Code, Pamphlet 211-1105.
5. Cast iron, steel, brass, and copper pipe, which terminates less than 18 inches above roof, shall be furnished with a combination counter-flashing and vandal-proof hood for protection against water, birds and foreign matter. Cast iron, steel, brass and copper pipe, which does not terminate within 18 inches of roof, shall be furnished with a counter-flashing sleeve. Pipe, which terminates more than 18 inches above roof, shall be furnished with protection against entrance of water, birds, and foreign matter.
6. Counter-flashing and combination counter-flashing sleeves and vandal-proof hoods shall be cast iron, vandal-proof, threaded, caulked or approved gas-heated sleeve type. Counter-flashing sleeves on each of these items shall extend down over flashing a minimum of 3/4 inch.
7. Flashing and flanges on ducts shall be installed waterproof at point of connection to the duct by riveting and soldering. Storm collars shall be securely screwed and installed waterproof around appliance vent pipe immediately above flashing.
8. Vent piping above roof shall be furnished with a combination counter-flashing sleeve and vandal-proof hood.

END OF SECTION

SECTION 15070

MECHANICAL SOUND, VIBRATION, AND SEISMIC CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Reduction or elimination of excessive noise or vibration within building due to operation of equipment, machinery, piping, and ductwork as specified.
 - 1. Vibration isolators.
 - 2. Seismic restraint devices.
 - 3. Acoustic housings.
 - 4. Lining and enclosing ductwork.
 - 5. Flexible ducts.
- C. Related Sections:
 - 1. Section 15400: Plumbing.
 - 2. Section 15700: Heating, Ventilating and Air Conditioning Equipment.
 - 3. Section 15800: Air Distribution.

1.02 PERFORMANCE REQUIREMENTS

- A. Provide sound level of spaces at levels not to exceed those listed below by furnishing acoustical devices indicated to provide specified sound levels.
- B. Provide rooms and spaces with the following maximum sound levels, in dbA.
 - 1. Auditorium 50
 - 2. Classrooms 45
 - 3. Offices 50

4. Work areas 50
5. Other type of rooms in dbA corresponding to the Room Criteria (RC) or Noise Criteria (NC) as defined in the ASHRAE Applications Handbook, Chapter 46.

C. Performance Requirements:

1. Aerodynamic and acoustic performance tests on equipment and duct silencers shall be conducted by an independent laboratory on a production unit.
2. Submit results with submittals.
3. Dynamic insertion loss values for silencers shall be measured by an independent NVLAP accredited laboratory in accordance with ASTM E 477 standards on a unit with a minimum face area of 4 sq. ft.
4. In general, silencers shall be selected for acoustical efficiency plus energy savings.
5. Acoustically absorptive filler material shall be inorganic mineral or glass fiber and shall be resistant to vermin and moisture and shall meet 25/50 flame and smoke spread when tested in accordance with ASMT E 84.

1.03 VIBRATION ISOLATION AND SEISMIC RESTRAINTS

- A. Provide vibration isolators to eliminate or reduce the transmission of vibration noise to any part of building.
- B. Provide vibration isolators to mitigate vibration frequency and load imposed by equipment. Isolator units shall be furnished with adequate strength and flexibility to provide proper resiliency under equipment weight and load impact without permitting excessive movement when starting.
- C. Where fabricated vibration isolator units are indicated, furnish manufacturer's standard catalog products with printed loading ratings.
- D. Seismic Requirements:
 1. Refer to Guidelines for Seismic Restraints of Mechanical Systems published by SMACNA, approved by DSA, for minimum seismic restraints required on mechanical components design and construction details.
 2. Provide seismic restraints for mechanical equipment or components specified. Where equipment is specified with proprietary names, design for seismic restraints is for first proprietary name listed.

3. Provide restraints, bracing and anchorage as required for the mechanical equipment, electrical equipment and components specified in the Contract Documents. Restraints, bracing and anchorage shall be installed to resist the total design earthquake or wind loads in any direction in accordance with CBC Code and SMACNA guidelines.
4. Provide restraints, bracing, and anchorage for the mechanical equipment and components.
5. For rigidly mounted liquid filled steel pipe, comply with the following:
 - a. Provisions of NFPA Pamphlet 13, Section 3 for sway bracing.
 - b. Provisions of NFPA Pamphlet 13, Section 3 for earthquake protection.
 - c. Hanger spacing as specified in Section 15050 under Hanger Spacing Schedule.
 - d. SMACNA Guidelines for Seismic Restraints, of Mechanical Systems and Plumbing Piping and approved by DSA.
6. For flexibly mounted liquid filled steel pipe, comply with the following:
 - a. Provisions of the California Building Code for flexibly mounted equipment.
 - b. Provisions of VISCMA (Vibration Isolation and Seismic Control Manufacturer's Association) Seismic Control Device Installation, Best Practices Manuals.
 - c. Installer may provide a DSA or OSHPD approved system such as the SMACNA Guidelines with Addendum No. 1, the Mason Industries Seismic Restraint Guidelines or other proprietary pre-approved system.
7. For ductwork and other mechanical equipment restraints, comply with SMACNA Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems and approved by DSA.

1.04 SUBMITTALS

- A. Provide in accordance with Division 01.
 1. Catalog cuts and data sheets on specific vibration isolators, seismic restraints, and anchors demonstrating compliance with the Specifications.

2. Shop Drawings for each piece of equipment including dimensions, structural member size, support point, vibration, and seismic restraints.
3. Written approval of frame design to be furnished by the equipment manufacturer.
4. Drawings indicating methods for suspension, support, seismic restraints, guides, etc., for piping, ductwork, etc.
5. Drawings indicating methods for isolation of pipes, ducts etc., piercing slabs, beams, etc.

1.05 QUALITY ASSURANCE

- A. Standards and Codes: Comply with applicable codes and standards having jurisdiction including, but not limited to:
 1. NFPA, Pamphlet 13.
 2. ASHRAE Systems Handbook.
 3. SMACNA Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems.
 4. CBC.
 5. VISCMA Seismic Control Device Installation, Best Practices Manuals
- B. Qualifications of Manufacturer and Installers: Comply with provisions as set forth in Section 15010: Basic Mechanical Requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Furnish and install vibration dampers, sound isolation pads, flexible connections and similar equipment required to prevent sound of water flowing in pipes, vibration of motors, and motor operated equipment from being transmitted to building structure; and, in case of fans, from being transmitted along ducts. Hot, tempered, and cold water lines shall be isolated from hangers, clamps and structural members by furnishing a commercially manufactured assembly of a hair felt or neoprene pad, cemented in a galvanized iron sleeve. Piping shall be isolated from vibrating equipment by furnishing required flexible connectors.

- B. Excepting sump pumps and in-line circulating pumps, pumps and similar motor operated equipment shall be installed on anti-vibration units.
- C. Flexible duct connections shall be furnished and installed at inlet and outlets of each fan, or ventilating unit, except curb-mounted roof exhaust fans.
- D. Flexible connections for freon piping shall be seamless flexible metal hoses of type and length recommended by manufacturer and suitable for system operating pressure.
- E. Flexible connections for all other piping shall be flexible metal hose or spool type with flanged ends, unless otherwise specified. Metal hose shall be covered with protective braiding in areas where physical abrasion may occur, or for personnel safety.
- F. Spool types shall be similar to American Rubber Co., Mercer Rubber Co PROCO, and hose types shall be D.M.E., Inc., U.S. Flex, Pennflex, Anaconda Flexpipe or Keflex with any required modifications to meet specified requirements. Flanges shall be furnished with steel retaining rings. Units installed on discharge side of pumps shall be furnished for a suitable working pressure of not less than 100 psig, and those on suction side for working pressures of 50 psig or 30 inches Hg vacuum.
- G. Units installed in cold water lines (less than 125 degrees F.) shall furnish a minimum temperature rating of 180 degrees F. and those installed in hot water lines (above 125 degrees F.) shall be constructed of special heat resistant materials and be furnished for a minimum temperature rating of 220 degrees F., continuous operation. Units shall be able to withstand a maximum lateral deflection of 3/8 inch. Temperature and pressure ratings shall be molded into body of each spool unit so they are easily identified. Spool types shall be for straight in flow only.
- H. Spool type units shall be furnished with control units comprised of a minimum of 2 tie-rods and anchor plates or internal guide sleeves to prevent excessive elongation or misalignment. Rubber washers shall be provided under bolt heads and rubber grommets in bolt holes to prevent any metal to metal contact between bolts and flanges.
- I. Where hose type units are furnished, restraining anchors or braces shall be provided if excessive or undesirable pipe movement occurs when system is operated.

2.02 GENERAL PROPERTIES OF VIBRATION ISOLATORS.

- A. Shall be provided with markings so that, after adjustment, when carrying their load, deflection under load can be verified; thus determining that load is within proper range of device and that correct degree of vibration isolation is being provided according to the design.
- B. Isolators to operate in direct proportion to their load versus deflection curve. Load versus deflection curves shall be furnished by manufacturer and must be linear over a deflection range of 50 percent above design deflection.

- C. Wave motion through isolator shall be reduced to following extent: Isolation above resonant frequency shall follow theoretical prediction based upon an un-dampened single degree of freedom system with a minimum isolation of 50 decibels above 150 cycles per second.
- D. Vibration isolator spring diameters shall be no less than their deflected height. Furnish spring with a 50 percent overload safety factor.
- E. Unless otherwise indicated, equipment installed on vibration bases shall provide a minimum operating clearance of one inch between structural steel base and floor or support base. Provide flexible connectors in piping and flexible conduit in power wiring to minimize transmission of vibration.
- F. Isolators and springs exposed to weather shall be hot-dipped galvanized or powder coated after fabrication and before installation. Hot-dipped zinc coating shall be not less than 2 ounces per square foot by weight complying with ASTM A 123. In addition, provide limit stops to resist wind velocity.
- G. Where indicated, provide structural steel bases with height saving brackets, and minimum of 3 points of support. Isolators shall be furnished with a method for leveling.
- H. Design isolators and seismic restraints for positive anchorage against uplift and turning.
- I. Provide and install, under this section of the Specifications, structural steel required to properly support equipment and steel required to support horizontal thrust arrestors.

2.03 ISOLATOR TYPES

- A. Type A: Steel Spring Isolators: Un-housed steel spring isolators, laterally stable and unrestrained. Design springs so that ratio of horizontal to vertical spring (stiffness) constant is between 0.9 and 1.3. Natural frequency of isolator must be 1/3 to 1/4 of driving frequency that is to be controlled. Isolators to provide a minimum additional travel to solid equal to 50 percent of rated deflection. Isolators shall be furnished with built-in leveling bolts complete with sound isolation pads type B. Static deflection as specified herein. Isolation pads shall be 50 percent wider than the outside diameter of the spring.
- B. Type B: Sound Isolation Pad: Provide under each spring isolator a sound isolation pad, utilizing high quality durable neoprene pad material, loaded to 40 psi. Build sound pad up to 2 layers of 1/4 inch thick neoprene material; separate layers with a 16 gage galvanized sheet metal plate. Top layer shall provide a hardness of 40 durometers

and the bottom layer shall be 40 durometers. Cold bond sound pads together and to isolator baseplate.

- C. Type C: Neoprene-in-Shear Isolators: Isolator shall be neoprene-in-shear type as recommended by manufacturer. Isolator shall provide a static deflection under rated load at 3/8 inch.

2.04 EQUIPMENT FRAMES

- A. Provide mounting frames and brackets to carry load of equipment without causing mechanical distortion or stress to the equipment.
- B. Type A Frame: Wide flange members, rigidized structural steel frame with brackets. Maximum allowable deflection at any point on load frame relative to unloaded frame shall be 0.005 inch. Members to be constructed of wide flange beams, with a depth of not less than 1/10 of length of span between isolators. Frame shall be Mason Industries type WF, M.W. Sausse type RMSB-W, or equal.
- C. Type B Frame: Channel members, rigidized structural steel frame with brackets. Frame to be constructed of channel steel with section depth equal to 1/10th length of longest structural member. Frame shall be Mason Industries type MSL, M.W. Sausse type RMSB_C, or equal.
- D. Type C Frame: Steel gusset or bracket welded or bolted directly to machine frame in order to accommodate isolator. Frame shall be Mason Industries type HSB, M.W. Sausse type RMSG, or equal.
- E. Type D Frame: Fabricated of rectangular channel steel forms for floating foundations to be filled with concrete on the Project site. Channel depth to be a minimum of 1/12th of longest dimension, but in no case less than 6 inches. Form shall include 1/2 inch reinforcing bars installed each way in a layer 1-1/2 inches above bottom and drilled steel members with sleeves mounted below holes to receive equipment anchor bolts. Weight of concrete and frame shall be two times or more than the weight of the unit it supports. Frame shall be Mason Industries type KSL, M.W. Sausse type RMSBI, or equal.

2.05 MATERIALS AND CONSTRUCTION (NOT IN CONTRACT)

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install isolators as required for installation of mechanical components to prevent transmission of vibration noise to any part of building.

- B. Install isolators to suit imposed load and the vibration frequency to be absorbed. Isolator units shall furnish adequate strength and flexibility to exhibit proper resiliency under machine load and impact without permitting excessive movement when starting.
- C. Where commercial vibration isolator and seismic restraint units are specified, furnish manufacturer's standard catalog products with printed loading ratings, or provide substantiating calculations.
- D. Install vibration isolators and seismic restraints in accordance with manufacturer's printed installation instructions.
- E. Where equipment is belt driven and motor is not installed on equipment, install motor, and driven equipment on unitized support, and install entire support isolators. Unitized support to be provided with adjustable slide rails sized for motor weight and frequency. Support shall be Mason Industries type WF, M.W. Sausse type RMSF, or equal.
- F. Do not install any equipment, piping, conduit, ductwork, etc., that makes rigid contact with building or its structural members, unless reviewed by the Architect.
 - 1. Coordinate Work with other trades to avoid rigid contact with building.
 - 2. Correct, before installation, any conflict with other Work that would result in solid contact to equipment or piping due to inadequate space.
 - 3. Obtain inspection from the IOR for concealed Work before enclosure.
 - 4. Notify manufacturer before installation of vibration isolation devices so that manufacturer may instruct and demonstrate technique for proper installation.
- G. The furnishing or installation of vibration isolators must not cause any change of position or alignment of equipment, ductwork, or piping, resulting in stresses in piping or ductwork, connections, or misalignment of shafts or bearings. Equipment, piping, and ductwork shall be maintained in a rigid position during installation. Load shall not be transferred to isolator until installation is complete and under full operational load.
- H. Air Compressors, Water Chillers, Floor Mounted Pumps: Install each unit, as indicated on Drawings, with its motor on a vibration isolated base utilizing type B frames except where a type D frame is indicated on Drawings. Install steel support frame furnished by equipment manufacturer, utilizing equipment anchor bolt templates and isolator height saving brackets. Provide springs as specified for type A isolator; static deflection shall be minimum of 2 inches.
- I. Fans (2000 rpm or higher) Air Compressors, Vacuum Pumps, Miscellaneous Equipment: As specified for floor mounted boilers except furnish type C isolators.

- J. Air Handling, Air Conditioning Units, Floor Mounted Fans, and Cabinet-Installed Fans: Install entire casing including filters, mixing box, fan section, coil sections, etc., on a continuous, integral, structural steel base, as indicated. Furnish type A, B, or C frames, reinforced as necessary to prevent distortion of frame. Furnish isolator type A; static deflection shall be minimum of 1-1/2 inches
- K. Suspended Fans and Air Conditioning Unit Fan Coils and Unit Ventilators: Suspend each integral unit from overhead structure on steel spring and elastomer hanger isolators and support deflection under rated load of 3/8 inch. Provide spring static deflection as follows:

Fan RPM	Min. Deflection
200 – 400	3 inches
400 – 700	2 inches
Above 700	1 inches

- M. Pipe Isolation: Where indicated and as required, furnish and support each pipe from an isolator. Isolator for the first 5 support locations away from vibrating equipment shall have the same deflection as the equipment isolators. After that, isolators shall be a neoprene-in-shear type of size as recommended by manufacturer; except where indicated on Drawings, pipe hanger rod shall be furnished with a steel spring isolator and elastomer element, with lower rod capable of 30 degrees total mis-alignment without contact on spring housing.
- N. Seismic Restraints: Floor or pad mounted equipment, without vibration isolators, shall be bolted to floor or other support. Floor mounted equipment with vibration isolators shall be provided with lateral and vertical restraining devices on all sides of base to restrict displacement of equipment. On all sides of suspended equipment, provide bracing for rigid supports and provide aircraft cable restraints for resiliently supported equipment.

3.02 EXAMINATION

- A. Arrange for the services of a certified representative of isolation manufacturer to visit the Project site for inspecting installation of devices. In the event the isolators do not meet specified requirements perform necessary revisions. Submit a written report to the Architect signed by above representative indicating all devices are properly installed and are operating as specified or required by isolation manufacturer.

END OF SECTION

SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Provide marking and identification required on mechanical piping systems, ducts, controls, valves, apparatus, etc., as specified in this section or any related sections.
- C. Related Sections:
 - 1. Section 15050: Basic Mechanical Materials and Methods.
 - 2. Section 15400: Plumbing.
 - 3. Section 15700: Heating, Ventilating and Air Conditioning Equipment.
 - 4. Section 15800: Air Distribution.

1.02 SUBMITTALS

- A. Submit in accordance with Division 01 and Sections 15010: Basic Mechanical Requirements.
- B. Submit Samples of materials.

1.03 QUALITY ASSURANCE

- A. Comply with provisions of Section 15010: Basic Mechanical Requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Piping systems, controls, valves, apparatus, etc., except those that are installed in inaccessible locations in partitions, walls, and floors, and those installed directly below grade, shall be permanently identified.

2.02 VALVES

- A. Furnish prepared chart or diagram for each piping system, indicating by identifying letter or number each valve in the system, its location, and function.
- B. Install charts in aluminum frame with clear glass front and secure on wall where designated by the IOR.
- C. Bind copies of each chart in operating instructions manual.
- D. Provide each valve with a brass, aluminum, or plastic disc, not less than 1-1/4 inches diameter bearing engraved numbers corresponding to those indicated on chart. Fasten discs to valve with No. 14 brass wire.
- E. Provide an additional tag for safety valves and other valves that could be hazardous to safety and health of occupants. Distinguish these tags from regular valve tags by color (such as yellow with black letters, and marked "Danger"); submit Sample tag to the Architect for review.

2.03 INSTRUMENTS AND CONTROLS

- A. Identify panel-mounted instruments and controls with engraved bakelite nameplates permanently affixed to panel boards.
- B. Identify alarm indicating devices and alarm reset devices by nameplates.
- C. Identify damper motors and automatic valves, flow switches, pressure switches, etc., with embossed aluminum or plastic tape affixed to controller, indicating service and setting.

2.04 EQUIPMENT

- A. Identify each major piece of equipment with stenciled designation corresponding to its designation on the Drawings.

2.05 PIPELINES IDENTIFICATION

- A. Identify pipes by means of colored labels with directional flow arrows as indicated in schedule.
- B. Materials: Waterproof plastic cloth, all-temperature, self-adhering, or markers similar to Western Tel-A-Pipe, Type I, W.H. Bradley Co., or equal.
- C. Size: For pipes up to 3 inches diameter, 2-1/4 inches x 9 inches minimum, with 1/2 inch letters; for pipes over 3 inches diameter, 2-1/4 inches x 9 inches minimum, with 1-1/2 inch letters.

D. Colors:

1. Backgrounds: As indicated in schedule.
2. Letters: White on red background; black on all other backgrounds.

E. Locations:

1. On accessible piping, whether insulated or not (including mechanical rooms, attic and ceiling spaces); except that labels shall be omitted from piping where contained material is obvious due to its connection to fixtures (such as faucets, water closets, etc.).
2. Near each valve and branch connection in such accessible piping.
3. At each pipe passage through wall or floor.
4. At not more than 40 feet spacing on straight pipe run between bands required in 2 and 3 above.
5. At each change in direction.

F. Application: Install on clean surfaces free of dust, grease, oil, or any material that will prevent proper adhesion. Replace non-adhering or curling labels with new labels, as required by the IOR.

1. Furnish spray adhesive on insulated pipes in addition to adhesive on marker.
2. Finish exposed markers with one coat of lacquer.

G. Schedule:

<u>Content of Pipe</u>	<u>Legend</u>	<u>Color</u>	<u>Note</u>
Sanitary waste	San waste	G	*
Sanitary vent	San vent	G	*
<u>Content of Pipe</u>	<u>Legend</u>	<u>Color</u>	<u>Note</u>
Indirect drain	Ind drain	G (1)	*
Fire sprinkler supply	Sprinkler supply	R	*
Fire sprinkler drain	Sprinkler drain	R	*

Chilled water supply	Chill water supply	G	*
Chilled water return	Chill water return	G	*

H. Notes on Schedule:

1. Symbol * indicates flow arrow required.
2. Symbol (1) indicates 2-1/4 inches x one inch yellow label with 1/2 inch letters reading UNSAFE WATER at one end of primary label.
3. Hyphen between words indicates 2 separate stock labels are required, although a single special label with all lettering is permitted.
4. Background colors: Symbol Y indicates yellow background color. Symbol G indicates green background color. Symbol R indicates red background color. All letters shall be in black print.

2.06 UNDERGROUND PIPE MARKERS

- A. Pipe markers shall be furnished to grade at each horizontal change in direction for non-metallic underground pipe. Markers shall be concrete plaque inscribed with the appropriate word (gas, water, sewer, air, etc.). Cleanouts to grade may serve as direction markers for waste lines. An electrically continuous No. 14 plastic covered copper tracer wire, Type TW, shall be installed in trench along pipe. Wire shall be fastened to pipe at not greater than 20 foot intervals. Wire shall terminate above grade with a 12 inch wire lead taped around each riser. Straight line transitions of metallic to non-metallic pipe shall be marked by installing tracer wire lead to grade under a marker.
- B. Tracer wires for non-metallic pipe shall be color-coded as follows:
 1. Gas: Yellow
 2. Domestic Water: Blue
 3. Fire Sprinkler: Red

2.07 IDENTIFICATION OF AIR CONDITIONING EQUIPMENT

- A. Provide identification markers to locate air conditioning equipment above T-bar ceilings. Install 3/4 inch to one inch diameter colored self-adhesive dots to T-bar ceiling grid indicating point of access. The following identification markers shall be recorded on the project record documents:

- | | | |
|----|--|-----------|
| 1. | Fire Damper: | Red |
| 2. | Manual Volume Dampers: | Blue |
| | a. Supply air: | Full dot |
| | b. Return air: | Half dot. |
| 3. | Fan coil unit: | Green |
| 4. | Filter Location if separate from fan coil: | Yellow |

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Correct detrimental conditions prior to commencing the Work of this section. Install markers and identification tags as specified with materials and installation procedures recommended by manufacturer.

3.02 CLEANUP

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

END OF SECTION

SECTION 15080

MECHANICAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Insulation furnished and installed under this section shall meet minimum legal requirements of the Building Energy Efficiency Standards adopted and incorporated in the California Energy Commission, Title 24, Part 2, Chapters 2 through 53, unless otherwise noted, for the following piping, ductwork, and equipment:
 - 1. Condensate drain piping from air conditioning equipment.
 - 2. Heating hot water supply and return piping.
 - 3. Refrigerant piping.
 - 4. Supply and return heating and cooling systems air ducts.
 - 5. Plumbing piping and equipment including hot and tempered domestic water supply and return piping.
- C. Related Sections:
 - 1. Section 15010: Basic Mechanical Requirements.
 - 2. Section 15050: Basic Mechanical Materials and Methods.
 - 3. Section 15075: Mechanical Identification.
 - 4. Section 15400: Plumbing.
 - 5. Section 15700: Heating, Ventilating and Air Conditioning Equipment.
 - 6. Section 15800: Air Distribution.

1.02 SUBMITTALS

- A. Submit in accordance with Division 01 and Section 15010: Basic Mechanical Requirements.
 - 1. Complete material list of items to be furnished and installed under this section.
 - 2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.
 - 3. Shop Drawings, catalog cuts and manufacturer's data indicating insulation, jacketing, adhesives, and coating. Insulating materials shall be certified by manufacturer to comply with the California quality standards for insulating material.
 - 4. Display Sample cutaway sections.
 - 5. Manufacturer's recommended method of installation procedures, which will become part of this Specification section.

1.03 QUALITY ASSURANCE

- A. Qualifications of Manufacturer and Installer, Workmanship and Standard of Quality: Comply with provisions stated under Section 15010: Basic Mechanical Requirements and Section 15050: Basic Mechanical Materials and Methods.
- B. Insulation Work shall be in accordance with the State of California Building Energy Efficiency Standards, CBC, and Uniform Mechanical Code.
- C. Test Ratings:
 - 1. Comply with provisions stated under Section 15010 and 15500 with emphasis on ASTM E 84, NFPA 255, or UL 723. ASTM C 167, ASTM C 302, UL label or listing of satisfactory test results from the National Bureau of Standards, or a satisfactory certified test report from an acceptable testing laboratory. Approval by the State Fire Marshal is required.
 - 2. Furnish labels, legibly printed with the name of the manufacturer or listings indicate that fire hazard ratings do not exceed those specified for materials proposed for installation. Flame spread not more than 25 and smoke developed not exceeding 50.

3. Tests shall be performed on each item individually when insulation, vapor barrier covering, wrapping materials, or adhesives are installed separately at the Project site.
4. Test insulation, vapor barrier covering, wrapping materials and adhesives as an assembly when they are factory composite systems.

1.04 PRODUCT HANDLING

- A. Protection, Replacement, Delivery and Storage: Comply with provisions stated under Sections 15010: Basic Mechanical Requirements and 15050: Basic Mechanical Materials and Methods.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. Insulating material shall be fire resistant, non-corrosive, shall not break, settle, sag, pack or disintegrate under vibration, nor absorb more than 1 percent moisture by weight.
2. Insulating material shall be furnished with thickness indicated in Table 1, and shall furnish thermal resistance in the range of R 4.0 to 4.6 in accordance with inch at 75 degrees F. For any other value of R, insulation thickness shall be calculated accordingly and submitted for review.
3. Asbestos in any quantity in insulating material is not permitted.
4. Provide insulation materials, adhesives, coatings, sealants, fitting covers, and other accessories with a fire hazard rating not to exceed 25 for flame spread, 25 for fuel contributed and 50 for smoke developed, except for materials listed as follows:
 - a. Nylon anchors for installing insulation to ducts or equipment.
 - b. Treated wood blocks.
5. Flameproofing treatments subject to moisture damage are not permitted.

TABLE 1 - MINIMUM PIPING INSULATION THICKNESS (1)

PIPING SYSTEM TYPE	FLUID TEMP RANGE (DEGREES F.)	NOMINAL PIPE DIAMETER (INCHES)					
		Runouts up to (2)	1 and Less	1.25-2	2.50-4	5-6	8 and Larger

Insulation Thickness Required (in inches)
Space Heating Systems (Steam, Steam Condensate and Hot Water)

~~Hot Water — Up to 200 — 0.5 — 1.5 — 1.5 — 1.5 — 1.5 — 1.5~~

Service Water Heating Systems (recirculating, piping supply and return)

~~Hot Water — Up to 180 — 0.5 — 1.0 — 1.0 — 1.5 — 1.5 — 1.5~~

Space Cooling Systems (Chilled water, Refrigerant, and Brine)

Chilled Water	40-60	0.5	0.5	0.75	1.0	1.0	1.0
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Refrigerant/Brine	Below 40	1.0	1.0	1.5	1.5	1.5	1.5
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Condensate Drain 1/2 inches Minimum insulation thickness.

From A/C Equipment: Insulate condensate drain lines within building, in room and in ceilings.

NOTES:

- (1) For piping exposed to ambient temperatures, increase thickness by 0.5 inch.
- (2) Runouts to individual terminal units, not exceeding 12 feet in length.
- B. Lagging Adhesives: Insulation finished with canvas shall be provided with laps adhered with Childers Chil-Seal CP50A/AHV2 or Foster's Sealfas 30-36, or equal. A finish coat of CP50A or 30-36 shall be installed to entire outer surface of lagging cloth at coverage specified by manufacturer.
- C. Canvas Jackets: Furnish 6 oz. in accordance with square foot minimum, 48 x 48 thread count canvas jacketing.

D. Insulation Jackets:

1. Exterior insulation exposed to weather shall be weatherproofed with Childers aluminum jacketing, or equal. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16 inch corrugations. Smooth or embossed jackets may be permitted in special situations to match an existing installation. Jacketing shall be furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. A minimum thickness of 0.016 aluminum jacketing is to be provided on ducts and piping. A minimum thickness of 0.020 shall be provided on tanks, equipment, and heat exchangers.
2. Insulated elbows, of 90 degrees and 45 degrees, with a nominal iron pipe size of 1/2 inch to 8 inches shall be provided with Childers aluminum Ell-Jacs insulation covers, or equal, manufactured from 1100 aluminum alloy of 0.024 inch thickness. Insulated elbows with a nominal pipe size of 10 inches to 18 inches shall be provided with Childers 4-piece aluminum Ell-Jacs.
3. Tees, Flanges, and Valve Insulation in Conjunction with Aluminum Jacketing: Furnish Childers Aluminum Special Fabrications Insulation Covers as manufactured by Childers Products Company, or equal.

E. Adhesives: Adhesives shall be acceptable to the State Fire Marshal. Name, type and method of installation shall be submitted for review. Acceptable products are stated under each category of insulation Work in following paragraphs:

1. Duct Liner Edge Sealing (Adhesive Exposed to Air Stream): Childers Chil-Spray NF CP-89 or 3M Fastbond 38-NF for spray installation. For brush installation, furnish Childers Chil-Stix CP-82 or Foster's Spark-Fas 85-20.
2. Duct Joint Sealing:
 - a. Childers Chil-Seal CP50A/50AHVZ
 - b. Foster's Sealfas 30-36
 - c. Borden Arabol 60-89-05 with canvas tape, minimum 2 inches width.
3. Duct Joint Caulking:
 - a. Childers Veloseal CP-72

b. 3M 321.

4. Valve and Fitting Cover: When installed in conjunction with PVC jacketing, furnish Zeston 25/50 rated polyvinyl chloride fitting covers as manufactured by Johns Manville, or equal.

2.02 SPACE HEATING PIPING SYSTEM AND DOMESTIC HOT WATER PIPING SYSTEM INSULATION (NOT USED)

2.03 COOLING PIPING SYSTEM INSULATION

A. General: Insulate chilled water supply and return piping and refrigerant piping.

B. Materials:

1. Classes of Insulation:

a. Class A: Expanded polystyrene pipe insulation, self-extinguishing type, either molded or extruded; Dow Chemical Styrofoam FR, California Zonolite Co. Dyfoam, or Koppers Insulfoam.

b. Class B: Glass fiber molded pipe insulation ASTM C 547.

Pipe insulation shall be one piece, preformed, and provide a minimum R factor of 4 at 75 degrees F. mean temperature. Insulation shall be faced with all-purpose fire retardant vapor barrier jacket. Pipe insulation shall be Johns Manville Micro-Lok, Certain-Teed Snap-On, or Owens-Corning ASJ/SSL II.

c. Class C: Expanded (foamed) urethane (polyurethane) pipe insulation of self-extinguishing type molded or fabricated, UpJohn Co. CFR Division, Armstrong Armalok or Expando-foam, or Owens-Corning Urethane.

d. Class D: Foamed plastic pipe insulation, self-extinguishing type, ASTM C 534 Type 1 - tubular. Pipe insulation shall be one-piece preformed, flexible tubing type and provide a minimum K factor of 0.28 at 75 degrees F. mean temperature. Pipe insulation shall be Johns Manville Rubatex, Armstrong Armaflex II, or equal.

e. Class E: Mineral fiber pipe insulation ASTM C547. Pipe insulation shall be one piece preformed up to 3 inches thickness and provide a minimum R factor of 4 at 75 degrees F. mean temperature.

Insulation shall be faced with all-purpose fire-retardant vapor barrier jacket. Pipe insulation shall be Industrial Insulation of Texas, Inc., Delta Snap Wrap, Bradford Enercon Enerok, or Lapinus 1200.

2. Locations and Class of Insulation Required:

<u>SERVICE</u>	<u>LOCATION</u>	<u>CLASS OF INSULATION</u>
Condensate drains from air conditioning equipment	Indoors at ceilings and in rooms	D
Refrigerant suction. Liquid line as required	All locations except underground	D
All other piping, except underground	All locations except underground	A, B, C, or E

3. Thickness: Refer to Table 1 of this section.

4. Adhesives:

- a. Polystyrene adhesives: Childers Chil-Rene CP-96 or King Adhesive Co. 15-165.
- b. Vapor barrier laps and penetrations: Furnish Childers Chil-Perm NF CP-32 or Epolux 660 on butt joints of foil-faced vapor barriers, and where pins and staples puncture facings.

2.04 HIGH TEMPERATURE EQUIPMENT INSULATION (NOT USED)

2.05 LOW TEMPERATURE EQUIPMENT INSULATION (NOT USED)

2.06 DUCTWORK AND PLENUM INSULATION

- A. General: Insulate ductwork and plenums with not less than the amount of insulation tabulated in Table 2. Insulation may be omitted under the following conditions:

- 1. Ceilings, which form return or relief plenums, need not be insulated.

2. Exposed return air ductwork in conditioned space.
3. Exposed supply air ductwork in conditioned space if the supply air temperature is higher than the maximum expected dew point temperature.
4. Return air ductwork between wall studs inside an interior wall.
5. Supply air ductwork between wall studs inside an interior wall if the supply air temperature is higher than the maximum expected dew point temperature.

TABLE 2 - INSULATION OF DUCTS AND PLENUM

INSULATION TYPES

<u>Duct Location</u>	<u>Cooling Only</u>	<u>Heating Only</u>
On roof or exterior of building	F-3 and W	F-1 and W
Attics, Garages, and Crawl Spaces	F-2	F-1
In walls, within floor-ceiling spaces and hot and cold plenums	F-2	F-1
Within the conditioned space or in basement	As specified above	None Required
Concrete slabs or within ground	None Required	None Required

B. Insulation Types:

1. F-1: One inch blanket fiberglass, factory-laminated with all-service jacket vapor barrier. Refer to the materials indicated in this section for external insulation below. Provide fiberglass duct liner as indicated.
2. F-2: 2 inches blanket fiberglass factory-laminated with all-service jacket vapor barrier. Refer to the materials indicated in this section for external insulation below. Provide one inch fiberglass blanket, duct liner as indicated.
3. F-3: 3 inches blanket fiberglass factory laminated with all-service jacket vapor barrier. Refer to the materials indicated in this section for external insulation. Provide one inch duct liner as indicated.

4. W: Weatherproof jacket, 0.016 inch thick aluminum, or stainless steel.

C. Notes:

1. Where ducts are utilized for both heating and cooling, minimum insulation provided shall be as required for the most restrictive condition.
2. Refer to the materials indicated in this section for external insulation and internal lining, this section, below.
3. Thickness of duct liners is based on type of installation.

D. Materials:

1. Fire-Resistive Insulation Materials and Coatings: Submit to the State Fire Marshal for approval.
2. Adhesives: See sub-sections 2.01, sections F, G, and H for applicable products.
3. External Insulation: Provide a minimum R value as required by the latest edition of the California Energy Efficiency Standards, but not less than 4.0 at 75 degrees F. (installed) glass fiber blanket, factory-laminated with reinforced foil Kraft (FRK) vapor barrier facing; Johns Manville Microlite, Owens Corning all-service faced duct wrap, Ultralite No. 100, Pittsburgh Plate Glass Superfine, or Silvercote Silvercel.
4. Internal Lining: Johns Manville Permacote® Linacoustic ® and/or Permacote® Spiracoustic®, or Certainteed. Internal lining shall conform to NFPA 90A, shall be UL listed, and meet ASTM G21, 22 specifications, and State Fire Marshal approved.
 - a. Noise regulatory criteria (NRC).
 - (1) Duct lining: Minimum NRC of 0.75 for interior spaces and minimum NRC of 0.90 for exposed to weather.
 - (2) Hot and cold plenums separated by single partition: Minimum NRC of 0.75, both sides.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Except as specified herein, install material in accordance with recommendations of manufacturer. Do not install insulation materials until tests specified in other sections are completed. Remove foreign material such as rust, scale, or dirt. Surfaces shall be clean and dry. Maintain insulation clean and dry at all times.
- B. On cold surfaces where a vapor barrier must be provided and maintained, insulation shall be installed with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are fastened to cold surfaces shall be insulated and vapor sealed to prevent condensation.
- C. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.
- D. Pipe or duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves; except where firestop or firesafing materials are required.
- E. Metal shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed accordingly.
- F. Insulation shall not be installed in the following locations unless otherwise noted:
 - 1. On vacuum return lines less than 50 feet long.
 - 2. On unions, flanged connections or valve handles.
 - 3. Over edges of any manhole, clean-out hole, clean-out plug, access door or opening to a fire damper, so as to restrict opening or identification of access.
 - 4. Over any label or stamp indicating make, approval, rating, inspection, or similar data, unless provision is made for identification and access to label or stamp.

3.02 INSTALLATION OF HEATING PIPING SYSTEM INSULATION (NOT USED)

3.03 INSTALLATION OF COOLING PIPING SYSTEM INSULATION (NOT USED)

3.04 INSTALLATION OF HIGH TEMPERATURE EQUIPMENT INSULATION (NOT USED)

3.05 INSTALLATION OF LOW-TEMPERATURE EQUIPMENT INSULATION (NOT USED)

3.06 INSTALLATION OF DUCTWORK AND PLENUM INSULATION

A. External Covering:

1. Before installing duct insulation, sheet metal ducts shall be clean, dry, and tightly sealed at joints and seams.
2. Duct exterior insulation shall be firmly wrapped around ductwork with joints lapped a minimum of 2 inches. Insulation shall be securely fastened with 18 gage copper-lined steel wire, or 16 gage soft-annealed galvanized wire spaced approximately 12 inches on centers and at loose ends, presenting a neat and workmanlike appearance. Where duct width is such that wiring will not fasten insulation firmly against duct an adhesive shall be furnished to fasten insulation to duct with wiring being installed at ends of insulation segment.
3. Duct insulation in finished rooms shall be covered with wrapped fiberglass cloth cover. Install on each corner of duct 26 gage galvanized steel small nose, wide flange corner bead of appropriate height. In unfinished rooms, the insulation shall have a vinyl or similar coating. In all rooms, insulation shall be fastened to the ducts with an approved adhesive instead of wire. Corners shall be cut and formed instead of bending the insulating material. Raw edges shall be taped.
4. Insulation on ductwork transporting conditioned air, both supply and return, and outside air intake ducts shall be furnished with a factory-applied, fire-resistant vapor barrier.
5. Exposed Ducts or Plenum:
 - a. Install insulation to ducts or plenum furnished with butt joints, without voids and with adhesive over entire surface of duct. Cover insulation with canvas jacket, fastened tightly to insulation with lagging adhesive. Install 2 finish coats of undiluted adhesive.

- b. When installing jacket, finished covering shall be even and level, without humps, with constant diameters on round ducts maintained.
- c. For non-lined insulated ducts or plenums exposed to weather: Insulation finish shall be 0.016 inch thick aluminum sheet with joints lapped not less than 3 inches, sealed, and secured with 6 gage by 3/8 inches aluminum sheet metal screws, or aluminum handgun-type rivets.

B. Lining:

1. General:

- a. Floors of cold plenums and fan enclosure plenums shall not be insulated.
- b. Cover short damper sections on lined ducts on outside to permit free operation of dampers and linkage.
- c. Dimensions of ducts indicated are net inside dimensions and must include thickness of duct liners to obtain the required duct size.
- d. Install insulation in square turns, where required, to cover interior surfaces before duct turns are installed.

2. Interior insulation (lining) of ducts shall be as specified in above. Lining may only be furnished as one of following assemblies:

- a. Factory installed, integral with sheet metal outer duct and interior perforated or non-perforated sheet metal liner, non-metal components not exposed to air stream; United Sheet Metal, Type P-27 or K-27.
- b. Liner material installed during fabrication of duct with sealed face only exposed to air stream. Insulation shall be fastened to sheet metal with an approved fire-retardant adhesive, with minimum 90 percent coverage and edges firmly adhered. Mechanical fasteners shall supplement the adhesive on top sections of ducts more than 12 inches wide and on sides of ducts more than 24 inches high, and shall be spaced on 16-inch centers maximum. Fastener posts shall be cut off approximately 1/4 inch from metal disc.

3. Interior insulation in ducts or plenums shall not have exposed edges. Edges open to entering or leaving air streams shall be covered, secured in place and sealed with approved duct liner edge sealers.

3.07 CLEANUP

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

3.08 PROTECTION

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

END OF SECTION

SECTION 15400

PLUMBING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Labor, materials, tools, and equipment to install plumbing systems as indicated.
- C. Related Sections:
 - 1. Section 15010: Basic Mechanical Requirements.
 - 2. Section 15050: Basic Mechanical Materials and Methods.
 - 3. Section 15070: Mechanical Sound, Vibration and Seismic Control.
 - 4. Section 15075: Mechanical Identification.
 - 5. Section 15080: Mechanical Insulation.
 - 6. Section 15180: Heating and Air Conditioning Piping Systems.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 15010: Basic Mechanical Requirements.

1.03 QUALITY ASSURANCE

- A. Unless otherwise noted, provisions including amendments thereto, of the State Plumbing Code Part 5, Title 24, CCR; of the Uniform Plumbing Code, latest edition; and of the latest Plumbing Ordinances of the City and County of Los Angeles are hereby made part of this section.
- B. Conform to provisions of Section 15010: Basic Mechanical Requirements.

- C. Manufacturer of plumbing products must have ANSI/NSF Standard 61, Section 9 certification to demonstrate compliance with the federal requirements for lead contribution to drinking water (Safe Drinking Water Act SDWA).

1.04 PRODUCT HANDLING

- A. Conform to provisions of Section 15050: Basic Mechanical Materials and Methods.

PART 2 - PRODUCTS

2.01 PIPING SYSTEMS

- A. Materials: Refer to Section 15050: Basic Mechanical Materials and Methods.
- B. Insulation for Piping: Refer to Section 15080: Mechanical Insulation

2.02 FIXTURES AND DRAINS

- A. General: Fixtures specified shall be furnished complete with trim and fittings. Cast iron plumbing fixtures shall be acid resistant enamel, and identified by casting letters "AR" or words "acid-resistant" into metal. Fixtures shall be white unless otherwise specified. Cast iron fixtures shall be white enamel inside and on back, rim and apron, with exposed unfinished surfaces painted white. Fixtures of same general classifications shall be of same make.
- B. Finished Brass:
 - 1. Unless otherwise specified, finished brass of a similar type shall be of same manufacturer and model throughout buildings.
 - 2. Finished and exposed brass equipment, except floor, shower and urinal drains shall be chromium-plated and polished. Floor, shower and urinal drains, unless otherwise specified, shall be nickel-bronze metal.
- C. Traps, Trap Arms and Tailpieces:
 - 1. Fixture traps shall be all cast brass, chromium-plated and polished. (No tubular traps). Exceptions as follows:
 - a. Traps that are an integral part of a fixture.
 - b. Traps concealed in floors, walls and furring.
 - c. Traps standard for service sinks and Industrial Shop equipment.
 - d. laboratory traps and tailpieces shall be as specified in section 15050:

“Basic Mechanical Materials and Methods”

2. Concealed traps and 17 gauge tailpieces may be rough brass finish, except as otherwise specified. Laboratory traps and tailpieces shall be as specified in Section 15050: Basic Mechanical Materials and Methods. Furnish chromium-plated and polished cast brass wall flanges with setscrews and chromium-plated and polished brass casing on discharge side of each trap.
 3. Tailpieces shall be not lighter than 17 gauge, brass, chromium-plated, and polished. Furnish and install chromium brass plated wall flanges with set screws and chromium-plated 20 gauge brass casing on discharge side of each chrome-plated all cast trap.
- D. Faucet and Shower Valve Handles: Faucet and shower valve handles shall be solid brass, chromium-plated and polished, and fastened to their stems by Allen type hollow head stainless steel set screws through the side of the handle extending into the stem. Handles with sharp edges or projections shall not be furnished.
- E. Fixture Supplies:
1. Supplies for garbage disposal units and water heaters shall be unplated rigid copper water tube with threaded adaptors for connections to valves and other threaded connections. All other supplies shall be chromium-plated brass with hospital threads or shall be furnished with fittings and valves, which completely cover threads.
 2. Exposed supplies for showers shall be chromium-plated brass pipe up to header with hospital threads or shall be furnished with fittings and valves, which completely cover threads.
 3. Supplies to water closet tanks, lavatories, and drinking fountains shall be furnished with chromium-plated and polished screwed type angle compression stops with square shank stems and lock shields extending beyond stem. Instead of solid supply piping, polished chrome-plated risers of 3/8 inch outside diameter with ferrule stop end and metal nosepiece may be furnished. The installation of braided stainless or easy hooker's supplies is not permitted. Exception: Supplies that rise vertically from floor shall be furnished with straight type instead of angle type stops.
 4. Each supply or pipe that penetrates a finished surface and plumbing pipes passing through a countertop or part of a cabinet shall be furnished with a chromium-plated brass flange except flanges furnished by manufacturer of flush valves as an assembly.
 5. Water supplies of plumbing fixtures shall be protected against back-siphonage in event of a vacuum in piping system.
 6. Discharge outlets of supply faucets for lavatories and sinks shall clear top of overflow rim by at least one inch.

7. Toilet and urinal flush valves shall be furnished with recognized atmospheric vacuum breakers, installed a minimum of 6 inches above fixture.

2.03 CLEANOUT ASSEMBLIES

- A. Cleanout plug shall be line size.
 B. Schedule Numbers:

CO-1: Iron body cleanout tee full line size up to 4 inches and round access plate, plugs shall be brass, countersunk with tapped boss for 5/16 inch No. 18 or 1/4 inch No. 20 screws. (Specify for finished walls at base of waste stack, above urinal and service sink.) AB&I and TYLER may be used as iron body cleanouts. Trim and accessories shall be Smith or Zurn or equal.

SMITH	ZURN	AB&I	TYLER	WATTS	MIFAB
4532-U	Z-1446-BP			CO-460-RD-34B	C1460-RD-6

CO-2: Iron body with approved UPC plug, top and adjustable sleeve, cut-off ferrule, polished scoriated brass nickel bronze secured cover. AB&I and TYLER may be used as iron body cleanouts. Trim and accessories shall be Smith or Zurn or equal (To be specified for finished floors inside buildings, in covered areas, and in concrete paving.)

Square:

AB&I	SMITH	ZURN	WATTS	MIFAB
	4053L-U-NB	ZN-1400-T	CO-200-S	C1220-S-1-6

Round:

SMITH	ZURN	WATTS	MIFAB
4033-L-U-NB	ZN-1400	CO-200-R	C1220-1-6

2.04 DRUM TRAPS

- A. Schedule Numbers:

DT-1: Extra heavy cast iron, bolted top.

SMITH	ZURN	WATTS	MIFAB
8714	ZA1180	SI-742-X	MI-SOLID-S

DT-2: Aluminum solid interceptor, furnish for on-floor installation.

SMITH	ZURN	WATTS	MIFAB
8710-AA	Z-1180	SI-742	MI-SOLID-S-AL

2.05 DIELECTRIC UNIONS

A. Schedule Numbers:

1. Dielectric style Unions using ferrous and no-ferrous metals are prohibited. Dielectric flanges are admitted for use – see DU-2.

DU-1: Brass union with 6-inch brass nipple.

DU-2: Brass union or Brass flanged fittings are to be used in between pipes made of dissimilar metals to prevent accelerated corrosion and deterioration in the piping systems due to galvanic and stray current.

WATTS	OR EQUAL
3100-CXC,	

2.06 FLEXIBLE HOSES

A. Schedule Numbers:

FLH-1: Braided stainless steel metal hose (for gas use). US Flex, Metraflex or equal.

FLH-2: Braided bronze metal hose (for non pressure condensate connection use). US Flex, Metraflex or equal.

2.07 HOSE BIBBS

A. Schedule Numbers:

HB-1: Furnish with bent nose.
(To be specified for use at roof top AC Unit. Mechanical Equipment Room, Boiler Rooms, etc.)

ACORN	ZURN	
8136-CP	equal	

2.08 PIPE HANGERS

A. Refer to Section 15050: Basic Mechanical Materials and Methods.

B. Schedule Numbers:

1. PH-1: Complete with clamps, inserts, etc.

SUPERSTRUT	UNISTRUT	TOLCO	B-LINE
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2.09 P-TRAPS

A. Schedule Numbers:

PT-1: Cast brass complete, chrome-plated.

ZURN	AB&A
Z-8712-LC	107

2.10 SERVICE STOP GAS VALVES

A. Schedule Numbers:

SGV-1: Bronze/Brass gas cock valve with double stake packing nut, ½” to 2”, with IPS, inclusive, with flat or square head. CSA approved.
(To be specified for oven ranges, convection ovens, skillets,)

AMERICAN	Mc DONALD
85 CBK or 86C	10596, flat 10604, square

SGV-2: Bronze/Brass, ¾” to 2” IPS (WOG) water, oil, or gas – full port ball valve. CSA approved.
(To be specified for larger water heaters, small boilers, pool heaters, and A/C units on roofs.)

WATTS	NIBCO	WILKINS
g4000-FDA	F-510-CS-R-66-FS	Model 850

SGV-3: Cast iron, 2” to 4” flanged ball valves (WOG) water, oil, or gas. CSA approved.
(To be specified for larger heating equipment.)

WILKINS	OR EQUAL
Model 850	

SGV-4: Lubricated plug gas valve, 3/4" to 2" IPS valve.
 (To be specified for use after gas meter headers, gas regulators, isolation valves for building isolation, individual floor level isolation, and boiler rooms.)

NORDSTROM	WALWORTH	RESUN
142	1786	1430

2.11 STOP VALVES

- A. Stops shall be loose key type, 1/2" IPS inlet and outlet chrome-plated brass casting, except as noted.
- B. Schedule Numbers:

STV-1:, Angle:

CHICAGO,	CRANE
442-LK	8.5113.

STV-2:, Partition:

CHICAGO	OR EQUAL
1771	

STV-3:, Straight Type, with Loose Key:

CHICAGO	CRANE
45-LK (1/2 inch)	8-5111

2.12 WASH SINKS - See Section 2.33 – "Service Sinks and Trim". (Not used)

2.13 YARD BOXES

- A. Schedule Numbers:

YB-1 Yard Boxes: 14 3/4"X20"X12", cast concrete, with cast iron traffic cover marked "GAS" (For use over gas stops).

BROOKS 36-H MB with No. 36-T Cast iron Cover	EISEL 363.5
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YB-2: Same as YB-1, marked "WATER" (For use over water valves).

BROOKS 36- H MB with No. 36-T Cast iron Cover	EISEL 363.5
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YB-3: Same as YB-1, marked "SEWER"

BROOKS 36- H MB with No. 36-T Cast iron Cover	EISEL 363.5
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2.14 FIXTURE CONNECTIONS

- A. Branches to individual fixtures shall be of the following sizes unless larger sizes are indicated on Drawings:

	Copper, Cold	Copper, Hot	Trap and Connections	Soil/ Waste	Vent
Lavatories	1/2"	1/2"	1-1/2"x1-1/4"	2"	1-1/2"
Sinks:					
Service	1/2"	1/2"	2"	2"	1-1/2"
Kitchen	1/2"	1/2"	1-1/2" x 1-1/2"	2"	1-1/2"
Classroom	3/8"	3/8"	1-1/2" x 1-1/2"	2"	1-1/2"
Fixture	Water Supply		Soil/ Horizontal	Vent	
Sill cocks	3/4" min.		-----	-----	

- B. Hose racks shall be furnished 2-inch supply lines. Reduce to 1-1/2 inches at rack valve.
- C. Water headers serving water closets shall be copper water tube, with following size throughout length:
1. 1-1/2 inches for 2 flush valves.
 2. 2 inches for 3 to 9 flush valves.
- D. Water headers serving urinals shall be of following size throughout length:
1. 1" for 1 or 2 flush valves.
 2. 1-1/4" for 3 flush valves.
 3. 1-1/2" for 4 to 8 flush valves.
- E. Water headers serving showers shall be same as listed above for urinals.
- F. Water headers serving lavatories shall be of following size throughout length:
1. 1/2 inch for 2 lavatories.
 2. 3/4 inch for 3 and 4 lavatories.
 3. One inch for 5 and 6 lavatories.

2.15 HEIGHT OF FIXTURES (Not used)

- B. Heights for access compliant fixtures.

Fixture	Adult	Elementary	Kindergarten and Younger
Toilets, center line from wall	18"	15"	12"
Toilets, height to top of seat	17" - 19"	15"	10"-12"
Lavatories, sink top height	34" max.	29" max.	24" max.
Lavatories, sink knee clearance	27" min.	24" min.	19" min.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Unless otherwise specified, plumbing fixtures, equipment and appliances that require connections to plumbing line shall be connected. This shall include fixtures specified or indicated as furnished by others, furnished by Owner, or specified in other related sections. Install supplies, stops, valves, traps, wall flanges, or pipe casing for connection of this equipment.
2. Install equipment as indicated on reviewed and accepted Shop Drawings.
3. Avoid interference with Work of other trades. Do not deviate from Drawings without review of the Architect.

- B. Examination: Check each piece of equipment in system for defects verifying that parts are properly furnished and installed.

- C. For piping Work, refer to Section 15050: Basic Mechanical Materials and Methods.

D. Plumbing Fixture and Equipment Installation:

1. Unless otherwise indicated, fixtures shall be installed with 5/16 inch brass bolts or screws of sufficient length to securely fasten fixture to backing, wall, or closet ring.

2. Fixtures installed against concrete or masonry walls shall have their hangers fastened with 5/16 inch brass bolts, Philip Shield type anchors, or 2 unit cinch anchors. Wood or plastic plugs are not permitted.
3. Fixtures installed against wood or metal stud walls shall have their hangers fastened to metal backing plates with 5/16 inch brass bolts screwed into plate. Fixture hangers for urinals shall be fastened centered vertically on metal backing plate with three 5/16 brass bolts each for small individual hangers and six, for larger one piece hangers. Lavatories shall be hung with not less than four 5/16 inch brass bolts or not less than five 1/4 inch brass bolts. Each sink hanger shall be hung with not less than four 5/16 inch brass bolt or not less than five 1/4 inch brass bolts.
4. Pan type drinking fountains shall be hung with 5/16 inch cadmium plated bolts with a bolt in each bolt opening in hanger. Hangers for pan type drinking fountains shall provide 2 inches (plus or minus 1/4 inch) between pan and wall. Spaces due to irregularities between fixtures and tile walls shall be neatly filled with white cement or silicone filler.
5. Backing for hanging of plumbing fixtures and equipment shall be installed in supporting wall at time rough piping is installed. Backing for stud walls shall be steel plate 1/4 inch thick, not less than 4 inches wide. Backing for urinals shall be 1/4" thick by 6" wide steel plate. Steel plate shall be attached to stud at each end of plate and to each stud it crosses. Plate shall be attached to metal studs by bolting with two 1/4 inch U-bolts per stud with bolts through plate and around stud flange or by welding with a 1/8 inch fillet weld full width of stud flange, top and bottom of plate. At wood studs, plate shall be carefully recessed flush with face of stud and attached to each stud with 2 No. 14 flat-head wood screws, 2 inches in length into pre-drilled 1/8 inch holes. Backing for stud walls supporting wall-hung closets shall be as detailed.
6. Rough-in for fixtures, equipment and appliances shall be as indicated on Drawings and as specified, including those items indicated as furnished by others, furnished by Owner, or future capacity. When connections to equipment from capped or plugged lines are required, caps or plugs shall be removed at time equipment is set and stops or valves installed and connections provided as specified.
7. Piping materials for trap arms shall be Brass, Cast Iron or DWV copper

E. Cleanouts in Drain, Waste, Vent and Sewer Lines:

1. Cleanouts shall be installed at locations stated in the California Plumbing Code and accessible at following locations:
 - a. At locations above first floor as stated on construction documents.
 - b. Install an accessible main line upper terminal cleanout in all restrooms above water closet over flow. (Install above upper terminal water closet where there are more than one water closet in a restroom).
 - c. Above faucets of each sink with brass plug.
 - d. Not to exceed 100-foot intervals in sewer and waste lines exterior of building.
 - e. At property line connection.
 - f. Where indicated on Drawings.
2. Cleanouts shall be extended to grade as follows:
 - a. Not to exceed 100-foot intervals in straight runs of pipe outside buildings.
 - b. At changes of direction greater than 22-1/2 degrees (underground).
 - c. At property lines.
 - d. Where cleanouts occur under concrete.
 - e. Where marked for future connections.
3. Cleanouts in building shall be extended to floor level or above floor level or above floor level in walls or furring when cleanouts are not accessible or where clearance is less than 18 inches.
4. Cleanouts in finished areas in building shall be concealed except that cleanouts above service sinks in janitor's rooms or closet, and cleanouts above service sinks or in exposed piping in boiler or heater equipment rooms, may be exposed. Cleanouts for urinals shall be installed above urinal and shall terminate behind an access plate.
5. Cleanouts in floors of covered areas and those extended to grade in concrete areas shall be floor level type with extensions body brass plugs and detachable nickel-bronze or aluminum alloy scoriated.
6. Concealed cleanouts in vertical lines shall be service weight soil cleanout tees with brass plugs and round cover plates unless otherwise specified or

indicated. A snug fitting sleeve of galvanized sheet metal shall be placed around hub of tee and shall extend to flush with finished soil, or cleanout shall be extended to finished wall.

7. Cleanouts extended from below floor to a wall or furring or on horizontal lines above floor that terminate at a wall or furring shall be iron body type with brass plugs and round cover plates.
8. Cover plates over cleanouts in painted walls shall be steel, bonderized and prime coated. Cover plates over cleanouts in tile walls shall be chromium-plated brass or nickel bronze. Plates shall be attached to cleanout plugs with 5/16 inch No. 18 or 1/4 inch No. 20 stainless steel vandal-proof type screws. Plates shall be one inch larger in diameter than fitting opening.
9. Cleanouts at bases of downspouts shall be tapped soil tees with brass plugs as hereinafter specified, full size of line.
10. Cleanouts extended to grade in exterior sewer lines other than floors or concrete areas shall be a cleanout assembly with secured top, extra heavy-duty, adjustable sleeve, cut-off ferrule, countersunk threaded brass plug and scoriated tractor type cover.
11. All other cleanouts shall be iron body type.
12. Cleanout extensions shall be no-hub cast iron soil pipe. Exterior cleanouts, those in concrete excepted, shall terminate in a 14 inch x 6 inch thick concrete block with cleanout assembly and top of block flush with finish grade.
13. Fittings in lines utilized as cleanouts shall be approved soil fittings including no-hub pipe. Tees and crosses in vent headers excepted.
14. Pipe joint compound shall not be installed on cleanout plug. After lines are tested and approved, each cleanout plug shall be removed, greased, and replaced.

3.03 EXCAVATION, TRENCHING AND BACKFILLING

- A. Perform trenching, excavation, and backfilling required for Work of this section as specified herein and in Section 02318: Excavating, Backfilling, and Compacting for Utilities.

3.04 SERVICE CONNECTIONS

- A. Determine exact location of required water, drain, and sewer connections and provide proper connections.
- B. Potable water lines shall be purged completely before connecting to sources of water for the Project. Determine quality of water supply before connection.

3.05 WATER HAMMER ARRESTORS

- A. Install water hammer arrestors indicated on Drawings and in following locations (only non-ferrous arrestors may be installed in copper water system):
 - 1. Water lines to lavatory headers, water closet and urinal headers, service sinks, kitchen sinks, wash fountains, drinking fountains, laboratories with medical type faucets and on wash sinks having 3 or more stations and all other quick closing fixture such as clothes washers, as close to fixture as possible.
 - 2. Between last 2 fixtures when 3 or more fixtures, other than those listed in 1 above, are served by a common header.
- B. When possible, arrestor shall be installed in wall or furring. When arrestor is installed in wall or furring, furnish an access plate large enough to permit removal of arrestor. Access plate shall be a minimum of 2 inches larger in each direction than arrestor.
- C. Fixture water lines shall be provided with mechanical water arrestor hammer dampening devices. Air chambers are not approved.

3.06 CONDENSATE DRAINS - FROM AIR CONDITIONING UNITS

- A. Connect drain piping from drain pan of air conditioning unit to condensate disposal location indicated. When coil or unit housing is shock or vibration isolated, connection shall be furnished through a flexible connector not less than 10 inches long. Drain line shall pitch to flow out at not less than one inch in 8 feet. Drain line size shall be per UPC (3/4 inch up to 3 ton only). Drain line shall not be reduced smaller than unit outlet connection.
- B. Condensate drain piping installed within building whether in air conditioned space or not shall be insulated. Refer to Section 15080: Mechanical Insulation, for type of material required.
- C. Condensate Trap:

1. A condensate trap shall be installed for each air conditioning coil. Trap shall be assembled from 2 brass unions: one between A/C unit and inlet of trap, and one at outlet of trap that connects to main drain.
 2. Trap configuration shall be per manufacturer's recommendations based on total unit casting static pressure (simulated plugged filter condition), but not less than 3 inch water seal.
 3. Running trap design is not permitted.
 4. Secondary drain shall not be trapped.
- D. Condensate trap shall be checked at equipment operational tests for proper water drainage flow from air conditioning unit. Cooling condensate pan shall be filled with water, filters covered with plastic (plugged filter simulated), unit panels replaced, and unit motor running at design condition. Pan shall drain without hesitation to bottom of inlet connection. Tests are made prior to installation of ceiling.
- E. Secondary Overflow Drain:
1. Drain pan installed underneath air conditioning units in concealed ceiling space or units that incorporate dam fitting shall be furnished with secondary drain piped to outside planter area with outflow location clearly visible.
 2. If outside building location is not available or feasible, secondary drains shall be piped to a classroom sink, if sink is not available pipe to a room corner away from cabinets, computers, desks, door ways/entrances or stairs.
 3. Secondary vertical pipe that penetrates through suspended ceiling shall be furnished with a coupling or threaded adapter so ceiling tile can be removed without damage.

3.07 CONDENSATE DRAINS - FROM WINDOW TYPE HEAT PUMP AND EXTERIOR WALL MOUNT HEAT PUMP UNITS

- A. Whether indicated on Drawings or not, window units and wall mount units without built in bottom drain pan for evaporator and condenser coils shall be provided with galvanized steel condensate pan at bottom of unit with drain line that drains into drywell. Install copper 1/2 inch diameter pipe for window type air conditioners and 3/4 inch diameter pipe for exterior wall-mounted heat pump units.

3.08 MAKE-UP WATER SYSTEMS

- A. Provide and connect make-up water systems for equipment in other sections.

3.09

GAS SERVICE

- A. Above Grade Service: Pipe shall be steel, hammered, free of dirt and scale, and blown out with oil-free air or nitrogen to a clean, dry condition. Piping shall not be installed in or through a ventilation duct or plenum.

- B. Underground Service, Gas approved (yellow) Polyethylene Plastic Pipe: Refer to Section 15050: "Basic Mechanical Materials and Methods".
 - 1. Pipes shall be joined with polyethylene fitting and joined together by thermal fusion in accordance with procedures recommended by Polyethylene plastic pipe and fitting manufacturer.
 - 2. Plastic pipe shall be installed not less than 30 inches below grade..
 - 3. Underground Warning Tape shall be installed 12" above buried gas piping. Warning tape shall be yellow with caution statement as follows: "CAUTION – BURIED GAS LINE BELOW".
 - 4. Plastic pipe shall not be installed in or under a building or structure. Pipe shall be installed under bituminous surfacing or compacted soil area, free from large stones. Pipe may be installed under sidewalks or driveways, as long as no joint occurs. Pipe installed under paved covered areas wider than 40 feet shall be installed in ventilated conduits extending 2 feet past paving.
 - 5. Pipe shall be installed on a 6 inches deep sand bed. After required pressure-leak test, pipe shall be covered with sand not less than 6 inches thick.
 - 6. Piping shall not support weight of valves, metal fittings or other items. Pipe shall be installed strain free.
 - 7. Plastic pipe fittings shall not be stored or left exposed to sunlight. Pipe in open trenches shall be shielded. A sand envelope of 6" minimum shall be placed around pipe, with exception of joints, until inspection by IOR is completed. Protection for pipe shall be provided when necessary to leave pipe exposed overnight.
 - 8. Installer of piping is required to have training and to have attained a certification. Non-trained/Non-certified installer must contact the manufacturer or manufacturer's representative to provide on-site fusion training and certification, prior to work commencement
 - 9. Polyethylene plastic pipe shall connect to a steel epoxy coated anodeless type riser to minimum of 6" above grade, when exiting the underground installation and transitioning to steel pipe connection.

10. Where s steel pipe rise passes into a structure or building, a double swing or double-offset joint shall be furnished. Pipe shall pass into structure 6” above grade and through a sleeve with a minimum one inch clearance. An isolation valve is required before pipe entering the building.

3.10 CLEANING - PLUMBING PIPING SYSTEMS AND FIXTURES

- A. Plumbing lines and fixtures shall be flushed to remove dirt and foreign material until water runs clear and no foreign substance or odor is present. Strainers and screens on faucets shall be removed during this cleaning operation.
- B. After satisfactory cleaning of strainer and screen replacements has been witnessed by IOR, post and maintain signs stating: "CAUTION - Water at this construction Project has not yet been certified for human consumption." Signs shall be furnished with letters at least 1/2 inch in height, and shall be conspicuously posted at entrances to Project site. Signs shall be paneled, black and yellow, in conformance with OSHA Section 1910.1455.

3.11 DISINFECTING DOMESTIC WATER PIPING SYSTEMS

- A. Newly installed or replaced piping and/or fixtures dispensing potable water shall be disinfected and undergo an approved bacteriological analyses before water system is allowed for public use.
- B. All work shall be performed by Technicians Certified by the American Water Works Association (AWWA) and/or the State of California Department Health Services, Grade II Water Treatment Operator Certification or higher issued by the Department of Health Services (DHS) for the State of California. Comply with Title 22, Code of Regulations Division 4, Chapter 13, Article 2 Operator Certification Grades.
- C. Method:
 1. A Reduced Pressure Backflow assembly shall be in installed to protect from cross contamination of the local water purveyor’s meter service supply when at any time there is any type of water connection with the piping to be disinfected (Chlorinated) and the water meter service supply.
 2. System is to be flushed to remove any materials that may have entered the system.
 3. Using a chemical feed metering pump and a chlorine tank, the chlorine solution is injected into the water system.
- D. Disinfection and De-chlorination procedure (24 or 3 Hour Contact Time):

1. 24 Hour Test Method:

- a. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.
- b. Piping system shall then be adequately flushed with water to remove any particles and eliminate air pockets.
- c. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 50 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.
- d. Chlorine residual test will be taken at all appropriate points and outlets to verify 50 PPM residual levels.
- e. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 24 hours.
- f. After 24 hours, chlorine residual levels will again be tested at various points throughout the system to insure a minimum of 25 PPM residual. If the system has not met the minimum of a 25 PPM residual, the above disinfection process shall be repeated.
- g. After satisfactory completion of the residual testing, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.
- h. The OAR may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

2. 3 Hour Test Method:

- a. If the water systems must be turned on for use as soon as possible, a 3 hours chlorine contact time to allow for disinfection is permitted with the OAR's approval.

- b. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.
- c. Piping system shall be then adequately flushed with water to remove any particles and eliminate air pockets. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 200 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.
- d. Chlorine residual test will be taken at all appropriate points and outlets to verify 200 PPM levels. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 3 hours.
- e. After satisfactory completion of a 3 hour disinfection period, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.
- f. The OAR may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

E. Bacteriological Test:

- 1. After final flushing and satisfactory results from the residual free chlorine concentration test, Bacteriological test samples shall be collected. The intent of the following is to provide insurance for an accurate representation to a complete Bacteriological test of the water system. At least two samples shall be taken from each floor of each building.
- 2. Bacteriological test samples shall be delivered to a State of California Department of Health Services Certified Laboratory to perform qualitative and quantitative bacterial analyses on the water samples for the presence of any Total Coliform bacteria and Plate Count. This count must be less than 500 cfu/mL.

3. The procedure shall be repeated if it shown by bacteriological examination made by an approved agency that the level of Disinfection does not meet these specifications.
4. After satisfactory results for the bacteriological test are provided to the OAR, warning Sign or Tags shall be removed.

3.12 VALVES ON PLUMBING SYSTEM

- A. Furnish and install gates, ball, globes, angles, and check valves on plumbing Work at following locations whether indicated on drawings or not.
- B. All hot and cold valves shall be iron pipe size (IPS).
 1. Sweat valves are prohibited.
 2. Above the ground copper water system, 2" and larger may utilize Victaulic butterfly valves and fittings for their connections. A 2" or larger Victaulic valve may be in a wall if an adequately sized access panel is provided for maintenance or removal.
- C. Valves shall be accessible and installed within an access panel approximately 3 feet above floor and no more than 7 feet above floor, or in a marked Yard Box to prevent tampering.
 1. Immediately after each water meter, in addition to any valve furnished by utility company, there shall be an accessible valve on the inlet side for a strainer assembly, dual Backflow device assembly and/or possibly a dual pressure reducing valve assembly.
 2. A gate or ball valve on each water supply before it enters building. Valve s shall be accessible from outside building and shall be installed in a marked Yard Box, unless otherwise indicated on drawings. Ball valves 2-1/2" size or larger shall omit gate valve handle and furnish 2" square operating nut.
 3. At multi story buildings, provide an isolation-valve or multiple valves for both hot and cold water in access panel to isolate and control each floor level.
 4. For classrooms, shops, offices and boiler / mechanical room, install a gate or ball valve to control hot and cold water lines to each group of fixtures, a group of fixtures shall be considered to be 2 or more fixtures in the same room. When practical, valves shall be installed on the same wall as group of

fixtures. Valves shall control ONLY fixtures in rooms in which they are installed.

5. For restrooms, a gate or ball valve shall be installed in each restroom to isolate the hot and cold water supply into a restroom regardless of the number of fixtures. These valves shall control and be accessible only from within the restroom in which fixtures are installed. If possible, valves shall be installed on the same wall as the group of fixtures it serves. Valves shall control only fixtures in restroom in which they are installed. Back to back restrooms shall be isolated separately and individually.
6. Install a gate or ball valve on each building branch line, which serves 2 or more fixtures, when These fixtures are not provided with a group isolation valve as specified above. These valves shall be located approximately 3 feet but not more than 7 feet above finish floor.
7. Install a gate, ball valve or partition stop for a drinking fountain or a group of drinking fountains.
8. Install a gate, ball valve or partition stop for hot and cold water supply to plumbing fixtures with no accessible supply stops, such as wall mounted faucets.

3.13 VALVES - GAS SERVICE

- A. A gas readily accessible shut-off stop shall be installed on each gas line entering a building immediately prior to the point it enters the building. Unless otherwise specified or indicated, shut-off valves for lines entering a permanent structure, buildings or portable buildings, shall be installed in a vertical riser above grade.
 1. Gas shut off valve for portable buildings – A dedicated Gas shut off valve shall be provided in a marked Yard Box, for each portable building to facilitate relocation/removal of building without the need to shut off gas to entire school.
- B. Gas Shut off valve within a building – A gas shut off valve with handles shall be accessible and serviceable within an access panel. Install valve minimum 3 feet above floor but less than 7 feet above floor.
- C. In addition to locations specified, gas shut ff valve shall be installed at following locations:
 1. Install a lubricated plug gas shut off valve on any line connected to gas main or header at master assembly.

2. Install a lubricated plug gas shut off valve before entering any building or structure.
 3. Install a gas valve on each outlet, in addition to any gas stop furnished with equipment.
 4. Service to laboratory gas cocks shall be furnished with a special precision check valve, located downstream from gas stop servicing room outlet at each laboratory cock. Unless otherwise specified, 1/8" bore shall be provided for each outlet cock.
 5. Install a gas shut-off valve on each gas line serving 2 or more gas outlets in same room. Service stop shall be installed not more than 7 feet above floor, and shall be in the room it serves.
 6. Install a gas shut-off valve on inlet side of each gas pressure regulating valve.
 7. Gas shut-off valves to be furnished with equipment.
 8. Install gas shut-off valve at not more than 1,000 foot intervals on each gas main.
 9. At multi-story buildings, provide gas-shut off valve(s) to isolate and control each floor/level. Install valve(s) in a concealed manner in walls with access panel(s).
 10. Gas shut-off valves in classrooms and locations subject to tampering shall be protected while remaining accessible.
- D. When a gas-shut off valve adjacent to gas-fired equipment is indicated in Contract Documents it shall be furnished and installed as part of Work of this section.
- E. When electrical wall switches with emergency push button are specified for controlling gas outlets at Laboratory Classrooms, provide main shut-off gas valve with normally closed electric solenoid valve within an accessible access panel.

3.14 ELECTROLYSIS PREVENTION

- A. Brass nipples, 6 inches, with recognized brass unions; flanges shall be furnished and installed at locations described herein. Flanges shall be installed with complete insulating component consisting of gasket bolt sleeves and bolt washers. Dielectric insulators shall be installed at following locations:

1. Where special applications indicated on Drawings require an insulation flange or brass union, with 6-inch brass nipple to be installed in a condensate line, or steam line, flange insulation shall be of a high temperature type, suitable for continuous operation at temperatures up to 220 degrees F. for condensate and 400 degrees F. for steam.
2. Where steel or cast iron in ground connects to copper or brass piping above ground, transition from steel or cast iron pipe to copper or brass pipe shall be provided in an accessible location.
3. Underground dielectric connections shall be furnished in accessible yard boxes.
4. Above ground dielectric connections shall be exposed; or if in finished rooms shall be located in accessible access boxes.

3.15 DEPTH OF SEWER LINES

- A. Minimum depth of below grade sewer lines shall be 24 inches to centerline of pipe. Sewer lines shall slope 1/4 inch per foot minimum, unless otherwise indicated. Minimum depth at Owner property line shall be 6 feet, unless otherwise required.

3.16 BACKFLOW PREVENTION DEVICES

- A. Backflow Devices: Installation of backflow devices shall be tested and certified by Los Angeles County backflow device tester before Substantial Completion. Tests shall be performed in presence of IOR. Test reports shall be turned over to IOR for mailing to proper agency.

3.17 CLEANUP

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

3.18 PROTECTION

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

END OF SECTION

SECTION 15700
HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes: Air conditioning and air handling equipment as indicated on Drawings and as specified. Air conditioning and air handling equipment shall include but not be limited to following:
 - 1. Split System Air Conditioning Units.
- C. Related Sections:
 - 1. Section 07600: Flashing and Sheet Metal.
 - 2. Section 15010: Basic Mechanical Requirements.
 - 3. Section 15050: Basic Mechanical Materials and Methods.
 - 4. Section 15070: Mechanical Sound, Vibration and Seismic Control.
 - 5. Section 15400: Plumbing.
 - 6. Section 15800: Air Distribution.

1.02 DESIGN REQUIREMENTS

- A. Work of this section is based on HVAC equipment units indicated as Basis of Design in Part 2 of this section. Products from different HVAC equipment manufacturers listed are never identical, although equivalent in capacity, performance and quality. In the cases where dimensions, weight, configuration and utility requirements differ from the products used as a basis of design, the Contractor, at no additional cost to the Owner shall coordinate and submit for Architect review and approval any required revision to the design.

1.03 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 15010: Basic Mechanical Requirements.
- B. For products listed that are not the basis of design, submit the following in addition to above requirements:

1. Title 24 Calculations: Replace HVAC unit values in calculation files provided by Architect and submit for review.

1.04 QUALITY ASSURANCE

- A. Provide submittals in accordance with Section 15010: Basic Mechanical Requirements.

1.05 PROJECT RECORD DOCUMENTS

- A. Provide Owner instructions on equipment operation and maintenance procedures, as indicated in Section 15010: Basic Mechanical Requirements.

1.06 WARRANTY

- A. Compressors shall be provided with manufacturer's 5-year unconditional warranty, (replacement only).
- B. Manufacturer shall warrant all parts, except heat exchangers, for a period of 5 years.
- C. Heat exchangers shall be provided with manufacturer's 10-year warranty, (replacement only).

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Capacities of air conditioning equipment indicated on Drawings are net capacities actually required. Standard catalog ratings shall be adjusted to actual Project site environmental conditions.

2.02 HEAT PUMP AND FAN COIL UNITS

- A. Manufacturer: Mitsubishi or equal.

B. SYSTEM DESCRIPTION

The variable capacity, heat pump heat recovery air conditioning system shall be a Mitsubishi Electric CITY MULTI VRFZ (Variable Refrigerant Flow Zoning).

The Y-Series system shall consist of PUHY outdoor unit, multiple indoor units, and M-NET DDC (Direct Digital Controls). The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor rated capacity.

- C. Quality Assurance:

1. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
2. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

3. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
4. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.
5. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

D. DELIVERY, STORAGE AND HANDLING

1. Unit shall be stored and handled according to the manufacturer's recommendation.

E. CONTROLS

1. The control system shall consist of a low voltage communication network of unitary built-in controllers with on-board communications and a web-based operator interface. A web controller with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
2. System controls and control components shall be installed in accordance with the manufacturer's written installation instructions.
3. Furnish energy conservation features such as optimal start, night setback, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.
4. System shall provide direct and reverse-acting on and off algorithms based on an input condition or group conditions to cycle a binary output or multiple binary outputs.
5. Provide capability for future system expansion to include monitoring and use of occupant card access, lighting control and general equipment control.
6. System shall be capable of email generation for remote alarm annunciation.
7. Control system start-up shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in Mitsubishi controls system configuration and operation. The representative shall provide proof of certification for Mitsubishi CMCN Essentials Training and/or CMCN Hands-On Training indicating successful completion of no more than two (2) years prior to system installation. This certification shall be

included as part of the equipment and/or controls submittals. This service shall be equipment and system count dependent and shall be a minimum of one (1) eight (8) hour period to be completed during normal working hours.

2.03 FILTERS

- A. Air filters shall be of pleated, disposable type of efficiencies indicated on drawings. Each filter shall consist of a non-woven cotton fabric media, media support grid and enclosing frame. Filter shall be UL 900 listed, Class 2.
- B. Filter media shall provide an average efficiency as specified on drawings per ASHRAE Test Standard 52.1 or 52.2.
- C. Initial resistance of air filters shall not exceed following limits for each efficiency level at face velocities indicated. Lower resistance requirements, if indicated on drawings shall have precedence.

30% (MERV 8)	0.27 inch water gauge @ 500 feet per minute
75% (MERV 11)	0.28 inch water gauge @ 500 feet per minute
- D. Media support shall be a welded wire grid or a rigid frame with an effective open area of not less than 96 percent.
 - 1. Media support shall be bonded to filter media to eliminate possibility of media oscillation and media pull-away.
 - 2. Media support grid shall be formed in such a manner that it effectively forms a radial pleat design, providing total use of filter media.
- E. Enclosing frame shall be bonded to air entering and air exit side of each pleat, to ensure pleat stability. Inside periphery of enclosing frame shall be bonded to filter pack, thus eliminating possibility of air bypass.
- F. Holding frames shall be factory fabricated of 16 gage galvanized steel, or equivalent and shall be furnished with gaskets and spring type positive sealing fasteners. Fasteners shall be capable of being attached or removed without use of tools.
- G. Manufacturers: Farr, Viledon or AAF.

2.04 LOUVERS, AIR CONDITIONING (use in conjunction with relief damper)

- A. Standard steel louvers shall be furnished complete with frames, blades, finish and construction details per Drawings and manufacturer's recommendations.
- B. Louvers shall be furnished with horizontal blades, 2 inches deep for air through wall or roof installation in conjunction with gravity relief damper for backdraft protection that will open at 0.01" W.C. room static pressure as indicated on Drawings. Blades shall be 16-gage steel, spaced at 1-7/8 inches at 30 degrees angle, and with baked epoxy

coating. Panel size shall be as indicated but not less than 24 inches width x 18 inches in height. Manufacturer "Ruskin" model CBD2 or equal.

PART 3 - EXECUTION

3.01 GENERAL

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

3.02 EQUIPMENT FOUNDATIONS

- A. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Equipment foundations shall be of sufficient size and weight, and of proper design to preclude shifting of equipment under operating conditions, or under any abnormal conditions imposed upon equipment.
- B. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Foundations shall meet requirements of equipment manufacturer and, when required by Architect, obtain from equipment manufacturer, approval of foundation design and construction, for equipment to be installed. Equipment vibration shall be maintained within design limits, and shall be dampened and isolated. Isolators shall be bolted to a structural member so as to be readily removable.

3.03 EQUIPMENT DESIGN AND INSTALLATION

- A. Uniformity: Unless otherwise specified, equipment of same type or classification shall be product of same manufacturer.
- B. Application: Only provide equipment as reviewed by Architect.
- C. Equipment Installation: Equipment installation shall be in strict accordance with these Specifications, and installation instructions of manufacturers. Equipment installed on concrete foundations shall be grouted before piping is installed. Piping shall be installed in such a manner as not to place a strain on any of equipment. Flanged joints shall be adequately extended before installation. Piping shall be graded, anchored, guided and supported, without low pockets.
 - 1. Install equipment in a neat and skillful manner, properly aligned, leveled, and adjusted for satisfactory operation.
 - 2. Install so connecting and disconnecting of piping and accessories can be readily accomplished, parts are readily accessible for inspection, service and repair.

Space shall be provided to readily remove filters, coils, compressors and fan wheels. Access doors shall be hinged with cam lock door handles.

3. Provide flexible connections for duct, pipe and conduit connections at moving equipment.

3.04 ROOF-TOP EQUIPMENT MOUNTING

- A. Install unit on platform or prefabricated mounting frame or curb secured directly to roof designed to suit roof conditions and requirements of provided unit. Submit Shop Drawings for review by Architect.

3.05 NOISE AND VIBRATION

- A. Operation of Equipment: Mechanical equipment and piping systems shall operate without exceeding specified noise and/or vibration levels.
- B. Corrective Measures: If specified noise and/or vibration levels are exceeded, provide necessary changes to reduce noise and/or vibration levels to within specified levels.

3.06 FIELD TESTS AND INSPECTION

- A. General: Perform field inspections, field tests, and trial operations as specified in Section 15010: Basic Mechanical Requirements. Provide labor, equipment and incidentals required for testing. The IOR will witness field tests and trial operations as specified in Section 15010: Basic Mechanical Requirements.
- B. Equipment and Material: Equipment and material certified as being successfully tested by manufacturer, in accordance with referenced Specifications and standards, will not require re-testing before installation. Equipment and materials not tested at place of manufacture will be tested before or after installation, as applicable or necessary, to determine compliance with reference Specifications and standards.
- C. Start-Up and Operational Test: System shall be started up and initially operated with components operating. During this test, various strainers or filters shall be periodically cleaned until no further accumulation of foreign material occurs. Adjust safety and automatic control instruments as required to provide proper operation and control sequence. Refer to Section 15010: Basic Mechanical Requirements.
- D. Extent of Field Tests: After installation and before completion, Work of this section shall be subjected to required field tests, including those specified here and in Section 15010: Basic Mechanical Requirements.
- E. Operation and Maintenance Data: Provide required operation and maintenance data as specified in Section 15010: Basic Mechanical Requirements.

3.07 REFRIGERANT PIPING

- A. Unless otherwise indicated, main liquid and suction lines from condensing unit to evaporator coil shall be of sizes specified by manufacturer.
- B. Refrigeration piping shall be refrigeration grade copper tubing, type L hard-drawn. In instances where refrigeration lines are installed in an inaccessible location and must be snaked through conduit or a trench, that portion of tubing required to complete connections through conduit or trench may be soft drawn. Maintain entire system clean and dry during installation. Pipe shall be sealed until installed.
- C. Refrigeration piping, both hard- and soft-drawn, shall be straight and free from kinks, restrictions or traps and horizontal runs shall be sloped towards compressor one inch to 10 feet wherever possible.
- D. Joints shall be installed with Silfos 15, Silvaloy 15, or equal, high melting point solder.
- E. Flare nuts required on suction lines shall be of short forged or frost-proof type. All other fittings shall be standard sweat-soldered type. Ells and return bends shall be long radius type. Install leak lock material.
- F. Refrigeration Piping: Joints shall be silver brazed and leak tested. Field fabricated lines shall be thoroughly flushed and cleaned before connection. Bleed nitrogen through lines during silver brazing, and cap and seal lines when not completed and connected to equipment.
- G. Sleeve penetrations of floors, walls and ceiling to allow for free motion of piping. Provide 24 gage galvanized iron pipe and chrome-plated escutcheon plates. Pack annular space between pipe and sleeve with incombustible material such as fiberglass and seal each end with mastic to provide a waterproof seal.
- H. Install insulated couplings at points of connection between dissimilar metals for cathodic protection. Insulate copper tubing from ferrous materials and hangers with 2-inch thickness of 3-inch wide strip, 10 mil. polyvinyl tape wrapped around pipe.
- I. Support piping by iron hangers and supports Hydra-Zorb Cushion Clamps on non-insulated piping, and Klo-Shure coupling clamp on insulated piping, or equal.
- J. Provide saddles to protect pipe insulation.
- K. Provide connections of copper and brass pipe and tubing with Harris Safety-SILV 56, complying with ANSI/AWS A5.8 and NSF 51.
- L. Insulate refrigerant suction lines.
- M. On split heat pump systems, insulate both suction and liquid lines. For insulation materials, refer to Section 15080: Mechanical Insulation.

3.08 CLEANUP

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

3.09 PROTECTION

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

END OF SECTION

SECTION 15800

AIR DISTRIBUTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Provide ductwork and appurtenances required for a complete air transmission and distribution system for the heating, ventilating, and air conditioning systems indicated on Drawings and as specified.
- C. Related Sections:
 - 1. Section 09910: Painting of Existing Facilities.
 - 2. Section 15010: Basic Mechanical Requirements.
 - 3. Section 15050: Basic Mechanical Materials and Methods.
 - 4. Section 15070: Mechanical Sound, Vibration and Seismic Control.
 - 5. Section 15080: Mechanical Insulation.
 - 6. Section 15700: Heating, Ventilating and Air Conditioning Equipment.
 - 7. Section 15900: HVAC Instrumentation and Controls.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 15010: Basic Mechanical Requirements.
- B. Manufacturer's Data:
 - 1. Complete list of items to be furnished and installed under this section. Material lists that do not require performance data shall include manufacturer names, types and model numbers.
 - 2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.

3. Literature shall include descriptions of equipment, types, models, sizes, capacity tables or curves marked to indicate performance characteristics, electrical requirements, options selected, space requirements (including allowances for servicing) and other data necessary to ensure compliance with requirements of these Specifications and performances indicated on Drawings. Data shall also include name and address of nearest service and maintenance organization that regularly stocks repair parts. Listings of items that function as parts of an integrated system shall be furnished at one time.
4. Shop Drawings: Shop Drawings indicating methods of installation of equipment and materials, sizes and gages of ducts, and details of supports. Items to be covered shall include but not be limited to following:
 - a. Layout of ductwork and equipment drawn to scale to establish that equipment will fit into allotted spaces with clearance for installation and maintenance. Indicate proposed details for attachment, anchoring to, and hanging from structural framing of building. Indicate vibration isolation units, foundations, supports, and openings for passage of pipes and ducts
 - b. Drawings indicating locations and sizes of sleeves and prepared openings for pipes and ducts.
 - c. Typical details of supports for equipment and ductwork.

1.03 QUALITY ASSURANCE

- A. Installer's and Manufacturer's Qualifications: Comply with provisions stated under Section 15010: Basic Mechanical Requirements.

1.04 PRODUCT HANDLING

- A. Protection, Replacements, Delivery and Storage: Comply with provisions stated in Section 15010: Basic Mechanical Requirements.

1.05 COORDINATION

- A. Coordinate activities in accordance with provisions of Section 15010: Basic Mechanical Requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Unless otherwise noted, provisions, including amendments thereto, of the HVAC Duct Construction Standards of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) and the California Mechanical Code (CMC), are hereby made part of this section.
- B. Rectangular, round and flat oval ducts shall be manufactured and installed in accordance with requirements of the HVAC Duct Construction Standards of SMACNA.
- C. Sheet metal ducts shall be fabricated from galvanized steel, aluminum or stainless steel.
- D. Galvanized steel ducts shall be fabricated of galvanized steel sheet, lock forming grade, conforming to ASTM A 525 and A 527.
- E. Galvanized steel ducts gage thickness and permissible joints and seams shall conform to requirements in Table 2, Minimum Metal Gages, of this section.
- F. Ducts shall be reinforced in accordance with SMACNA standards.
 - 1. Cross-broken Duct: Duct sizes 19 inches wide and larger which have more than 10 square feet of unbraced panel shall be beaded or cross-broken. This requirement is applicable to 20 gage or less thickness and 3 inches w.g. or less pressure. For details, refer to SMACNA manual.
- G. Round, Oval and Flexible Duct for Galvanized Steel and Aluminum Ducts:
 - 1. Round Spiral Ducts and Fittings: Fabricated from galvanized sheet steel shall be machine-formed spiral pipe with sealed spiral locking joints. Fittings shall be furnished with continuous corrosion-resistant welds. Ducts and fittings shall be as manufactured by United Sheet Metal, or equal. Provide gages of ducts and fittings recommended by manufacturer.
 - 2. Details of seams and transverse joints for round duct and fittings shall conform to SMACNA standards.
 - 3. Flat oval ducts shall be provided as indicated on the Drawings. Reference standard details in SMACNA manual.
 - 4. Minimum duct wall thickness for flat oval duct construction shall be as indicated in SMACNA manual.
 - 5. Non-metallic flexible duct for T-bar suspended ceiling may be provided upon review of the Architect, after submittal of installation, bench details and certified test data in accordance with the Air Diffusion Council Test Code FD-72. Flexible duct shall be rated for not less than 6 inches w.g. static pressure.

6. Flexible duct shall be non-metallic, insulated for conditioned air supply and return. The flexible ducts shall be factory fabricated with exterior reinforced laminated vapor barrier, 1-1/2 inch thick fiber glass insulation (K=0.25 @ 75 degrees F.), encapsulated zinc-coated spring steel wire helix and impervious, smooth, non-perforated interior vinyl liner and factory fabricated steel connection collars. For the composite assembly, including insulation and vapor barrier, comply with NFPA Standard 90 A or 90 B and tested in accordance with UL Standard, UL-181. Non-insulated metallic ducts shall be provided for exhaust only.
 7. Methods of installations, standards for joining and attaching, and supporting flexible duct shall conform to applicable provisions of SMACNA manual.
 8. These provisions apply for ducts furnished for indoor comfort heating, ventilating and air conditioning service only.
 9. Specifications herein shall not supersede installation requirements by flexible duct manufacturer if those are more stringent.
- H. Fittings and Other Construction Details: Details of fittings such as elbows, turning vanes, branch take-off and connections, duct access doors, connections for grilles, registers and ceiling diffusers, flexible connector at fan, etc., shall conform to applicable provisions of this section or SMACNA manual.
- I. Duct Seam and Joint Sealant: Furnish duct seam and joint sealant or tape for metal ducts. Sealant for low-pressure ducts shall be 3M Company Miracle D17, or equal, for installation with a caulking gun. Provide tape joints with canvas with Borden Chemical Division Arabol adhesive, or equal. Provide sealing material for medium-pressure ducts as described in the SMACNA manual for those pressures.
- J. Restrictions:
1. Zinc-coated steel duct shall not be installed for ductwork transporting moisture-laden air. Aluminum shall not be installed for kitchen cooking equipment ductwork. Fume hood exhaust shall be stainless steel, non-metallic, or coated metal as required. Flexible duct may only be furnished where specifically indicated on Drawings. Aluminum ducts shall not be installed for internal pressures above 2 inches of water.
 2. Fiberglass duct is not permitted as a substitute for sheet metal duct.

2.03 ACOUSTICAL DUCT AND PLENUM LINERS

- A. Duct liners shall conform to requirements of Section 15080: Mechanical Insulation.

2.04 DAMPERS

A. Manually Operated Volume Control Dampers:

1. VD-1, Rectangular: Multi-blade type, opposed blade operation, 16 gage galvanized steel blades; center pivoted on 3/8 inch diameter steel trunnions; interlocking edges; dampers shall be in own angle frame, full duct size as indicated on Drawings; frame of minimum 16 gage steel channel construction. Provide with damper operator and axles positively locked to blade. Ruskin MD 35, or equal.
2. VD-2, Round: Frame shall be constructed of not less than 16 gage galvanized steel, blades of not less than 16 gage galvanized steel channel construction with factory neoprene seals, 1/2 inch diameter axle shafts and locking hand quadrant. Ruskin CDR S25, or equal.
3. VD-3, Oval: Frame shall be constructed of not less than 14 gage galvanized steel channels with factory blade seals of not less than 12 gage galvanized steel with not less than 1/2 inch diameter axle shafts. Provide Ruskin standard construction for frame, blade and axle size, thickness and material variation. Provide adjustable locking hand quadrant. Ruskin CDO 25, or equal.

B. Automatic Fire Dampers:

1. FD, Fire Dampers: Shall conform to requirements of and be listed by State of California Fire Marshal and NBFU Pamphlet 90A. Dampers shall provide airflow resistance not to exceed 0.05 inch water gage static pressure at 900 fpm or 0.25 inch water gage at 2000 fpm. Dampers shall be installed in required steel sleeve at each penetration of a rated partition.
 - a. Vertical-mounted fire dampers: Fire damper shall be curtain type with blades removed from the air stream to allow for maximum free area. Dampers will be provided in factory sleeves as tested and listed by manufacturer. Dampers shall be rated for 1-1/2 hours for installation in one or 2-hour partitions. Provide UL listed fusible links of adequate size and temperature rating. Dampers will be installed according to the manufacturer's recommended installation instructions provided with units. Provide suitable access for inspection and servicing of each damper. Pottorff Model VFD-10 ISB (CSFM No. 3225-368:101), Ruskin, or equal.

- b. Ceiling fire dampers: Ceiling fire dampers shall be butterfly type with ceramic material to minimize heat radiation. Dampers shall be rated for one hour and shall be furnished as a part of an integral sleeve ceiling box that will accept air distribution, have a UL listed and pre-mounted hanger tabs. Dampers shall be installed according to the manufacturers recommended installation instructions. Pottorff Model CFD-15 ES (CFSM No. 3225-368:104), Ruskin, or equal.
- c. Combination fire and smoke dampers: Combination fire and smoke dampers shall be louver bladed type. Units shall be tested and listed under UL 555 and UL 555S. Rating 1-1/2 hours for installation in one or 2-hour partitions. The seals shall be non-degradable steel to steel. Leakage shall not exceed 15 cfm/sq. ft. at one inch w.g. and shall be tested at 850 degrees F. Dampers shall be capable of being remotely controlled and reset for pressurization and smoke evacuation. Fire-releasing device shall be UL 33 listed melting fusible links. Dampers shall be provided in sleeves with pre-mounted non-stall motor actuators and dual-position indicators for remote annunciation, if required. The complete assembly shall be factory cycled and tested prior to shipment. Provide suitable access for inspection and servicing of each damper. Pottorff Model FSD142 (CSFM No. 3225-368:110) with non-stall motor, or Ruskin Model FSD 35, FSD60 (CSFM No. 3225-245:005, 102) with electric fuse link Model EFL 200, with electric non-stall motor, or equal.
- C. Relief Dampers: Parallel multi-blade type. Constructed of 20 gage galvanized sheet steel or aluminum alloy with solid stops all around. Bearings shall be self-lubricated type. Damper shall open on a positive pressure within space and close to a backdraft. Interlocking edges shall prevent dust infiltration when closed. Air Balance, Pottorff, Ruskin or Metal Form.
- D. Duct Access Panels: Provide factory fabricated access panels in ducts where required for servicing fire or smoke dampers, and at other locations as specified in this section. Units shall consist of removable panel, gasketed and pressure sealed by controlled spring tension locks. Construct unit, including interior parts, of same material as duct. Units shall be constructed to be suitable for installation in systems of up to 5 inches water gauge static pressure.

2.05 AIR DISTRIBUTION DEVICES

A. General:

- 1. Grilles, registers, diffusers and appurtenances shall conform to requirements specified herein and shall be of type and sizes as specified and indicated on Drawings. Performance shall be in accordance with Air Diffusion Council Test

Code 1602R2 including airflow velocity, pressure, temperature, and sound measurements.

2. Sponge neoprene, rubber, vinyl or felt border gaskets shall be provided for surface-mounted registers, grilles or diffusers.
3. Maximum sound level for supply diffusers and return and exhaust grilles shall not exceed NC 35.
4. Ceiling diffusers shall be provided with equalizing deflectors. Barber-Colman Deflectrol, Anemostat Model ED, Tuttle, or Bailey M-6.
5. Ceiling mounted grilles, registers and diffusers shall be provided with a factory applied, baked enamel, dull finish, bone white to match acoustical ceiling tile.
6. Grilles or registers mounted on painted walls or other surfaces shall be furnished with a baked prime coat and finish painted in accordance with Section 09900: Paints and Coatings.
7. Ceiling diffusers return grilles with duct connections, and exhaust grilles shall be provided with loose key-operated opposed blade volume control. Volume controls for return grilles without duct connections are not required.

B. Ceiling Diffusers - Round, Square, Rectangular:

1. Acoustical Tile on Plaster Ceilings or Exposed Ceilings: Units shall be square or rectangular modular core type flush and flanged for surface mounting. Anemostat Type QC-S, or equal.
2. Prefabricated Acoustical Tile Ceilings with Inverted Exposed T-Bars: Units shall be square or rectangular modular core lay-in, flush panel type with a nominal overall dimension of 24 inches x 24 inches. Anemostat Type QC-L, or equal.
3. Units shall be round, adjustable pattern, surface-mounted type. Anemostat Type C-27, or equal.

C. Grilles - Return, Exhaust, Ceiling, Square, Rectangular:

1. Acoustical Tile on Plaster Ceiling: Return and exhaust grilles shall be single deflection type with horizontal fixed face bars set at straight or 45 degree angle and flush and flanged for surface mounting. Anemostat Type S3HD, or equal.
2. Prefabricated Acoustical Tile Ceiling with Inverted Exposed T-Bars: Return and exhaust grilles shall be with single deflection horizontal fixed face bars, set

at straight or 45 degree angle flush, lay-in panel type with nominal overall dimension of 24 inches x 24 inches. Anemostat Type SAC3LD, or equal.

D. Registers, Supply, Return, Wall:

1. Sidewall supply register shall be double deflecting type (no opposed blade volume control allowed). Anemostat Type S2H or equal.
2. Sidewall return register shall be single deflecting type with horizontal fixed face bars set at 45 degree angle flush and flanged for surface mounting (no opposed blade volume control allowed). Anemostat Type S3HD, or equal.

2.06 SMOKE DETECTORS

- A. Refer to Division 16: Fire Alarm Systems

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 DUCTWORK

- A. Construct ductwork according to details of fabrication and methods of support, as indicated in the SMACNA manuals and CMC, unless specified or indicated otherwise in this section or on Drawings. In event of conflict, the most stringent requirement shall be provided.
- B. Unless otherwise required, construct ducts to conform accurately to dimensions indicated and to be straight and smooth on inside, with joints neatly finished.
- C. Duct dimensions indicated are net inside dimensions. If the indicated duct is to be furnished with an acoustic lining, add twice the thickness of the acoustic liner in both the duct width and height dimensions to provide the gross sheet metal duct dimensions.
- D. Where aluminum is welded, provide aluminum with thickness of minimum 16 gage, and metallic arc or acetylene process of welding.
- E. Anchor ducts to building structural slab, framing and roof decking and detail method of anchoring and fastening if not indicated on Drawings. Supports shall be seismically constructed.

- F. Construct and install ducts to be completely free from vibration under operating conditions.
- G. Indicate on layout drawing, required for suspended ductwork, location of supports, loads imposed on each fastening or anchor, typical details for anchorage, and details for special anchorage for supports attached to metal roof decking.
- H. Attach supports only to building structural framing members and concrete slabs.
- I. Where supports are required between structural framing members, detail and install suitable intermediate metal framing.
- J. Ducts transporting air-conditioned or heated supply air shall be insulated in accordance with requirements of Section 15080: Mechanical Insulation.
 - 1. Ducts exposed to weather shall be furnished with exterior insulation with weather jacket and interior lining as indicated on Table 2, Section 15080: Mechanical Insulation.
- K. Ferrous angles and structural members and joining collars specified for construction and support of ductwork and plenums shall be primed with one heavy coat of required asphaltic aluminum paint before installation or fabrication. Metal surfaces shall be thoroughly cleaned before installation of paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls are not required to be primed or painted.
- L. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint, Devcon Z or ZRC cold galvanizing compound.

3.03 DUCT CONSTRUCTION

- A. Minimum ductwork gages, joints, reinforcing, and bracing shall conform to the following tables. Hoods, plenums, and castings shall not be lighter than the duct gage listed in Table 2 for corresponding dimensions. Additional bracing shall be provided to prevent objectionable panel vibration.
- B. Provide longitudinal seams of the grooved snap lock and standing, sealed and taped, or sealed spiral or continuously welded. For exhaust duct, taping may be omitted.

TABLE 1 - SHEET METAL THICKNESS FOR CIRCULAR DUCTS AND FLAT-OVAL
(FOR STATIC PRESSURES LISTED)

Gage Thickness 2" Water Column	Diameter of Duct	Horizontal Girth	
Maximum S.P. Round / Oval	Maximum Diameter Support	Maximum Distance	Joints
26 / 24	Up to 9"	10'	2" slip
26 / 24	9" - 14"	8'	4"
24 / 22	14" - 23"	8'	4"
22 / 20	23" - 37"	8'	4"
20 / 18	37" - 51"	6'	1-1/4" x 1-1/8" flange

C. Construction Details for Rectangular Sheet Metal Ducts for Low-Pressure Systems -
Velocities not Exceeding 2,000 Feet Per Minute:

1. For pressures in excess of 2 inches water column, duct wall thickness shall be 2 gages heavier than set forth in this table.
2. Duct specifications shown below are applicable when ducts larger than 18 inches are cross-broken. Where cross breaking is not provided, duct wall thickness shall be 2 gages heavier on ducts 19 inches to 60 inches wide unless longitudinal standing seams are furnished.

TABLE 2 - MINIMUM METAL GAGES

Minimum Gage Thickness Steel / Aluminum	Max. Side, Gross Dimensions	Duct Permissible Girth Joints & Longitudinal Seams	Horizontal Support Maximum Distance
26 / 24	Up to 12"	Drive-slip, plain S-slip, or 1" pocket lock	10'
24 / 22	13" - 18"	Drive-slip, plain S-slip,	10'

1" pocket lock

<u>Minimum Gage Thickness Steel / Aluminum</u>	<u>Max. Side, Gross Dimensions</u>	<u>Duct Permissible Girth Joints & Longitudinal Seams</u>	<u>Horizontal Support Maximum Distance</u>
24 / 22	19" - 30"	Hemmed S-slip, 1" bar slip, or 1" pocket lock on 5' centers. Hemmed S-slip, 1" slip, or 1" pocket lock on 5' centers with 1" x 1" x 1/8" angles on center line between. Hemmed S-slip, 1" bar slip, or 1" pocket lock on 10' centers with cross break 1" standing seam on 5' centers.	10'
22 / 20	31" - 42"	1" bar slip, reinforced bar slip, or pocket lock 5' centers. 1" bar slip, reinforced bar slip, or pocket lock on 10' centers with 1" x 1" x 1/8" angles on center line between. 1" standing seam on 5' centers inside longitudinal standing seams with 1"x 1" x 1/8" angles on 5' centers on exterior.	8'
22 / 20	43" - 54"	1-1/2" bar slip, reinforced bar slip, or pocket lock on 4' centers. 1-1/2" bar slip, reinforced bar slip, or pocket lock on 8' centers with 1-1/2" x 1-1/2" x 1/8" angles on center line between. 1-1/2" bar slip, reinforced bar slip, or pocket lock on 4' centers with cross break.	8'

Minimum Gage Thickness Steel / Aluminum	Max. Side, Gross Dimensions	Duct Permissible Girth Joints & Longitudinal Seams	Horizontal Support Maximum Distance
20*/ 18	55" - 60"	1-1/2" standing seam on 3' centers inside longitudinal standing seam with 1-1/2" x 1-1/2" x 1/8" angles on 4" centers on exterior.	8'
20*/ 18	61" - 84"	Reinforced bar slip, angle slip, alternate bar slip, or angle reinforced pocket lock on 4' centers using 1-1/2" x 1-1/2" x 1/8" angles on centerline between reinforced bar slip, angle slip, alternate bar slip or angle reinforced pocket lock on 8' centers using 1-1/2" x 1-1/2" x 1/8" reinforcing angles 2' on centers in-between 1-1/2" angle reinforced standing seam on 2' center using 1-1/2" x 1-1/2" x 1/8" reinforcing angles. Inside longitudinal standing seams with 1-1/2" x 1-1/2" x 1/8" angles on 2' centers on exterior.	6'

* Button punch snap-lock seams, Lockformer, or equal, shall only be permitted on 20 and 22 gage galvanized steel ducts. For aluminum duct, button punch snap-lock is not permitted.

- D. Ferrous angles and structural members and joining collars specified for the construction and support of ductwork and plenums shall be primed with one heavy coat of asphalt aluminum paint before installation or fabrication. The metal surface shall be thoroughly cleaned before application of the paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls is not required to be primed or painted.
- E. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint, Devcon Z or ZRC cold galvanizing compound.
- F. S-type or drive-slip type girths or longitudinal seams shall not be furnished for ductwork installed outdoors or mounted on roofs. Provide angle-reinforced government lock only.

- G. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint, Devcon Z or ZRC cold galvanizing compound.

3.04 DUCTS AND PLENUMS WITH LINERS

- A. Ducts and plenums lined with acoustical insulation shall be as indicated on Drawings.
- B. Duct dimensions indicated on Drawings are net. Add thickness of acoustic liners to obtain gross sheet metal duct dimensions.
- C. For duct liner Specifications and installation, refer to Section 15080: Mechanical Insulation.

3.05 DUCT ELBOWS AND TURNING VANES

- A. Duct elbows, including supply, exhaust, and return, shall be provided with a centerline radius of 1.5 times duct width parallel to radius whenever possible; centerline radius shall not be less than width of duct parallel to radius.
- B. Where space does not permit above radius, or where square elbows are indicated on Drawings, turning vanes shall be installed whether indicated on Drawings or not.
- C. Turning vanes shall be thick double-wall vane type, Titus Y or Z, Tuttle and Bailey Ducturn, or equal. Duro-Dyne vane rail system duct turns may be furnished, provided they are of thick double wall type and Shop Drawings are submitted and reviewed by the Architect. Duct turning vanes shall be of same material as ductwork and shall be rigidly fastened in ductwork.

3.06 DUCT JOINTS AND SEAMS

- A. Conditioned air supply ducts shall be furnished with joints and seams taped for air tightness or welded, except spiral seam factory machine formed duct components. Spiral seam is exempted. Joints between slip-fit components may be assembled with all seams and joint connections fastened with screws and taped.
- B. Other ducts shall be furnished with joints and seams sealed by caulking, taping, soldering, or welding. Ducts for grease hood exhaust shall be furnished with grease-tight welding or brazing on external surface for joints and seams. Fiberglass ducts shall be provided with a thermally activated closure system, Johns Manville Fortifiber Therm-Lock with Automatic Bond Indicator dots, or equal.
- C. S-slip or drive-slip type girths or longitudinal seams are not permitted on exterior or exposed rooftop mounted ductwork. Provide angle-reinforced government lock only.

- D. Caulking, taping, or other joint or seam treatment shall be provided in accordance with recognized standards.
- E. Unless otherwise detailed, taping shall be with Duro-Dyne FT-2, 2-inch wide tape, installed over S-2 duct sealer or Arabol and canvas tape or listed Miracle tape. Ducts shall not be covered or insulated on outside until joints are inspected by the IOR. A second coat of Arabol or adhesive shall be installed 24 hours after initial application if separation occurs. Provide only approved and UL or Factory Mutual listed material for sealing and caulking.
- F. Seams around fan, coil housing and plenums shall be sealed with gaskets or caulking compound to provide an airtight assembly.
- G. Ductwork connected to range hoods shall be provided with grease-tight seams, and shall be constructed and installed so that grease or other material cannot become pocketed in any portion thereof, and system shall slope downward toward hood not less than 1/4 inch per lineal foot. Joint caulking or sealing compound shall be as required by DSA.
- H. Duro-Dyne S-2, or equal, as recommended and guaranteed by manufacturer for this specific application, shall be installed in accordance with manufacturer's recommendations. Metal surfaces shall be thoroughly cleaned before installing caulking compound. Galvanized surfaces shall be etched, if necessary, to obtain a bond between metal and caulking compound.

3.07 DUCT TRANSITION

- A. Slopes in sides of transition pieces shall be no greater than 1 to 5. Abrupt changes or offsets in duct system are not permitted, except when reviewed by the Architect.

3.08 DUCT TEST HOLES

- A. Holes in ducts and plenums shall be provided for pilot or static tubes for obtaining air measurements to balance or check air systems. Holes shall be covered with neoprene gasketed sheet metal cover or plugged with a fitted neoprene plug chained to duct.

3.09 FLEXIBLE CONNECTIONS

- A. At points where sheet metal connections are installed to fans or air handling units, or where ducts of dissimilar metals are connected, a flexible connection of commercial grade, Duralon by Duro-Dyne Corporation, or equal, non-combustible material shall be installed and securely fastened by zinc-coated steel clinch-type bands or a flange type connection. Inlet and outlet openings shall be axially in-line, maximum deviation of centerline shall be less than 5 percent of diameter or shortest dimension of a rectangular

inlet of fan or air handling unit, with system at rest. Duct end of connection shall be seismically restrained if more than 4 feet from last support.

3.10 AIR TERMINAL DEVICES

A. General:

1. Install supply devices after ducts, plenums, and casings have been cleaned and blown free of small particles, as specified. Devices shall be aligned to be parallel to ceiling construction or walls and ceiling surfaces, and shall be pulled tightly to compress gaskets and to fit neatly against surfaces.

B. Diffusers: Support surface mounted ceiling diffusers from angles or channels resting on and fastened to ceiling construction. Do not support from ducts. Install lay-in diffusers on T-bar ceilings supported by ceiling structure. Provide sheet metal adaptor box above each diffuser to allow space for volume controller with round collars for connection to round ducts where indicated on Drawings. Fasten duct-mounted diffusers to duct collars.

C. Registers and Grilles:

1. Install wall supply registers at least 6 inches below ceiling, unless otherwise indicated. Locate return and exhaust registers 6 inches below ceiling unless otherwise indicated.
2. Support ceiling diffuser type inlets, registers, and grilles as required above for ceiling diffusers.
3. Fasten wall mounted and duct mounted registers and grilles to flanges of duct collars.

3.11 DAMPERS

A. Manually operated dampers, gravity dampers, fire dampers, and motor operated dampers shall be furnished and installed as specified and indicated. Upon completion of installation, dampers shall be checked, lubricated, and adjusted so that they operate freely, without binding. Dampers shall be of standard commercial manufacture, complete with damper frame. Where painting is required, they shall be shop finished unless otherwise noted.

1. Balancing dampers shall be installed in main supply ducts from fan discharge plenums, where 2 or more ducts are connected to each plenum, although such balancing dampers may not be indicated. Each zone shall be provided with a

manual volume damper. Sheet metal screws shall be installed through handles and into ducts to lock damper in place after test and balance.

2. Supply, return, and exhaust branches shall be provided with manual volume dampers.
3. Dampers installed in accessible locations shall be provided with locking and indicating quadrants. Ventlock, Duro-Dyne, or equal.
4. Dampers installed in ductwork in furred ceiling spaces or in roof spaces with less than 30 inches of clearance below beams, joists, or other construction, and where access panels are not provided shall be furnished with damper rods extended below ceiling and terminated with a concealed damper regulation. Ventlock, Young, or equal.
5. Dampers not identified as splitter, extractor, or butterfly dampers shall be of multi-louver type arranged for opposed blade operation. Damper shall be same dimension as adjoining duct and be tight closing. Blades shall be not greater than 4 inches. Dampers shall be not less than 20 gage steel. Teflon, or equal.
6. Motor operated dampers shall be furnished by temperature control manufacturer as part of temperature control equipment and shall conform to requirements of Section 15900: HVAC Instrumentation and Controls.
7. Dampers shall be provided with accessible operating mechanisms. Where operators are exposed in finished portions of building, operators shall be chromium-plated with exposed edges rounded. Splitter dampers are not permitted unless specified and reviewed by the Architect.
8. Dampers shall not be installed in combustion air ducts.
9. Access panels shall be installed for access at each damper's operating mechanism.

3.12 FIRE DAMPERS

- A. Fire dampers shall be installed and accessible at duct penetrations of rated walls and partitions and as required by State Fire Marshal and NFPA 90A.
- B. Fire dampers shall be sized, and adjoining duct enlarged, to assure full size air passage of connecting ductwork.
- C. Fire dampers shall be electrically actuated, power open-fail close type, and UL 555 classified for 1-1/2 hours.

3.13 BACKDRAFT DAMPERS

- A. Backdraft dampers shall be installed at locations indicated in accordance with the State of California Energy Conservation Standards, Title 24, CCR.

3.14 DUCT SLEEVES AND PREPARED OPENINGS

- A. Furnish duct sleeves for 15-inch diameter ducts or less passing through floors, walls, ceilings, or roof and install during construction of the floor, wall, ceiling, or roof. Install round ducts larger than 15 inches diameter and square and rectangular ducts passing through floors, walls, ceilings or roof through prepared openings. Provide duct sleeves and prepared openings for duct mains and duct branches.
- B. Provide one inch clearance between duct and sleeve or between insulation and sleeves for insulated ducts, except at grilles, registers and diffusers.
- C. Provide prepared openings for round ducts larger than 15 inches in diameter and for square and rectangular ducts with one inch clearance between duct and openings or between insulation and opening for insulated ducts, except at grilles, registers and diffusers.
- D. Provide closure collar of galvanized sheet metal not less than 4 inches wide unless otherwise indicated on Drawings on each side of walls or floors where sleeves or prepared openings are provided except where grilles or diffusers are installed. Install collar tight against surface. Fit sharp edges of collar installed around insulated duct to preclude tearing or puncturing insulation covering vapor barrier. Fabricate collars from round ducts in steel. Provide not less than 4 nails to attach collar where openings are 12 inches in diameter or less and not less than 8 nails where openings are 20 inches in diameter or less.
- E. Pack space between sleeve or opening and duct or duct insulation with commercial grade packing yarn.

3.15 FLEXIBLE DUCT RUNOUTS

- A. Runouts from branches, risers or mains to air terminal units and outlets may be pre-insulated, factory fabricated flexible ducts complying with NFPA No. 90A. Flexible ductwork shall not exceed 7 feet in length. When required to suspend flexible ducts, furnish hangers of type recommended by manufacturers of pre-insulated flexible duct and install at intervals recommended. Method of attachment to other components of air distribution system for a vapor-tight joint shall be in accordance with printed instructions of flexible duct manufacturer. Bend radius shall be 1-1/2 times diameter of duct, measured from centerline. Bends greater than 90-degree angle are not permitted. Non-metallic flexible duct shall be permitted only in T-bar suspended ceilings.

3.16 DUCT HANGERS AND SUPPORTS

- A. Single horizontal ducts shall be suspended from heavy steel hanger straps securely fastened to overhead structural members. Ducts shall be supported by a hanger strap passing around and fastened to duct with not less than 2 Parker No. 10 screws set approximately 2 inches in from each edge, to form a supporting stirrup attached to overhead supports. Rectangular ducts shall be provided with 2 hanger straps, one located on each side of duct. Round ducts may be installed from a single hanger strap unless conditions require that duct be held tight against ceiling, in which case 2 hanger straps may be brought down each side of duct, oriented at right angles to axis of duct and securely fastened to duct standing leg seam or angle iron stiffener with a minimum of 2 bolts, measuring 1/4 inch, for each side of duct. Hanger straps shall be galvanized with a minimum size of 1-1/8 inches x 14 gage. Angles of galvanized steel of 1-1/8 inches x 1-1/8 inches x 16 gage (14 gage for ducts 60 inches or greater) may be furnished instead of straps.
- B. Where ducts are installed one above the other, they shall be individually supported on a trapeze of steel angles with 3/8 inch supporting steel rods securely fastened to overhead construction. A minimum distance of 3 inches shall be maintained between ducts wherever possible, but in no event shall distance be less than 2 inches. Minimum sizes of steel angles shall be 1-1/2 inches x 1-1/2 inches x 1/8 inch for duct sizes through 60 inches in greatest dimension, 2 inches x 2 inches x 1/8 inch for duct sizes 61 inches through 84 inches, 2 inches x 2 inches x 3/16 inch for duct sizes 85 inches through 96 inches, and 2 inches x 2 inches x 1/4 inch for duct sizes over 97 inches
- C. Ducts 30 inches square area and greater and ducts 20 feet long and longer shall be seismically restrained. Refer to Section 15070: Mechanical Sound, Vibration and Seismic Control.
- D. Hangers shall not be supported by, or fastened to, non-structural members including blocking. Toggle or Molly type bolts are not permitted.
- E. Vertical ducts shall be supported with suitable angles on each side of each duct located at each floor and at intervals not to exceed 8 feet. Angles shall be sized for required span so that they will be rigid, without bending or sagging.
- F. Roof-mounted ductwork shall be installed a minimum 12 inches above roof and shall be supported by galvanized welded pipe, one on each side, and fastened to roof in pitch pan filled cold process cement. Install supports at each turn, unit connections, and each penetration, and space at maximum 6 feet off-center in general.

3.17 ACCESS PLATES AND DOORS

- A. Access plates and doors shall be furnished and installed where stops, valves, fire dampers, fusible links, coils, damper operating mechanism, control equipment,

lubrication fittings, air filters, air handling equipment and similar items normally requiring adjustment or servicing are installed in concealed spaces.

- B. Access plates and doors shall be located to permit convenient access to equipment sized to permit removal of equipment for servicing. Access plates shall be no less than 12 inches x 12 inches in clear opening. Proper servicing of equipment requires adequate access for maintenance personnel. Access doors shall not be less than 24 inches x 24 inches, unless otherwise detailed. Two or more valves shall not be located in same access area unless sufficient clearance is provided for operation, servicing and removal of each valve.
- C. Openings in ducts or plenums whose longer dimension does not exceed 12 inches may be covered by a plate of same material as duct, gasketed and fastened to duct or plenum with sheet metal screws.
- D. Access plates in floors shall not be less than 8 inches x 8 inches and shall be carborundum surface brass with cast brass frames anchored into concrete. Access plates in tile walls shall be chromium plated brass and polished. Approved serrated plates furnished as part of a clean-out assembly are permitted in floors instead of a separate plate.
- E. Access plates and doors in walls and ceilings of finished rooms and in locations normally accessible to students shall be furnished with continuous piano hinges, unless otherwise specified, and a special flush type spring-loaded latch requiring an Allen wrench to operate. Access devices shall be installed after plastering in plaster ground openings.
- F. Access panels or doors penetrating one-hour fire resistive ceilings shall meet code requirements for such openings.
- G. Access panels shall be fire-rated Milcor manufactured by Inland Steel Products Co., or equal. Access doors shall be as required for installation in openings penetrating one-hour fire resistive ceilings. Access doors shall be furnished with a flush, key-operated cylinder lock, furnished with 2 keys each, instead of Allen headlock for non-rated ceilings.
- H. Access panels that are part of an integrated ceiling are specified in Section 09510: Acoustical Ceilings. Identification markers shall be affixed to adjacent supports, under this portion of Work, to indicate location and type of mechanical device to be serviced.
- I. Access panels installed in ducts or plenums located in heater or equipment rooms containing gas-fired equipment shall be furnished with heavy-duty spring closing hinges and refrigerator door type catches unless otherwise required. When these panels are intended for maintenance personnel access, catches shall be operable from both interior and exterior.

- J. Other access panels, except those specified above, shall be furnished with suitable hinges and one or more sash fasteners.
- K. Panels located in ducts and plenums shall be installed with gaskets made of synthetic rubber, felt, or similar material to provide an airtight installation. Panels shall be constructed and reinforced to prevent vibration.
- L. Letter words "FIRE DAMPERS" on panels over fire dampers and words "DO NOT OPEN - HEATER IS OPERATING" on panels located in heater or equipment rooms. Letters shall be approximately 3 inches high, if space is available.
- M. Furnish a key to operate latch access plates, one for each access plate, but not to exceed 5 keys for any one Project.
- N. Access plates and panels shall be furnished with manufacturer's name or trade mark and model number cast or stamped thereon, or upon a label permanently affixed thereon.
- O. Provide duct through roof flashing as detailed in the SMACNA standards or as indicated on Drawings.
- P. Refer to SMACNA Figures 2-12 and 2-13 for access plate and door construction.

3.18 PRESSURE TESTING

- A. Test and provide substantially airtight supply, return and exhaust ducts, plenums and casings at static pressure indicated for system before covering with insulation or concealing in masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable through senses of feeling or hearing at duct joints. Test ductwork for leaks at 1-1/2 times operating pressure but at a minimum of 2 inches of water.

3.19 CLEANUP

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

3.20 PROTECTION

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

END OF SECTION

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: This section provides basic electrical requirements.
- C. Related Sections:
 - 1. Section 02318: Excavating, Backfilling, and Compacting for Utilities.
 - 2. Section 03300: Cast-in-Place Concrete.
 - 3. Section 09900: Paints and Coatings.
 - 4. Division 15000: Mechanical.

1.02 BASIC ELECTRICAL REQUIREMENTS

- A. Quality Assurance:
 - 1. Workers possessing the skills and experience obtained in performing work of similar scope and complexity shall perform the Work of this Division.
 - 2. Refer to other sections of the Specifications for other qualification requirements.
- B. Drawings and Specifications Coordination:
 - 1. For purposes of clearness and legibility, Drawings are essentially diagrammatic and the size and location of equipment is indicated to scale whenever possible. Verify conditions, dimensions, indicated equipment sizes, and manufacturer's data and information as necessary to install the Work of this Division. Coordinate location and layout with other Work.
 - 2. Drawings indicate required size and points of termination of conduits, number and size of conductors, and diagrammatic routing of conduit. Install conduits with minimum number of bends to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and comply with applicable code requirements.

3. Routing of conduits may be changed provided that the length of any conduit run is not increased more than 10 percent of length indicated on the Drawings.
4. It is intended that outlet locations be coordinated with architectural elements although the outlet locations indicated on the Drawings may be distorted for clarity.
5. Coordinate electrical Work with all other Work.

C. Terminology:

1. Signal Systems: Applies to clock, bell, fire alarm, annunciator, sound, public address, buzzer, telephone, television, inter-communication, and security systems.
2. Low Voltage: Applies to signal systems operating at 120 volts and less.
3. UL: Underwriter's Laboratories Inc.

D. Regulations: Work shall comply with the requirements of authorities having jurisdiction and the California Electrical Code. Material shall conform to regulations of the National Board of Fire Underwriters for electrical wiring and apparatus. Materials shall be new and UL listed.

E. Structural Considerations for Conduit Routing:

1. Where conduits pass through or interfere with any structural member, or where notching, boring or cutting of the structure is necessary, or where special openings are required through walls, floors, footings, or other buildings elements, conform to CBC, Part 2, Title 24, Section 1906 A 3 for conduits and pipes embedded in concrete and Section 2320 A 11.10 for notches and bored holes in wood; for steel, as detailed on the structural steel Shop Drawings.
2. Where a concrete encasement for underground conduit abuts a foundation wall or underground structure which the conduits enter, encasement shall rest on a haunch integral with wall or structure, or shall extend down to footing projection, if any, or shall be doweled into structure unless otherwise indicated. Underground structures shall include maintenance holes; pull boxes, vaults, and buildings.
3. Holes required for conduit entrances into speaker poles, floodlight poles or other poles, shall be drilled with the conduit nipple or coupling welded to poles. Welds shall be provided by the electric arc process and shall be continuous around nipple or coupling.

F. Electrically Operated Equipment and Appliances:

1. Furnished Equipment and Appliances:

- a. Work shall include furnishing and installing wiring enclosures for, and the complete connection of electrically operated equipment and appliances and electrical control devices which are specified to be furnished and installed in this or other sections of the Specifications, wiring enclosures shall be concealed except where exposed Work is indicated on the Drawings.
- b. Connections make-up cords and cord caps shall be provided as necessary to install equipment ready for use. Equipment shall be tested for proper operation and, if motorized, for proper rotation. If outlets are of incorrect electrical characteristics or any specified equipment fails to operate properly, repair and/or replace the outlet and/or equipment.

2. Equipment and Appliances Furnished by Others:

- a. Equipment and appliances indicated on Drawings as "not in contract" (NIC), "furnished by others," or "furnished by the Owner," will be delivered to the Project site. Required electrical connections shall be included and performed for such equipment and appliances. Motorized equipment will be furnished factory-wired to a control panel or junction box unless otherwise indicated. Appliances will be furnished equipped with portable cord and cap. Provide disconnect switches where required.
- b. Connections to equipment furnished under this Division shall be part of the Work of this section. Work shall include internal wiring, installation, connection and adjustment of bolted drive motors in which the motor is supplied as a separate unit, and connections only for equipment furnished with factory installed internal wiring, except as further limited by Drawings and this Specification. Work shall include furnishing and installing suitable outlets, disconnecting devices, starters, push-button stations, selector switches, conduit, junction boxes, and wiring necessary for a complete electrical installation. Work shall also include furnishing and installing conduit and boxes for HVAC control systems, furnished under Division 15. Devices and equipment furnished shall be of same type used elsewhere on the Work or as specified.

- c. Electrical equipment furnished under other sections, for installation and connection under Work of this section, will be delivered to the Project site ready for installation.
- d. Mechanical equipment furnished under other sections, and requiring electrical connection under this section, will be set in place as part of the Work of the section furnishing such equipment unless noted otherwise.
- e. Suitability and condition of equipment furnished under other sections shall be determined in advance of installation. Immediate notice of damage, unsuitability, or lack of parts shall be given to the entity providing such equipment.

G. Protection of Materials:

- 1. Protect materials and equipment from damage and provide adequate and proper storage facilities during progress of the Work. Damaged materials and/or equipment shall be replaced with new.

H. Cleaning:

- 1. Exposed parts of Work shall be left in a neat, clean, usable condition. Finished painted surfaces shall be unblemished and metal surfaces shall be polished.
- 2. Thoroughly clean parts of apparatus and equipment. Exposed parts to be painted shall be thoroughly cleaned of cement, plaster, and other materials. Remove grease and oil spots with solvent. Such surfaces shall be wiped and corners and cracks scraped out. Exposed rough metal shall be smooth, free of sharp edges, carefully steel brushed to remove rust and other spots, and left in proper condition to receive finish painting.
- 3. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Advise the IOR before starting the Work of this Division.
- B. Exposed conduits shall be painted to match the surfaces adjacent to installation. Refer to Section 09900: Paints and Coatings.

- C. Salvaged materials removed from buildings shall be removed from the Project site as required by the OAR.
- D. Trenches outside of barricade limits shall be backfilled and paved within 24 hours after being inspected by the IOR. Provide traffic plates during the time that trenches are open in traffic areas.
- E. Where structural walls are cored for new conduit runs, separation between cored holes shall be 3 inches edge to edge from new or existing holes, unless otherwise required by the Architect.
- F. Electrical equipment shall be braced and anchored as indicated on the Drawings.

3.02 CLEANUP

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

3.03 PROTECTION

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

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. Boxes, enclosures, keys and locks.
 - 2. Receptacles and switches.
 - 3. Identifications and signs.
- C. Related Sections:
 - 1. Section 16010: Basic Electrical Requirements.

PART 2 - PRODUCTS

2.01 BOXES, ENCLOSURES, KEYS AND LOCKS

- A. Outlet Boxes and Fittings:
 - 1. Outlet boxes installed in concealed Work shall be galvanized steel, pressed, or welded type, with knockouts.
 - 2. In exposed Work, where conduit runs change direction or size, outlet boxes and conduit fittings shall be cast metal with threaded hubs cast integral with box or fitting. Boxes and fittings shall not have unused spare hubs except as otherwise indicated or specified.
 - 3. Fittings shall be cast metal and non-corrosive. Ferrous metal fittings shall be cadmium-plated or zinc galvanized. Castings shall be true to pattern, smooth, straight, with even edges and corners, of uniform thickness of metal, and shall be free of cracks, gas holes, flaws, excessive shrinkage, and burnt-out sand.
 - 4. Covers for fittings shall be galvanized steel or non-corrosive aluminum and shall be designed for the particular fitting installed.
 - 5. Light fixture outlets shall be 4-inch octagon, 4-inch square, 2-1/8 inches deep or larger, depending upon number of conductors or conduits therein, and shall be furnished with 3/8 inch malleable iron fixture studs, and plaster rings. Plaster rings shall be furnished with round opening with 2 ears drilled 2-23/32 inches center to center.

6. For local switch outlets provide 4-inch square 2-1/8 inch deep, boxes for single gang, 5-inch square boxes for two-gang, and special solid gang boxes with gang plaster ring for more than 2 switches.
7. For clock, bell, fire alarm pull station, speaker, thermostat, telephone, and data outlets, provide 4-inch square, 2-1/8 inch deep boxes or larger, if necessary, with single gang plaster rings. For television outlets, provide 4-gang deep boxes and 4-gang plaster rings.
8. Plaster rings shall be provided on flush-mounted outlet boxes except where surface mounted or otherwise indicated or specified. Plaster rings shall be the same depth as the finished surface.
9. Factory made knockout seals shall be installed to seal box knockouts, which are not intact.
10. Where flexible conduit is extended from flush outlet boxes, provide and install weatherproof universal box extension adapters.

B. Junction and Pull boxes:

1. Junction and pull boxes, in addition to those indicated, shall only be used in compliance with codes, recognized standards, and the Contract Documents.
2. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel with ample laps, spot welded, and shall be rigid under torsion and deflecting forces. Boxes shall be furnished with auxiliary angle iron framing where necessary to ensure rigidity.
3. Covers shall be fastened to box with a sufficient number of brass machine screws to ensure continuous contact all around. Flush type boxes shall be drilled and tapped for cover screws if boxes are not installed plumb. Surfaces of pull and junction boxes and covers shall be labeled in black marker ink designating the system, panelboard and circuit designation contained in the box. In exposed Work, the designation shall be installed on the inside of the pullbox and/or junction box cover.
4. Weatherproof NEMA 3R pull and junction boxes shall conform to the foregoing for interior boxes with the following modifications:
 - a. Cover of flush mounting boxes shall be furnished with a weather-tight gasket cemented to, and trimmed even with, the cover all around.
 - b. Surface or semi-flush mounting pull and junction boxes shall be UL listed as rain-tight and shall be furnished complete with threaded conduit hubs.
 - c. Exposed portions of boxes shall be galvanized and finished with one prime coat and one coat of baked-on gray enamel, unless already furnished with factory baked-on finish.

5. Junction and pull boxes shall be rigidly fastened to the structure and shall not depend on conduits for support.
6. Underground Concrete Pull Boxes:
 - a. Pre-cast concrete pull boxes. Concrete pull boxes shall be traffic type, reinforced for H-20 wheel loading, pre-cast concrete. Pull boxes with inside dimensions of 2 feet x 3 feet x 3 feet deep shall consist of a base section, top ring, and cover. Base section shall be furnished with 2 knockouts measuring 10 inch x 10 inch in each 3 feet side, and one 20 inch x 20 inch knockout in each 2-foot side. Pull boxes with inside dimension 4 feet x 4 feet x 4 feet deep shall consist of a base section, midsection, topping, and cover. Base section shall be furnished with 2 knockouts measuring 8 inches x 16 inches on each of 2 opposite sides, and one 20 inch x 20 inch knockout on each of the other 2 opposite sides. Pull boxes shall be furnished with a minimum of 6-inch diameter sump knockout and one inch diameter ground rod knockout. In pull boxes, furnish and install cable racks on walls. Racks shall be furnished with 3 porcelain cable holders on vertical steel mounting bars. Pull boxes shall be furnished with 3/4 inch diameter pull irons. Covers shall be traffic-type consisting of steel safety plate bolted to frame. Covers shall be marked as electrical, power, or signal as required. Pull boxes shall be as manufactured by Quickset, or equal.
 - b. Provide end bells in duct entrances. Terminate each metal conduit with insulated bushing provided with a grounding terminal.
 - c. Install pulling irons on opposite walls and below horizontal centerlines of ducts and bricked-up openings, and in bottom. Install pulling irons with each end hooked around a reinforcing bar.
 - d. Install floor drains in concrete pull boxes into sumps containing 10 cubic feet of one inch crushed rock; minimum size to 48 inches deep and 36 inches diameter. Provide 36-inch lengths of tile pipe extending down into sumps. Provide grilles over top openings of pipe.
 - e. Install 3/4 inch diameter, 10-foot copper weld steel ground rods in power concrete pull boxes. Locate near a wall with 6 inches projection above floor for grounding clamps. Permanently and effectively ground metal equipment cases, cable racks, and similar items in pull boxes.
 - f. Provide 6-inch deep sand base under pull boxes.
 - g. Identify power and signal cables by tagging in manholes and pull boxes. Tie securely to cables with nylon cord or insulated type TW wire. Tie so that turns of wires do not form closed electrical circuits.
 - h. Top of steel plate shall provide a minimum coefficient of static friction of 0.5 for either wet or dry conditions, when tested for any shoe sole material. Testing and certification of the friction factor shall be conducted by an approved independent testing laboratory under the direction of a registered professional engineer. Testing shall conform to

ASTM D 1047 or F 489 or F 609, or other procedure reviewed by the Architect.

7. Underground utility boxes shall be reinforced concrete with non-setting shoulders to prevent settlement following installation. Boxes shall be furnished with cast iron cover with finger hole, size as indicated on Drawings. Utility boxes shall be as manufactured by Quickset, or equal.
8. Manholes, vaults, and pull boxes required by a utility company, and installed as part of this Contract, shall meet the requirements of the servicing utility company.

C. Floor Outlets:

1. Provided floor outlets, except for extension outlets, shall be Harvey Hubbell Inc. B-2503, or equal, adjustable, cast iron, watertight floor boxes with flush brass floor plates, and shall be set to finish flush with finish floor covering, whether it be concrete, wood, resilient floor covering, or other finish materials.
2. Telephones above floor outlets shall be provided with Harvey Hubbell Inc. SC-3098 pedestals with SS309B plates, or equal. Refer to other Division 16 sections.
3. Plugs above floor outlets shall be provided with brass 2-1/8 inch flush caps and shallow brass extensions with 2 back-to-back, 15 amp, 125 volt, grounding type receptacles, Harvey Hubbell Inc. SC-3092, or equal.
4. Furnished extension floor outlets shall be cast iron floor boxes with cast iron covers and 1/2 inch offset entries for above-floor conduit extensions; Harvey Hubbell F3186, or equal. Boxes shall be designed to permit access to wiring without disturbing above-floor extensions and shall be set flush with the finish floor.
5. Furnished above floor service fittings for surge suppression receptacles shall be Hubbell SC3098 with cover plates SS309DS, or equal.
6. Furnished above floor service fittings for data outlets shall be Hubbell SC3098 with required cover plates, or equal. Refer to other Division 16 sections.

D. Floor Pockets:

1. Three-Gang: Furnished three-gang floor lighting pockets shall be flush floor type, with cast iron floor plate and hinged cast iron door notched for cables. Three-gang floor pockets shall be C.W. Cole TLS-353-6, or equal, for wood floors and C.W. Cole TLS-353-6-C, or equal, for concrete slabs. Each floor pocket shall be provided with three 20 amp, 3 wire, 125 volt receptacles with matching caps.

2. Single Gang:
 - a. Receptacle floor pockets shall be single gang, flush floor type, with cast iron floor plate, hinged cast iron door notched for cable and cast iron box; C.W. Cole TLA-362-1-FE, or equal. Provide each pocket with a standard, single grounding type receptacle unless otherwise indicated. Provide C.W. Cole TLS-362-1, or equal, in wood floors.
 - b. Microphone or projector floor pockets shall be single gang flush floor type with cast iron floor plate, hinged cast iron door, notched for cable and cast iron box, C.W. Cole TLA-362-3-FE, or equal. Provide C.W. Cole TLS-362-3, or equal, in wood floors.

E. Keys and Locks:

1. Provide 2 keys with furnished door locks, including cabinet door locks and switchboard locks, 2 keys for lock switches on switchboards or control panels, and 2 keys with interlocks or other furnished lock switches. Deliver keys to the IOR.
2. Locks shall be keyed to Corbin No. 60 keys for access to operate equipment and Corbin 70 keys for service access. Special keys and locks shall only be provided where specified.

2.02 RECEPTACLES AND SWITCHES

A. Receptacles:

1. Duplex receptacles shall be specification grade, 15 amps, 125 volts, 3-wire, side-wired with binding screws, parallel slots, U-ground, plaster ears and captive mounting screws. Body shall be phenolic, plastic, or Bakelite. Receptacles shall be heavy-duty, 3-blade current carrying contacts and doublewide flat blade ground contacts. Provide Arrow-Hart 5242-I, Hubbell 5242-I or Leviton 5242-I.
 - a. Duplex receptacles on circuits supplied by Electronic Grade Panelboards shall be Hubbell 5242-S (Blue), or equal.
2. Single receptacles shall be specification grade, grounding type, side-wired, with binding screws, and shall have standard size ivory bakelite base. For circuits consisting of one single receptacle only, ampere rating of receptacle shall be the same as circuit breaker or fuse. For receptacles rated 15 amps/125 volts, provide NEMA 5-15R, Arrow-Hart 5251-I. For receptacles rated 20 amps/125 volts, provide NEMA 5-20R, Arrow-Hart 5721-I, or equal.
 - a. Single receptacles on circuits supplied by Electronic Grade Panelboards shall have the same ampere rating as circuit breaker or fuse. For receptacles rated 20 amps/125 volts, provide NEMA 5-20R (blue), Hubbell 5342-S (blue), or equal.

3. For kiln receptacles and range receptacles, provide 3-pad, 4-wire, grounding type, rated 50 amps at 125/250 volts, polarized, Arrow-Hart 5754, or equal. Provide with 2-gang, stainless steel plates, Arrow-Hart 9336, or equal.
4. For dryer receptacles, provide 3-wire, non-grounding type, rated 30 amps at 125/250 volts, polarized, with L-shaped and angled straight contacts and ivory bakelite base, Arrow-Hart 9344N, or equal, with 2-gang stainless steel plates, Arrow-Hart S703, or equal.
5. Provide ground-fault interrupter type receptacles, specification grade, consisting of duplex receptacles and reset devices manufactured in standard configuration for installation with stainless steel smooth plates, Hubbell S26, single, or equal. For receptacles, provide feed-thru, 15 amp, NEMA 5-15R, ivory in color, Hubbell GF5262I, or equal. Exterior mounted receptacles shall be weatherproof.
6. Provide weatherproof receptacles, except where otherwise indicated or specified, consisting of duplex receptacles, as specified herein, and metal plates with die-cast hinged lids and weatherproof mats; Arrow-Hart 5252-WP, or equal.
7. Provide tamper-resistant receptacles as 15 amp, 125 volts, Hubbell HBLSG62HI, NEMA 5-15R, or equal.

B. Switches:

1. Local Switches:

- a. Provide local switches, tumbler type, specification grade, and rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, and standard size composition cups which fully enclose the mechanism. Switches shall be approved for installation at currents up to the full rating on resistive, inductive, tungsten filament lamp and fluorescent lamp loads, and for up to 80 percent of the rating for motor loads. Provide switches as single pole, double pole, 3-way, 4-way, non-lock type. Provide non-lock type switches with ivory handles; Hubbell HBL 1221-I single pole, HBL 1222-I double pole, HBL 1223-I 3-way, and HBL 1224-I 4-way, or equal.
- b. Provide lock type switches, specification grade, 20 amp, 120-277 volts with metal or nylon key guides with on/off indication, and operable by the same key. Keys for lock type switches; Hubbell Cat. No. HBL 1209. Key switches; Hubbell HBL1221-L single pole, HBL1222-L double pole, HBL1223-L 3-way, and HBL1224-L 4-way, or equal.
- c. Rotary lock switches shall incorporate a tumbler type lock to prevent unauthorized operation. Lock shall be tumbler type by Corbin, keyed to a HH41 key. Lock switch to be installed with pin tumblers facing downward. Key shall be removable in all positions. Each device shall be complete with 2 keys. Keys shall be delivered only to the IOR. Switches shall be rated at 20 amps, 120-277 volt AC. Switches; single pole shall be Arrow-Hart 1191; double pole shall be Arrow-Hart 1192;

3-way shall be Arrow-Hart 1193, or equal. Switch plates shall be of stainless steel, engraved with on and off positions indicated. Switch plates shall be Arrow-Hart 1187, or equal. For switch plates of 2 or more gangs, provide special order plates equal to the single gang plate.

- d. Pilot light switches shall be rated 20 amps and shall conform to the specifications for local switches. The switches shall be furnished with red, Lexan handles that are lighted by long-lasting neon lamps. Pilot light shall light when load is on. Single pole, 120 volt switches; Hubbell HBL1221-PL. Single pole, 277 volt switches shall be Hubbell HBL1221-PL7, or equal.
- e. Provide remote control switches for mechanically held contactors arranged for 3-wire control, tumbler type, momentary contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclose mechanism, and ivory handles. Hubbell HBL1556-I, or equal.

2. Time Switches and Photoelectric Controls:

- a. Provide time switches with a 7-day, solid-state, electronic type capable of fully automatic or manual operation and housed in a sheet steel enclosure unless built into a panel or switchboard. Contacts rated for 25 amps resistive or inductive, each pole 240 VAC; 5 amps tungsten or 470 VAC pilot duty, each pole 240 VAC. Time switches to contain a non-volatile clock and non-volatile memory with a built-in rechargeable power carry-over system. Provide a minimum of 15 on/off set points per week. Timing to be in one minute increments with a minimum on or off time of one minute. Time switch digital displays to indicate days of week, hours, and minutes. Display to contain a load status light to indicate when equipment is in operation. Time switches; EZ Controls Model EZ-701-1, single pole or Model EZ-701-2, double pole, or equal.
- b. For outdoor lighting control, provide time switches with digital and astronomic capabilities. Provide 365 days with holiday capabilities with 16 single dates and 5 holiday blocks of unlimited duration utilizing eighth and ninth day schedules. Provide 2 separately controllable relay closure output circuits. Each circuit to be single pole, double throw, with contacts rating of 10 amp resistive at 120/250V and 7.5 amp inductive at 120/250V. Provide 48 events per circuit per week; separate scheduling for each day of week. Provide selectable daylight saving or standard time, automatic leap year correction, and 72-hour memory backup with rechargeable battery. Time switch; Tork series DZS-200, or equal.
- c. Where more than 2 timed circuits are required, provide; Tork K series, or equal, digital, 4, 6 or 8 circuits, with the following features:
 - 1) Liquid crystal display panel.

- 2) Holiday scheduling: Up to 40 dates may be assigned special holiday schedules, up to one year in advance.
 - 3) Automatically adjusts to and from daylight savings time and for leap year.
 - 4) Contact ratings: 10 amp at 240 VAC.
 - 5) Safety override switch for each circuit to either provide shut down of circuit or to override on.
 - 6) Selective review: All or part of schedule shall be displayed at touch of a key.
 - 7) Battery backup for 24 hours.
 - 8) Supply voltage: 120 V.
 - 9) 365-day advance scheduling.
- d. Photoelectric control: Photoelectric control rated 2,000 watts, 120V with single pole, single throw, normally closed contact, enclosed in a die-cast aluminum gasketed enclosure with 1/2 inch conduit fitting, Tork series 2100, or equal.
3. Telephone Dialers for Elevators:
- a. Provide telephone dialers; Viking Electronics Inc. Model K-1500-4, or equal, with PG-1 programmer one number dialers.
 - b. Install dialers in elevator machine rooms and connect to a RJ-11 jack.
4. School Main Entrance Intercom Station: See other Division 16.sections
- a. Single zone audio surveillance base station with talkback feature. Unit to be provided with a built-in speaker and microphone; Louroe Electronics API-TB, or equal.
 - b. Two-way talk/listen flush-mounted, vandal-proof remote station with microphone, 3-inch speaker and call button mounted to 11 gage stainless steel faceplate; Louroe Electronics TLSP-PB, or equal. For surface mounted applications; provide Louroe Electronics TLMC, or equal.
 - c. Provide wiring for base and remote stations as 2/C No. 18 unshielded for speaker and No. 22 drain; West Penn 360, or equal.
- C. Hand and Hair Dryers:
1. Description: The electrically operated hand dryer shall be designed for heavy duty operation, intrinsically safe, tamper proof and be operated by either push button or automatic control, and be either surface mounted or semi-recessed as noted on Drawings.

- a. The dryer cover shall be one piece, heavy duty, rib reinforcement, 0.250" thick tamper proof cast iron. The cover shall be finished in acid-resistant porcelain enamel. Dryer operating instruction information shall be noted on front.
 - b. All units with an external nozzle shall be furnished with a chromium plated nozzle. The nozzle shall be fixed to blow air in a down position only.
 - c. The dryer cover shall be mounted with two recessed tamper proof bolts to a heavy steel wall plate which in turn is to be fastened to the wall with four concealed 1/4" mount bolts. The bolts shall be inserted through rubber grommets to reduce noise and wall vibration.
 - d. The dryer cover shall be furnished with an air intake, fabricated of heavy-gauge stamped steel with a chip proof baked polyurethane finish. There shall be no accessible live parts close to these openings. A fixed grating shall protect the fan output area.
 - e. The dryer shall be either surface mounted or semi-recessed mounted as indicated on Drawings. Recessed units shall include a 16 gauge steel wall-mounting box.
 - f. The entire unit shall be internally grounded.
2. Mechanism: The motor shall be of a universal or of an induction design with permanently lubricated bronze bushing or bearings.
- a. The unit shall be suitable for installation on either a standard 115, 208, or 220 volt, single phase AC supply, as designated on Drawings.
 - b. The heating element shall operate within a range of 1500 watt to 2300 watt.
 - c. The unit shall be UL listed.
 - d. The fan shall be furnished with a large single inlet and be centrifugal type, constructed of welded and plated steel or of molded R/C (QMFZ2) polypropylene rated at a minimum 94hb. It shall deliver a minimum 1300CFM and shall be mounted directly on the motor shaft. All parts shall be easy to service and replace.
 - e. The heating element shall be spiral wound Nichrome wire mounted directly on the fan housing. The element shall produce an air temperature of 142 degrees F. at a 72 degrees F. ambient room. The motor and heating element shall be protected by an automatic resetting device.
 - f. Means of Activation – A dryer, as designated on the Drawings, shall be provided with either:
 - 1) Push Button Control: On operation the dryer shall run no longer than 40 seconds.

- 2) Infrared Sensor Control: The dryer shall start automatically when the hands are placed underneath the nozzle and stop automatically when the hands are removed. The inferred sensor shall be mounted to the internal assembly and shall contain a failsafe feature, which will shut off the dryer if it runs for more than 60 seconds.
- 3. Warranty: The manufacturer shall provide a 10 year material warranty.
- 4. Manufacturers: Model shall be push button operated or automatic sensing operated and shall be surface mounted or semi-recessed mounted as designated on Drawings.

	SURFACE MOUNTED		SEMI-RECESSED	
	Push Button Model	Automatic Model	Push Button Model	Automatic Model
a. American Dryer:	A60F	A60TF	A60RF	A60TRF
b. Bobrick:	B-731	B-700	---	B-750
c. World Dryer Co.:	A52	XA52	AR52	XRA52

- D. In restrooms and toilets where sensor-operated urinal and water closet flushometers are installed, provide a flush meter 120 VAC or 24AC; 50 VAC transformer circuit.

2.03 DISCONNECT SWITCHES

- A. Multi-pole switches serving as disconnection means shall be heavy duty, indoor or outdoor rated, either 250 volt or 600 volt as noted and shall be sized to accommodate the load served. Disconnect switches shall be independently mounted from the equipment served.
- B. Fused disconnect switches shall meet the above requirements and shall have rejection type fuse clips. Fuses shall be type RK-5 dual element.

2.04 TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS)

- A. Provide externally mounted TVSS as manufactured by Sine Control International (no known equal) model number as called for on the plans. Unit shall be connected to a dedicated circuit breaker in the protected panel. Leads to the TVSS unit shall be kept as short as possible and in no case shall exceed 36” in length. Sine Control: 888 724-8877
- B. Integral TVSS units inside of the panel as supplied by panel manufacturers are not acceptable and will be rejected.

2.05 IDENTIFICATION AND SIGNS

- A. Identification Plates:

1. Provide identification plates, unless otherwise specified, for switchboards, unit substations, motor control centers, control panels, push-button stations, time switches, contactors, motor starters, motor switches, panelboards, and terminal cabinets.
2. Identification plates shall adequately describe function, voltage and phase of the identified equipment. Where identification plates are detailed or described on Drawings, inscription and size of letters shall be as indicated. For lighting and power panels, identification plates shall indicate panel designation, voltage, and phase of panel. For terminal cabinets, identification plates shall indicate system contained in the terminal cabinet.
3. Identification plates shall be black-and-white nameplate stock of bakelite with characters cut through black exposing white. Plates shall be furnished with beveled edges and shall be securely fastened in place with No. 4 Phillips-head, cadmium-plated steel, self-tapping screws. Characters shall be 3/16 inch high, unless otherwise indicated.

B. Markings:

1. Install identification markings to surface-mounted starters, switches, disconnect switches, contactors, and other devices controlling motors and appliances. Provide abbreviations required along with an identifying number. Markings to be provided with locking type stencils using paint of a contrasting color. Figures shall be 3/8 inch high unless otherwise indicated. Dymo Industries Inc., self-sticking plastic labels, with embossed characters made with a typewriter, may be installed instead of stencils and paint.
2. High Voltage: High voltage switchboards, cabinets, boxes, and conduits exposed in accessible locations, including under buildings and in attics, are required to be marked "DANGER-HIGH VOLTAGE". Markings for switchboards shall consist of 18 gage steel, porcelain enamel sign of standard manufacture. Markings for boxes, cabinets, and conduits shall be by means of stenciling or printed self-adhesive markers, Westline Tel-A-Pipe, or equal. Provide letters of black on orange background and not less than 1-7/8 inches high. On conduit runs, install markings at intervals not exceeding 10 feet in any individual area. Markings shall be installed after other painting Work is complete.

C. Warning Signs:

1. Provide a warning sign on outside of each door or gate to rooms or enclosures containing high voltage equipment. Signs required to read, "WARNING - HIGH VOLTAGE - KEEP OUT". Provide 2 inch high lettering.
2. Provide a warning sign on each high-voltage non-load break disconnect and fused cutout (not oil filled). Signs required to read, "DO NOT OPEN UNDER LOAD". Provide 2 inch high lettering.
3. Provide signs of standard manufacture, 18 gage steel, with porcelain enamel finish. Provide red lettering on a white background.

PART 3 - EXECUTION

3.01 INSTALLATION AND SUPPORT OF BOXES

- A. Install outlet boxes flush with finished surface of wall or ceiling. Install plumb and securely fastened to structure, independent of conduit. Except where otherwise indicated, provide factory-fabricated bar hangers to support outlet boxes.
- B. Outlet boxes installed in suspended or furred ceilings with steel runner or furring channels shall be supported, except where otherwise indicated, by a Unistrut P-4000 channel spanning main ceiling runner channels. Each box shall be supported from its channel by a 3/8 inch 16 threaded steel rod with a Unistrut P-4008 nut and a Tomic No. 711-B Adapta-Stud. Rod shall be tightened to a jamb fit with channel and its nut. Box shall be locked to the rod by means of a 1/2 inch locknut on stud and a 3/8 inch 16 hex nut locking stud to rod.
- C. Heights of outlets and equipment indicated on Drawings shall govern. In the absence of such indications, the following heights shall be maintained with heights measured to the centerline unless otherwise noted:
 - 1. Install wall-mounted telephones, light switches, other switches, and fire alarm pull stations, 48 inches above the finished floor. Refer to other Division 16 Sections.
 - 2. Install bell outlets in corridors 12 inches below ceiling.
 - 3. Install clocks, speakers, and bell outlets in classrooms and offices, 8 feet above finished floor. Refer to other Division 16 Sections.
 - 4. Install fire alarm strobe lights 80 inches to bottom of light above finished floor.
 - 5. Install outside bells and yard light outlets 4 feet above second floor level for 2 or more story buildings, 12 inches below top plate level for one story buildings without covered porch or arcade, and 12 inches below covered porch and arcade ceilings.
 - 6. Install desk telephones, power receptacle outlets, and data outlets 15 inches above finished floor.
 - 7. Install panelboards and terminal cabinets 6 feet-6 inches from finish floor to top of cabinet.
 - 8. Install television outlets at a height corresponding to location of television monitor, or a minimum of 15 inches above finished floor. Refer to other Division 16 sections.

3.02 COVER PLATES

- A. Provide a plate on each switch, plug, pilot light, data, interphone, public telephone, and television outlet, and on existing and reset outlets where so indicated or required. Plates shall be of stainless steel unless otherwise specified.

- B. Cover plates shall be mounted parallel to floor, ceiling and doorways.
- C. In the following cases and at the required locations, provide switch and receptacle plates engraved with the following designations:
 - 1. Three-gang and larger gang switches.
 - 2. Lock switches.
 - 3. Pilot switches.
 - 4. Switches so located that operator cannot see one of the fixtures or items for equipment controlled with his hand on the switch.
 - 5. Switches not in same room with fixtures or items of unit heaters, air curtains, fly fans, etc.
 - 6. Receptacles operating at other than 120 V.
 - 7. Switches operating on 277 V.
 - 8. Where indicated on Drawings.
- D. Designations shall be as indicated on Drawings or as specified, engraved in plates with 3/16 inch high, block-type letters filled with black enamel. Where designations are not indicated or specified, they will be provided, estimate 10 letters per gang.

3.03 IDENTIFICATION OF CIRCUITS AND EQUIPMENT

- A. Provide descriptive nameplates or tags permanently attached to switchboards, motor control centers, transformers, panelboards, circuit breakers, disconnect switches, starters, pushbutton control stations and other apparatus installed for operation or control of circuits, appliances, or equipment.
- B. Provide nameplates of engraved laminated bakelite or etched metal. Submit Shop Drawings denoting dimensions and format to the Architect before installation. Fasten to equipment with escutcheon pins, rivets, self-tapping screws, or machine screws. Self-adhering or adhesive backed nameplates are not permitted.
- C. Fasten tags to feeder wiring in conduits at every point where runs are broken or terminated, including pull wires in empty conduits. Indicate circuit, phase, and function. Tag branch circuits in panel boards and motor control centers. Tags may be manufactured of pressure-sensitive plastic or embossed self-attached stainless steel or brass ribbon.
- D. Provide circuit identification cards and cardholders in all panel boards. Cardholders shall consist of metal frame retaining a clear plastic cover permanently attached to inside of panel door. List of circuits shall be typewritten on a card. Circuit description shall include name or number of circuit, area and connected load.

- E. Junction and pull boxes shall have covers stenciled with box number when indicated on Drawings, or circuit numbers according to panel schedules. Data shall be lettered in a conspicuous manner with a color contrasting with finish.
- F. Name shall be correctly engraved, with a legend indicating function or areas, when required by codes or indicated on the Drawings.

3.04 PROTECTION

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

3.04 CLEANUP

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

END OF SECTION

SECTION 16060

GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Provide and install grounding system as indicated or required.
- C. Related Sections:
 - 1. Refer to related sections for their system grounding requirements.
 - 2. Section 16010: Basic Electrical Requirements.

1.02 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. IEEE 142 Green Book.
 - 2. Underwriter's Laboratories (UL).
 - 3. California Electrical Code.
 - 4. B.I.C.S.I. (Signal)
 - 5. EIA/TIA (Signal and power).

1.03 SYSTEM DESCRIPTION

- A. Metallic objects on the Project site that enclose electrical conductors, or that are likely to be energized by electrical currents, shall be effectively grounded.
- B. Metal equipment parts, such as enclosures, raceways, and equipment grounding conductors, and earth grounding electrodes shall be solidly joined together into a continuous electrically conductive system.
- C. Metallic systems shall be solidly interconnected to the electrical system as provided by the service entrance and for grounded separately derived systems that are installed.

- D. A separately derived AC source shall be grounded to the equipment grounding conductor and to a separate “made” electrode.
- E. All raceways shall contain a code sized equipment grounding conductor, bonded to electrical grounding system.
- F. Cold water, or other utility piping systems, shall not be utilized as grounding electrodes due to the installation of insulating couplings and non-metallic pipe in such installations. Grounding electrodes shall be “made” electrodes specified as follows:
 - 1. Grounding electrodes as specified hereafter in this section.
 - 2. Concrete enclosed electrode, fabricated of at least 20 feet of No. 2 AWG, minimum size, bare copper conductor, encased by at least 2 inches of concrete, located within or near bottom of a concrete foundation, or footing, which is in direct contact with earth. Footing rebar shall be connected to copper wire with approved connectors. An external electrode, as specified hereafter or as required by the NEC, shall be installed and connected to foundation or footing rebar.
- G. Non-current carrying metal parts of high-voltage equipment enclosures, signal and power conduits, switchboard and panelboard enclosures, motor frames, equipment cabinets, and metal frames of buildings shall be permanently and effectively grounded.
- H. Metallic or semi-conducting shields and lead sheaths of cables operating at high voltage shall be permanently and effectively grounded at each splice and termination.
- I. Neutral of service conductors shall be grounded as follows:
 - 1. Neutral shall be grounded at only one point within the Project site for that particular service. Preferable location of grounding point shall be at the service switchboard, or main switch.
 - 2. Equipment and conduit grounding conductors shall be bonded to that grounding point.
 - 3. If other buildings or structures on the Project site are served from a switchboard or panelboard in another building, power supply is classified as a feeder and not as a service.
 - 4. Equipment grounding conductor is installed from switchboard to each individual building. At building, grounding conductor is bonded with power equipment enclosures, metal frames of building, etc., to “made” electrode for that building.
 - 5. Neutral of feeder shall not be grounded.

- J. For a distribution transformer(s) at a building(s) the secondary neutral conductor shall be grounded to “made” electrode serving the building.
- K. Within every building, the main switchboard or panelboard shall be bonded to the cold water line. Metallic piping systems such as gas, fire sprinkler, or other systems shall be bonded to the cold water line.

1.04 SUBMITTALS

- A. Provide in accordance with Division 01.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Furnished yard boxes shall be precast concrete and shall be approximately 14 inches wide by 19 inches long by 12 inches deep or larger, as required to obtain required clearances. Boxes shall be furnished with bolt-down, checkered, cast iron covers and cast iron frames cast into boxes. Yard boxes shall be Brooks 36, or equal.
- B. “Made” electrodes shall be copper-clad steel ground rods, minimum 3/4 inch diameter by 10 feet long.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Grounding electrodes shall be installed in the nearest suitable planting area, where not otherwise indicated on Drawings, and each electrode shall terminate within a concrete yard box installed flush with finish grade. In planting areas, finish elevation of concrete yard boxes shall be 2 inches above planting surfaces.
- B. If concrete enclosed electrode is provided, grounding wire shall terminate to a suitable copper plate with grounding lugs.
- C. Grounding rods shall be driven to a depth of not less than 10 feet. Permanent ground enhancement material, as manufactured by Erico Electrical Products, or equal, shall be installed at each ground rod to improve grounding effectiveness. Install in accordance with manufacture's installation instructions.
- D. Grounding electrodes shall provide a resistance to ground of not more than 5 ohms.
- E. When installing grounding rods, if resistance to ground exceeds 5 ohms, 2 or more rods connected in parallel shall be provided to meet grounding resistance requirement.

- F. Ground rods shall be separated from one another by not less than 10 feet.
- G. Parallel grounding rods shall be connected together with recognized fittings and grounding conductors in galvanized rigid steel conduit, buried not less than 12 inches below finish grade.

3.02 TESTING

- A. Provide the services of an approved independent testing laboratory to test grounding resistance of “made” electrodes, ground rods, bonding of building steel, water pipes, gas pipes and other utility piping. Tests shall be performed as follows:
 - 1. Visually and mechanically examine ground system connections for completeness and adequacy.
 - 2. Perform fall of potential tests on each ground rod or ground electrode where suitable locations are available per IEEE Standard No. 81, Section 8.2.1.2. Where suitable locations are not available, measurements will be referenced to a known dead earth or reference ground.
 - 3. Perform the two point method test per IEEE No. 81, Section 8.2.1.1 to determine ground resistance between ground rod and building steel, and utility piping - such as water, gas and panelboard grounds. Metal railings at building entrances and at handicapped ramps shall also be tested.
 - 4. Test shall be performed in the presence of the IOR.
- B. Submit 3 copies of test results to the Architect. Test results shall be submitted on an official form from the independent testing laboratory recording Project location, test engineer, test conditions, test equipment data, ground system layout or diagram, and final test results.

3.03 PROTECTION

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

3.04 CLEANUP

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

END OF SECTION

SECTION 16073

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
 - 1. Division 16 Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Nonmetallic slotted channel systems. Include Product Data for components.
 - 4. Equipment supports.
- C. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 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:

- a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - h. Submit others for approval by electrical engineer of record.
3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 6. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
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:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
 - e. Submit others for approval by electrical engineer of record.
 3. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 4. Fitting and Accessory Materials: Same as channels and angles.
 5. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 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) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 - 5) Submit others for approval by EOR.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - 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) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 6) Submit others for approval by EOR.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 6. Toggle Bolts: All-steel springhead type.
 7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps, single-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.

6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 5 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use **3000-psi (20.7-MPa)**, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: 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).

- B. Touchup: Comply with requirements in Division 9 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 16120

LOW-VOLTAGE WIRES (600 VOLT AC)

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Low-voltage wire, splices, terminations and installation.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01.

PART 2 - PRODUCTS

2.01 WIRES

- A. Wires shall be single conductor type THHN or THWN insulated with polyvinyl chloride and covered with a protective sheath of nylon, rated at 600 volts. Wires may be operated at 90 degrees C. maximum continuous conductor temperature in dry locations and 75 degrees C. in wet locations and shall be listed by UL Standard 83 for thermoplastic insulated wires listed by Underwriter's Laboratories (UL) for installation in accordance with Article 310 of the National Electrical Code. Conductors shall be stranded or solid copper for 10 AWG and smaller conductors and stranded copper for 8 AWG and larger conductors. Wires shall be identified by surface markings indicating manufacturer's identification, conductor size and metal, voltage rating, UL symbol, type designations and optional rating. Indentations for lettering is not permitted. Wires shall be tested in accordance with the requirements of UL standard for types THWN or THHN.
- B. Conductors shall be solid Class B or stranded Class C, annealed uncoated copper in accordance with UL standards.

2.02 STANDARDS

- A. THWN/THHN wires shall comply with the following standards:
 - 1. UL 83 for thermoplastic insulated wires.
 - 2. UL 1063 for machine tool wires and cables.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Wires shall not be installed until plastering throughout the building is completed and debris and moisture is removed from conduits, boxes, and cabinets.
- B. Wire-pulling compounds furnished as lubricants in installing conductors in raceways shall be talc or other compounds approved and listed by UL. Oil, grease, graphite, or similar substances are not permitted. Pulling of 10 gage or larger conductors shall be performed with a cable pull machine. When pulling conductors, do not exceed manufacturer's recommended values
- C. The IOR will observe installation of feeder cables. Notify the IOR not less than 2 working days in advance of the proposed time of feeder installation.
- D. At outlets for light, power, and signal equipment, pigtail splices with 8-inch circuit conductor leads for connection to fixtures, equipment, and devices.
- E. Pressure cable connectors, pre-insulated Scotchlok, Y, R or B spring-loaded twist-on type, may be furnished in splicing 8 gage or smaller conductors, for wiring systems, except public address, telephone system, or system clocks.
- F. Joints, splices, taps, and connections for cables 6 gage and larger shall be performed with high-pressure compression cable connectors approved for installation with copper conductors. Connectors shall be insulated with heavy wall heat shrink WCSM, or cold-applied roll-on sleeve RVS. Insulation level shall be a minimum of 600V and joints, splices, and taps shall be qualified to ANSI C 119.2, and UL listed for pressure connectors.
- G. Wire switchboards, panel cabinets, pull boxes, and other cabinets except public address, shall be neatly grouped and tied in bundles with nylon ties at 10-inch intervals. At switchboards, panels and terminal blocks, wires shall be fanned out to terminals. If bundles are longer than 24 inches, a maximum of 9 current carrying conductors may be bundled together.
- H. Install conductor lengths with a minimum length within the wiring space. Conductors must be long enough to reach the terminal location in a manner that avoids strain on the connecting lug.
- I. Maintain the conductor required bending radius.
- J. Neutral conductors larger than 6 gage, which are not color identified throughout their entire length, shall be painted white or taped white where they appear in switchboards, cabinet, gutters or pull boxes. Neutral conductors 6 gage and smaller shall be white color identified throughout their entire length.

- K. Fire alarm, clock, security intrusion detection, public address, CATV, data, and telephone system wiring shall be continuous from terminal cabinets or from equipment to each device. Splices are not permitted between devices and/or terminal cabinets at junction and pull boxes. Wiring shall be terminated at terminal blocks only.
- L. Wiring systems shall be free from short circuits and grounds, other than required grounds. Provide the services of an approved independent testing laboratory to test feeder and branch circuit wire insulation resistance. The tests to be performed are as follows:
 - 1. With a megger insulation tester, perform the time-resistance method to test feeders and branch circuit wires sized #2 and larger. Tests must be conducted with wire disconnected at each end in order to test the wire itself. A second test must be conducted with the wire connected at each end and the circuit breakers or switches in the closed positions.
 - 2. Tests shall be performed in presence of the IOR.
 - 3. Insulation resistance shall not be less than 100 mega-ohms.

3.02 COLOR CODES

A. General Wiring:

- 1. Color code conductor insulation as follows:

SYSTEM VOLTAGE		
Conductor	208Y/120	480Y/277
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow

- 2. For conductors 6 AWG or larger, permanent plastic-colored tape may be furnished to mark conductor end instead of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.

- B. Signal Systems: Wires for signal systems shall be color-coded and installed under observation of the IOR. Except where otherwise specified, color-coding shall be as follows:

<u>SYSTEM</u>	<u>COLOR CODE</u>
Clocks	Pink, Gray and Orange
Program Bells (Elementary Schools)	White (Common), Black
Program Bells (Secondary Schools)	White (120 volt, common) Black (C.R. program)

	Blue (Shop program) Brown (Gym program) Yellow (Auditorium fire alarm)
Fire Alarm Bells/Horns	Pink (+) and Gray (-)
Fire Alarm Strobes	Orange (+) and Blue (-)
Fire Alarm System Feeder or Service	Black and White
Fire Alarm Pull Stations (Non-Addressable)	Red (+) and Black (-)
Heat Detectors (Non-Addressable), Smoke Detectors	Red (+) and Yellow (-)
Duct Smoke Detectors (Non-Addressable)	Red (+) and Yellow (-)
Fire Sprinkler Flow Switches (Non-Addressable)	Red (+) and Purple (-)
Fire Sprinkler Tamper Switches (Non-Addressable)	Red (+) and Brown (-)
White Visual Program Signals Stripes,	Yellow with White White (Common)
Program Switching Units (Common)	Blue (Hot), White 4 - Yellow (Shop program) 4 - Blue (Gym program) Blue ("All" button) 2 - Black (Spares)
Spare Wires	Black

3.03 FEEDER IDENTIFICATION

- A. Lighting, power, low-voltage feeder wires and cables shall be identified at each point conduit run is broken by a cabinet, box, gutter, etc. Where terminal ends are available, identification shall be by means of heat shrink wire markers, which provide terminal strain relief. Markers shall be Raychem Shrinkmark, Brady Perma-Sleeve, or equal. Identification in other areas shall be by means of wrap-around tape markers Raychem Cable Markers, Brady Perma-Code or equal. Markers shall include feeder designation, size, and description.

3.04 TAPE

- A. Splices, joints, and connectors joining conductors shall be covered with insulation equivalent to that provided on conductors. Free ends of conductors connected to energized sources shall be taped. Voids in irregular connectors shall be filled with insulating compound before taping. Thermoplastic insulating tape approved by UL for installation as sole insulation of splices shall be furnished and shall be installed according to manufacturer's printed specifications.

3.05 PROTECTION

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

3.06 CLEANUP

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

END OF SECTION

SECTION 16130

RACEWAYS, BOX FITTING, AND SUPPORTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. Raceways and wire ways
 - 2. Conduit installation.
 - 3. Pullboxes.
 - 4. Underground requirements.
- C. Related Sections:
 - 1. Section 16010: Basic Electrical Requirements.
 - 2. EIA/TIA 569 Standards.

1.02 SUBMITTALS

- A. Materials List: Provide in accordance with Division 01.

PART 2 - PRODUCTS

2.01 RACEWAYS

- A. Conduit Materials:
 - 1. Metallic conduit, and tubing shall be manufactured under the supervision of a UL Factory Inspection and Label Service Program. Each 10-foot length of conduit and tubing shall bear the UL label and manufacturer's name.
 - 2. Rigid metallic conduit shall be rigid steel, heavy wall, mild steel, zinc-coated, with an inside and outside protective coating manufactured in accordance with ANSI C 80.1. Couplings, elbows, bends, and other fittings shall be the same materials and finish as the rigid metallic conduit. Fittings,

connectors, and couplings shall be threaded type, manufactured in accordance with ANSI C 80.1 and UL 6.

3. Electrical metallic tubing shall be steel tubing, zinc-coated with a protective enamel coating inside, manufactured in accordance with NEMA C 80.3. Fittings, couplings, and connectors shall be gland compression type, manufactured in accordance with NEMA C80.3. Electrical metallic tubing is designated hereinafter as EMT.
 4. Flexible steel conduit shall be of flexible interlocking strip construction with continuous zinc coating on strips, manufactured in accordance with UL 1. Connectors and couplings shall be required fittings of the type, which thread into convolutions of flexible conduit.
 5. Liquid-tight flexible metal conduit shall be galvanized heavy wall, flexible locked steel strip construction with smooth moisture and oil-proof, abrasion-resistant, extruded plastic jacket. Connectors shall be as required for installation with liquid-tight flexible conduit and shall be installed to provide a liquid-tight connection.
 6. Non-metallic conduit shall be rigid PVC electrical conduit extruded to schedule 40 dimensions of Type II. Grade 1 high impact, polyvinyl chloride, sweeps, couplings, reducers and terminating fittings shall be listed under the UL re-examination service, and shall bear the manufacturer's listed marking.
- B. Sleeves for Conduits: Sleeves shall be adjustable type, of 26 gage galvanized iron, Adjust-to Crete Co. Adjust-to-Crete, or Jet Line Products Inc. Jet-Line, or equal.
- C. Where conduit enters a building through a concrete foundation below grade, or ground water level, or where it is necessary to seal around a conduit where it passes through a concrete floor or wall, provide O-Z/Gedney Type FSK Thru Wall and Floor Seal, or equal.
- D. Expansion Joints: Where conduits embedded in masonry or concrete cross seismic separations between or within buildings, expansion joints, or at locations indicated, provide a sliding or a sliding and deflecting fitting, as conditions require, in each conduit. Provide O-Z Electrical Mfg. Co. Inc. Type AX, with bonding strap and clamps. At exterior locations, provide O-Z Electrical Mfg. Co. Inc. Type EX, or equal.
- E. Conduit Seal Fittings:
1. Provide conduit seal fittings where indicated on the Drawings. Conduit seals shall be of rigid galvanized steel. Seals in horizontal conduit installations shall be Appleton Type ESU, Crouse Hinds Type EYS, or

equal. Seals in vertical conduit installations shall be Appleton Type SF, Crouse Hinds Type EYD, or equal, with continuous drain.

2. Install sealing compound after wire has been installed. Ensure drain is not blocked in vertical seals when installing compound. Where conduit seals are installed in hazardous area applications, there shall be no conduit coupling, fitting, etc., between seal and boundary of hazardous area.

F. Surface Metal Raceway:

1. The surface metal raceway system for branch circuit wiring, data network, voice, video, and other low voltage wiring shall be as manufactured by the Wiremold Company, or equal. The raceway system shall be UL listed. Computer data installation shall be as required by other sections of this Division.
2. The raceway base and cover sections shall be manufactured of steel and finished in ivory, gray enamel or custom colors suitable for field painting to match adjacent finishes.
3. The raceway shall be a 2-piece design with a metal base and snap-on metal cover, Wiremold 4000 or equal. The base and cover sections shall be a minimum of 0.040 inch wall thickness. The base section shall be available in 10-foot lengths. A hand-operated cutting tool shall be available for the base and cover to ensure clean, square cuts.
4. A full complement of fittings shall be furnished, including but not limited to, flat internal and external elbows, tees, entrance fittings, wire clips, cover clips, couplings, support clips, C-hangers and end caps. The fitting color shall match the raceway color. Fittings shall be supplied with a base where indicated and/or required. A take-off fitting shall be furnished as required.
5. Device brackets shall be furnished for mounting single or 2-gang devices within the raceway. Devices shall be provided with the ability of mounting flush or in conjunction with standard faceplates.
6. The raceway shall be furnished with a complete line of connectivity outlets and modular inserts for unshielded twisted pair including category 5, fiber-optic, coaxial, and other cabling types with face plates and bezels to facilitate installation. Computer data installation shall be as required by other sections of this Division.
7. Raceway shall be furnished with corner elbows and tee fittings to maintain a cable bend radius which meets the requirements of fiber-optic and copper cables under EIA/TIA 569 for communications pathways.

- G. Wire ways shall be 16 gauge galvanized steel enclosed hinge/screw wiring troughs, surface metal raceway, wireway, and auxiliary gutter designed to enclose electrical wiring. Wireway fittings shall be furnished with removable covers and sides to permit complete installation of conductors throughout the entire wireway run. Cover shall be furnished with keyhole slots to accept captive screws locking the cover securely closed. Wire ways shall be UL listed and shall be Square D Type LDG NEMA Type 1 enclosure, or Type RD NEMA Type 3R enclosure, or equal.
- H. Penetration in Fire-Rated Structures: Provide 3M, or equal, caulk and fire barriers for installing fire-rated seals around penetrations through floors, walls, and elevator shafts. Fire stop system must be UL classified for through-penetration applications of metallic conduits and busways.
- I. Pull Wires: Install 1/8 inch polypropylene cords in empty conduits and empty underground service conduits.

PART 3 - EXECUTION

3.01 CONDUIT INSTALLATION

- A. General Requirements:
 - 1. Provide complete and continuous systems of rigid metallic conduit, outlet boxes, junction boxes, fittings and cabinets for systems of electrical wiring including lighting, power, and signal systems, except as otherwise specified.
 - 2. Within buildings, EMT may be installed instead of rigid metallic conduit where permitted by ordinance. EMT shall not be installed in concrete, underground, outdoors, below 6 feet above finished surface, where subject to damage, or in conduit installations longer than 100 feet.
 - 3. Within buildings, flexible steel conduit may be installed instead of rigid steel conduit where permitted by ordinance. Flexible steel conduit shall not be installed for conduit installations longer than 50 feet, and where conduit size is 1-1/4 inches or greater.
 - 4. Liquid-tight flexible steel conduit shall be installed, except where otherwise specified, for final connection of motor terminal boxes, shop equipment, cafeteria equipment, HVAC equipment and other equipment, and shall be of sufficient length, not exceeding 36 inches, to permit full travel or adjustment of motor on its base.
 - 5. Connectors for flexible metal conduit shall be the types which threads into convolutions of conduit. Connectors for watertight flexible metal conduit

shall be as required for installation and shall be installed to provide a watertight connection.

6. Exposed conduit shall be installed vertically and horizontally following the general configuration of the equipment, using cast threaded hub conduit fittings where required and shall be clamped to equipment with suitable iron brackets and one hole pipe strap.
7. If connection is from a flush wall-mounted junction box, install a weatherproof universal box extension and adapter and extend with rigid steel conduit to motor starter or junction box on equipment.
8. Underground feeder distribution conduits for systems may be non-metallic conduit instead of rigid conduit except where otherwise specified or indicated.
9. Conduit shall be concealed unless otherwise indicated. Conduits exposed to view, except those in attic spaces and under buildings, shall be installed parallel or at right angles to structural members, walls, or lines of building. Conduits shall be installed to clear access openings.
10. Bends or offsets will not be permitted unless absolutely necessary. Radius of each conduit bend or offset shall be as required by ordinance. Bends and offsets shall be performed with standard industry tools and equipment or may be factory fabricated bends or elbows complying with requirements for radius of bend specified. Heating of metallic conduit to facilitate bending is not permitted. Public telephone conduit bends and offsets shall be provided with a radius which is not less than 10 times trade size of conduit unless otherwise permitted. Refer to underground installation, specified in this section, for radius of bends and offsets required for underground installations.
11. Running threads are not permitted. Provide conduit unions where union joints are necessary. Conduit shall be maintained at least 6 inches from covering on hot water and steam pipes and 18 inches from flues and breechings. Open ends of conduits shall be sealed with permitted conduit seals during construction of buildings and during installation of underground systems. Installation of conduit directly under water lines is not permitted.
12. Joints in conduits installed in concrete, in wet location, exposed to weather or underground shall be installed liquid tight. Conduit threads shall be filled with permitted pipe joint compound before screwing into couplings and threaded fittings.

13. Where conduits are terminated in groups at panelboards, switchboards, and signal cabinets, etc., provide templates or spacers to fasten conduits in proper position and to preserve alignment. Conduits terminating at signal cabinets shall only enter cabinets in the following locations:
 - a. Conduits entering top, side, and bottom of cabinets shall be aligned in a single row, centered 2 inches from rear of cabinet.
 - b. Conduits entering back of cabinet shall be aligned in a single row centered 2 inches from top of cabinet.
 - c. Conduits shall not be spaced closer than 3 inches on centers.
14. Conduits, one inch and smaller above metal lath ceilings, shall be tied to ceiling channels. Conduits of 1-1/4 inches or larger above metal lath ceilings, shall be rigidly suspended with pipe hangers or pipe racks or shall be secured to superstructure with factory fabricated pipe straps. Conduits in metal lath or steel stud partitions shall be tied to furring channels or studs. In ceiling spaces and in partitions, tie wires shall be spaced not more than 5 feet apart, shall fasten conduit tight against channels and studs at point of tie and shall not support any of the conduit weight. Tie wire shall be 16 gage galvanized double annealed steel tie wire.
15. Where auxiliary supports, saddles, brackets, etc., are required to meet special conditions, they shall be fastened rigid and secure before conduit is attached thereto.
16. Conduit in ceiling spaces, stud walls, and under floors, shall be supported with factory fabricated pipe straps or shall be suspended with pipe hangers or pipe racks. Pipe straps shall be attached to and shall fasten conduit tight at point of support against ceiling and floor joists, rafters, and wall studs, or 2-inch x 4-inch headers fitted between joists or wall studs.
17. Conduits installed on exposed steel trusses and rafters shall be fastened with factory fabricated conduit straps or clamps, which shall fasten conduit tight against supporting member at point of support.
18. Conduits installed under buildings shall be strapped with factory fabricated conduit straps to underside of concrete floor or joists, or wood floor joists, or shall be suspended with pipe hangers or pipe racks. Conduits under building are not permitted to be placed directly on grade; they shall be suspended from building or shall be buried below surface of ground. One inch and larger conduits under buildings shall be installed with conduit hangers or racks.

19. Pipe hangers for individual conduits shall be factory fabricated, consisting of a pipe ring and threaded suspension rod. Pipe ring shall be malleable iron, split and hinged, and shall securely fasten conduit, or shall be spring able wrought steel. Rings shall be bolted to or interlocked with suspension rod socket. Rods shall be 3/8 inch for 2-inch conduit hangers and smaller and shall be 1/2 inch for 2-1/2 inch conduit hangers and larger.
20. Pipe racks for groups of parallel conduits and for supporting total weights not exceeding 500 pounds shall be trapeze type and shall consist of a cross channel, Steel City Kindorf B-900, Unistrut P-1000, or equal, suspended with a 3/8 inch minimum diameter steel rod at each end. Rods shall be fastened with nuts, top and bottom to cross-channel and with square washers on top of channel. Conduits shall be clamped to top for cross-channel with conduit clamps, Steel City Kindorf C-105 or Unistrut P-1111 through P-1124. Conduits shall not be stacked one on top of another, but a maximum of 2 tiers may be on same rack providing an additional cross-channel is installed. Where a pipe rack is to be longer than 18 inches, or if the supported weight exceeds 500 pounds, submit Shop Drawings of installation to the Architect for review.
21. Conduits suspended on rods more than 2 feet long shall be rigidly braced to prevent horizontal motion or swaying.
22. Factory fabricated pipe straps shall be one or 2-hole formed galvanized clamps, heavy-duty type, except where otherwise specified.
23. Hangers, straps, rods, or pipe supports under concrete shall be attached to inserts set at time concrete is placed. Under wood, install bolts, lag bolts, or lag screws; under steel joists or trusses, install beam clamps.
24. Conduits shall be supported at intervals required by ordinance, but not to exceed 10 feet. One inch and smaller exposed conduits shall be fastened with medium or heavy duty one-hole malleable iron straps. Perforated straps and plumber's tape is not permitted for the support of conduits.
25. Conduits stubbed up through a roof or an arcade shall be flashed with a waterproof flashing, constructed of 24 gage galvanized sheet metal or of aluminum not less than 0.030 inch thick. Base of flashing shall extend on roof not less than 10 inches from conduit. Flashing shall extend up conduit not less than 6 inches and shall be in contact with conduit for one inch at top.
26. Bushings for rigid steel conduit shall be threaded insulating type. Setscrew bushings are not permitted.
27. Flex conduits shall be cut square and not at an angle.

28. Install conduits with a minimum number of bends, and in such a manner as to conform to structure and meet applicable code requirements.
29. Routing of conduits may be changed providing length of any conduit run is not increased more than 10 percent of the length indicated on Drawings.

B. Underground Requirements:

1. Conduits installed underground shall be entirely encased in 3 inch thick concrete on all sides with multiple conduits spaced not less than 1-1/2 inches apart, except where otherwise specified. Provide required conduit spacers to prevent any deflection of conduits when concrete is placed and to preserve position and alignment of conduits in concrete. Conduits shall be tied to spacers. Anchors shall be installed to prevent floating of conduits during placing of concrete. Provide red colored concrete to encase conduits of systems operating above 600 volts.
2. Underground conduits shall be buried to a depth of not less than 24 inches below finished grade to top of the concrete envelope, unless otherwise specified.
3. Assemble sections of conduit with required fittings and stagger joints. Cut ends of conduit shall be reamed to remove rough edges. Joints in conduits shall be provided liquid-tight. Bends at risers shall be completely below surface where possible.
4. Conduits in a common trench shall be separated by at least 3 inches of concrete. Electrical power and/or lighting conduit runs installed in a common trench with conduits containing signal system wiring such as public address, telephone, intrusion detection, fire alarm, television, computer networking, and clock systems shall maintain a separation of a minimum of 6 inches from these types of signal system conduits. Electrical power, lighting and signal conduits installed in a common trench with other utility lines such as gas, water, sewer and storm lines shall maintain 12 inches separation from these types of utility lines.
5. The IOR will observe underground installations before and during concrete placement. A mandrel shall be drawn through each run of conduit in presence of the IOR before and after placing concrete. Mandrel shall be 6 inches in length minimum, and have a diameter that is within 1/4 inches of diameter of conduit to be tested.
6. Non-metallic conduit installations shall comply with following additional requirements. Joints in PVC conduit shall be sealed by means of required solvent-weld cement supplied by conduit manufacturer. Non-metallic

conduit bends and deflections shall comply with requirements of applicable electrical code, except that minimum radius of any bend or offset for conduits sized from 1/2 inch to 1-1/2 inches inclusive shall not be less than 24 inches. Bends at risers and risers shall be PVC-coated rigid steel conduit or EMT if inside the structure. Radius of curve of bends or offsets in non-metallic conduit for public telephone system shall be not less than 10 times trade size of conduit, unless otherwise specifically permitted.

7. Furnish and install a 6-inch wide, polyethylene, red underground barrier type 12 inches above full length of concrete reading, "CAUTION ELECTRIC LINE BURIED BELOW".
8. Underground conduit systems provided for utility companies shall be furnished to meet the requirements of the utility companies rendering service.
9. Protect inside of conduit from dirt and rubbish during construction by capping openings.
10. Add bell-end bushings for conduit stub-up including underground entries to pull boxes, manholes, under floor standing switchboards and motor control centers.
11. Underground conduit for systems operating above 600 volts shall be a minimum size of 4 inches.

C. General Installation Requirements for Computer Network System Conduits: As required by other sections of this Division.

1. Location of outlet boxes and equipment on Drawings is approximate, unless dimensions are indicated. Drawings shall not be scaled to determine position and routing of wireways, drops, and outlet boxes. Location of outlet boxes and equipment shall conform to architectural features of the building and other Work already in place and must be ascertained in the field before start of Work.
2. The maximum pulling tensions of the specified cables shall not be exceeded and proper radius of cable bends shall be maintained.
3. For computer network wiring, conduit types shall be limited to rigid metal conduit, electrical metallic tubing, schedule 40 PVC, and flexible metallic conduit for lengths less than 6 feet.
4. Interior section of conduit run shall be not longer than 100 feet and contain not more than 2 bends of 90 degrees between pull points or pull boxes.

5. The inside radius of a conduit bend shall be at least 6 times the internal diameter of the conduit. When the conduit size is greater than 2 inches, the inside radius shall be at least 10 times the internal diameter of the conduit. For fiber-optic cable, the inside radius of a conduit bend shall be at least 10 times the internal diameter of the conduit.
6. Conduit shall be sized in accordance with Table 4.4-1 of EIA/ TIA 569 standard.
7. Splicing or terminating cables in pull boxes is not permitted.
8. For indoor application, a pull box shall be provided in conduit run where:
 - a. The length is over 100 feet.
 - b. There are more than 2 bends of 90 degrees.
 - c. There is a reverse bend in the run.
9. Boxes shall be provided in a straight section of conduit and shall not be installed in lieu of a bend. The corresponding conduit ends are to be aligned with each other. Conduit fittings shall not be installed in place of pull boxes.
10. Where a pull box is provided with raceways, the pull box shall comply with the following:
 - a. For straight pull-through, provide a length of at least 8 times the trade-size diameter of the largest raceway.
 - b. For angle and U-pulls:
 - (1) Provide a distance between each raceway entry inside the box and the opposite wall of the box of at least 6 times the trade-size diameter of the largest raceway, this distance being increased by the sum of the trade-size diameters of the other raceways on the same wall of the box.
 - (2) Provide a distance between the nearest edges of each raceway entry enclosing the same conductor of at least:
 1. Six times the trade-size diameter of the raceway; or
 2. Six times the trade-size diameter of the larger raceway if they are of different size.

3. For a raceway entering the wall of a pull box opposite to a removable cover, provide a distance from the wall to the cover of not less than the trade-size diameter of the largest raceway plus 6 times the diameter of the largest conductor.

11. Drawings generally indicate Work to be installed, but do not indicate all bends, transitions of special fittings required to clear beams, girders or other Work already in place. Investigate conditions where conduits and wire ways are to be installed, and furnish and install required fittings.

D. Slabs on Grade:

1. Unless specifically reviewed by the Architect and DSA, conduits 1-1/4 inches and larger are not permitted to be installed in structural concrete slabs. Where conduits are permitted, and are installed in concrete slabs on grade, slabs shall be thickened at bottom where conduits occur to provide 3 inches of concrete between conduit and earth. Required excavation shall be part of the Work of this section.
2. If concrete slab is 5 inches or more in thickness with a moisture barrier plastic sheet between earth and slab, one inch and smaller conduits shall be installed in the slab with a minimum of one inch concrete between earth and conduit.

- E. Concrete Walls, Beams, and Floors: Provide sleeves where conduits pierce concrete walls, beams, and floors, except floor slabs on grade. Sleeves shall provide 1/2 inch clearance around conduits. Sleeves shall not extend beyond exposed surfaces of concrete and shall be securely fastened to forms. Where conduits pass through walls below grade, caulk with required sealant and backer materials between conduit and sleeve to provide a watertight joint. Sealant shall be as indicated in Section 07920: Joint Sealants.

3.02 STUBS

- A. Panelboard: Install 2 one inch conduits from each flush mounted panelboard to access under floor space and to accessible ceiling space where these conditions occur. Cap conduits with standard galvanized pipe caps.
- B. Floor: At points where floor stubs are indicated in open floor areas, for connections to machines and equipment, conduits shall be terminated with couplings, tops flush with finished floor. Stubs shall extend above couplings the indicated distance. Where capped stubs are designated, couplings shall be closed with cast iron plugs with screw drive slots.
- C. Underground:

1. Underground conduit stubs shall be terminated at locations indicated, and shall extend 5 feet beyond building foundations, steps, arcades, concrete walks and paving. Rigid metallic conduit stubs and non-metallic conduit stubs shall be capped by installing a coupling flush in end wall of concrete encasement and plugging with a permitted plug. Project record drawings shall indicate location of ends of underground conduit stubs fully dimensioned and triangulated with reference to buildings or permanent landmarks. These dimensions, including depth below finished grade, shall be marked on project record drawings in presence of the IOR before backfilling trench. Where extending existing concrete encased stubs, clean, chip and wire brush end of existing concrete and brush on a heavy coat of neat cement paste or epoxy bonding agent.
2. Over ends of individual underground conduit stubs or groups of conduit stubs, install 4-inch x 18-inch deep PVC filled with concrete, flush with finished grade in asphaltic concrete or lawns, and 2 inches above finished grade in planting areas. Cast a 3-inch x 3-inch brass plate engraved "ELECT" flush in top of concrete. Secure plate to concrete with brass dowels or other required anchorage methods.

3.03 PROTECTION

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

3.04 CLEANUP

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

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Receptacles with integral surge suppression units.
4. Wall-box motion sensors.
5. Isolated-ground receptacles.
6. Hospital-grade receptacles.
7. Snap switches and wall-box dimmers.
8. Solid-state fan speed controls.
9. Wall-switch and exterior occupancy sensors.
10. Communications outlets.
11. Pendant cord-connector devices.
12. Cord and plug sets.
13. Floor service outlets, poke-through assemblies, service poles, and multi-outlet assemblies.

- B. Related Sections include the following:

1. Division 16 Section "Voice and Data Communication Cabling" for workstation outlets.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. 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.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

1.7 EXTRA MATERIALS (NOT USED)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
 - 5. Submit others for approval by EOR.

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5351 (single), 5352 (duplex).
 - b. Hubbell; HBL5351 (single), CR5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5381 (single), 5352 (duplex).
 - e. Submit others for approval to EOR.
- B. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498 Supplement SD.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 8300 (duplex).
 - b. Hubbell; HBL8310 (single), HBL8300H (duplex).
 - c. Leviton; 8310 (single), 8300 (duplex).
 - d. Pass & Seymour; 9301-HG (single), 9300-HG (duplex).
 - e. Submit others for approval by EOR.
- C. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; CR 5253IG.
 - b. Leviton; 5362-IG.
 - c. Pass & Seymour; IG6300.
 - d. Submit others for approval by EOR.
 3. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- D. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; TR8300.

- b. Hubbell; HBL8300SG.
 - c. Leviton; 8300-SGG.
 - d. Pass & Seymour; 63H.
 - e. Submit others for approval by EOR.
3. Description: Labeled to comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; GF20.
 - b. Pass & Seymour; 2084.
 - c. Submit others for approval by EOR.
- C. Hospital-Grade, Duplex GFCI Convenience Receptacles, 125 V, 20 A: Comply with UL 498 Supplement SD.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; HGF20.
 - b. Hubbell; HGF8300.
 - c. Leviton; 6898-HG.
 - d. Pass & Seymour; 2091-SHG.
 - e. Submit others for approval by EOR.

2.4 TVSS RECEPTACLES

- A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 1449, with integral TVSS in line to ground, line to neutral, and neutral to ground.
- 1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 volts and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
 - 2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."
- B. Duplex TVSS Convenience Receptacles:
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5362BLS.
 - b. Hubbell; HBL5362SA.
 - c. Leviton; 5380.
 - d. Submit others for approval by EOR.
 3. Description: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R.
- C. Isolated-Ground, Duplex Convenience Receptacles:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; IG5362BLS.
 - b. Hubbell; IG5362SA.
 - c. Leviton; 5380-IG.
 - d. Submit others for approval by EOR.
 3. Description: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- D. Hospital-Grade, Duplex Convenience Receptacles: Comply with UL 498 Supplement SD.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 8300BLS.
 - b. Hubbell; HBL8362SA.
 - c. Leviton; 8380.
 - d. Submit others for approval by EOR.
 3. Description: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R.
- E. Isolated-Ground, Hospital-Grade, Duplex Convenience Receptacles:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; IG8300HGBLS.
 - b. Hubbell; IG8362SA.
 - c. Leviton; 8380-IG.
 - d. Submit others for approval by EOR.
 3. Description: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R. Comply with UL 498 Supplement SD. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation

from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.5 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES (NOT APPLICABLE)

2.6 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; L520R.
 - b. Hubbell; HBL2310.
 - c. Leviton; 2310.
 - d. Pass & Seymour; L520-R.
 - e. Submit others for approval by EOR.

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A: (NOT USED)

2.7 PENDANT CORD-CONNECTOR DEVICES (NOT APPLICABLE)

1. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6

2.8 CORD AND PLUG SETS (NOT APPLICABLE)

2.9 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
 - e. Submit others for approval by EOR.

C. Pilot Light Switches, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221PL for 120 V and 277 V.
 - b. Hubbell; HPL1221PL for 120 V and 277 V.
 - c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
 - d. Pass & Seymour; PS20AC1-PLR for 120 V.
 - e. Submit others for approval by EOR.
3. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221L.
 - b. Hubbell; HBL1221L.
 - c. Leviton; 1221-2L.
 - d. Pass & Seymour; PS20AC1-L.
 - e. Submit others for approval by EOR.
3. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors. (NOT APPLICABLE)

F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 1995L.
 - b. Hubbell; HBL1557L.
 - c. Leviton; 1257L.
 - d. Pass & Seymour; 1251L.
 - e. Submit others for approval by EOR.

2.10 WALL-BOX DIMMERS (NOT APPLICABLE)

- A. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.11 FAN SPEED CONTROLS (NOT APPLICABLE)

2.12 OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 6111 for 120 V, 6117 for 277 V.
 - b. Hubbell; WS1277.
 - c. Leviton; ODS 10-ID.
 - d. Pass & Seymour; WS3000.
 - e. Watt Stopper (The); WS-200.
 - f. Submit others for approval by EOR.
3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).

B. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; AT120 for 120 V, AT277 for 277 V.
 - b. Leviton; ODS 15-ID.
 - c. Submit others for approval by EOR.
3. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).

C. Long-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; ATP1600WRP.
 - b. Leviton; ODWWV-IRW.
 - c. Pass & Seymour; WA1001.
 - d. Watt Stopper (The); CX-100.
 - e. Submit others for approval by EOR.
3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).

D. Long-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; ATD1600WRP.
 - b. Leviton; ODW12-MRW.
 - c. Watt Stopper (The); DT-200.
 - d. Submit others for approval by EOR.
3. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, and a minimum coverage area of 1200 sq. ft. (111 sq. m).

E. Wide-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; ATP120HBRP.
 - b. Leviton; ODWHB-IRW.
 - c. Pass & Seymour; HS1001.
 - d. Watt Stopper (The); CX-100-3.
 - e. Submit others for approval by EOR.
3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 150-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).

F. Exterior Occupancy Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Leviton; PS200-10.
 - b. Watt Stopper (The); EW-100-120.
 - c. Submit others for approval by EOR.
3. Description: Passive-infrared type, 120/277 V, weatherproof, adjustable time delay up to 15 minutes, 180-degree field of view, and 110-foot (34-m) detection range. Minimum switch rating: 1000-W incandescent, 500-VA fluorescent.

2.13 COMMUNICATIONS OUTLETS (NOT APPLICABLE)

2.14 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: **0.035-inch- (1-mm-)** thick, satin-finished stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant , die-cast aluminum with lockable cover.

2.15 FLOOR SERVICE FITTINGS (NOT APPLICABLE)

2.16 POKE-THROUGH ASSEMBLIES (NOT APPLICABLE)

2.17 MULTIOUTLET ASSEMBLIES (NOT APPLICABLE)

2.18 SERVICE POLES (NOT APPLICABLE)

2.19 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices Connected to Normal Power System: Ivory, unless otherwise indicated or required by NFPA 70 or device listing.
 - 2. Wiring Devices Connected to Emergency Power System: Red
 - 3. Isolated-Ground Receptacles: (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pig tailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles **down**, and on horizontally mounted receptacles to the **right**.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
 2. Test Instruments: Use instruments that comply with UL 1436.
 3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
 1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Test straight blade **convenience outlets** for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

END OF SECTION

SECTION 16715

FIRE ALARM SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. Fire alarm system shall consist of one fire alarm control panel or networked nodes, of the same make and CSFM (California State Fire Marshall) listed for the application as indicated in drawings.
 - 2. All labor, equipment, materials, connections, testing, and performance of operations in the installation of fire alarm system as indicated on Drawings or as specified herein.
- C. Related Sections:
 - 1. Section 15700: Heating, Ventilating, and Air Conditioning Equipment.
 - 2. Section 15900: HVAC Instrumentation and Controls.
 - 3. Section 16010: Basic Electrical Requirements.
 - 4. Section 16050: Basic Electrical Materials and Methods.
 - 5. Section 16130: Raceways, Fittings and Supports.
 - 6. Section 16120: Low-Voltage Wire 600 Volts AC

1.02 SYSTEM REQUIREMENTS

- A. Fire detection system shall continually supervise and monitor the following initiating, signaling, and monitoring circuits:
 - 1. Manual fire-pull stations.
 - 2. Smoke and heat detectors, including those installed under other sections.
 - 3. Fire sprinkler flow and tamper switches and related fire sprinkler horn or bell.
 - 4. Alarm signaling circuits including alarm bells, horns and visual alarm

units.

5. Annunciators.
 6. Power supplies and batteries.
 7. Interconnection with PA, telephone, HVAC system where applicable, and kitchen fire suppression system.
- B. System controls shall be UL listed for power limited applications in accordance with California Electrical Code.
- C. Fire alarm devices shall be listed for installation in the fire alarm system panel to which they are being connected.
- D. Complete installation shall conform to the latest version of NFPA 72, California Fire Code, CBC, and California Electrical Code in force at time of the bid.

1.03 APPROVALS

- A. Fire alarm, signal, and control equipment shall be approved by the Architect, in addition to other required approvals. Fire alarm system shall pass a Los Angeles City Fire Chiefs Regulation 4 test administered by the Owner.
- B. Certification: Installation of fire alarm system shall not start until Shop Drawings, including State Fire Marshal listing numbers of fire alarm components, are submitted and approved by the Architect. Written certification by fire alarm equipment distributor or manufacturer shall be submitted to the Architect stating that system and its component parts are as approved and listed by the State Fire Marshal, and that the design conforms to requirements set forth in CBC.

1.04 PERFORMANCE

- A. System shall be fully programmable, configurable, and expandable in the field without special tools or PROM programmers and shall not require replacement of memory ICs. Programming shall be provided through built-in keypad in control panel, or external computer. Programs shall be non-volatile memory.

1.05 SYSTEM FUNCTIONAL OPERATION

- A. When a fire alarm condition is detected by one of the system initiating devices, the following functions shall occur:
1. System alarm LED shall flash.
 2. Local sounding device in panel shall be activated.
 3. 80-character LCD display shall indicate type of device, custom label

- location label and point status alarm condition.
4. Appropriate change of status message shall be transmitted to remote annunciator.
 5. Automatic programs assigned to alarm point shall be executed and associated indicating devices and relays activated.
 6. Remaining signaling devices at the Project site such as program bells, horns, or tone over PA systems, either manual or automatic, shall be rendered inoperable, however voice audio PA functions shall remain fully operational.
 7. U.D.A.C.T (universal digital alarm communicator transmitter) shall activate.
- B. When a trouble condition is detected by one of the system initiating devices, the following functions shall occur:
1. System trouble LED shall flash.
 2. Local sounding device in panel shall be activated.
 3. 80-character LCD display shall indicate type of device and custom label location associated with trouble condition and its location. Unacknowledged alarm messages shall have priority over trouble messages. If such an alarm is displayed, then trouble messages shall not be displayed.
 4. Appropriate message shall be transmitted to remote annunciator.
 5. U.D.A.C.T shall activate.
- C. Activation of control panel acknowledge switch in response to a single new trouble or alarm condition shall silence panel sounding device and change system alarm or trouble LED from flashing to steady-ON. If additional new alarm or trouble conditions exist in system, activation of this switch shall advance display to next alarm or trouble condition that exists, and shall not silence local audible device or change LED to steady until new conditions have been so acknowledged. New alarm conditions shall always be displayed before new trouble conditions. Occurrence of a new alarm or trouble condition shall cause panel to resound, and sequences as described above, shall repeat.
- D. Activation of signal silence switch shall cause appropriate indicating appliances and relays to return to normal condition. Selection of indicating circuits and relays silenced by this switch shall be fully programmable.
- E. Activation of signal silence switch shall cause electronically latched initiating

devices or zones, as well as associated output devices and circuits, to return to normal condition. If alarm conditions exist in system after system reset switch activation, system shall then resound alarm conditions as indicated hereafter.

- F. Activation of system test switch shall initiate an automatic test of intelligent detectors in system. Such test shall activate electronics in intelligent devices, simulating an alarm condition. A report summarizing results of this test shall be displayed automatically on front panel. At end of test, system can be reset by activation of system reset switch.
- G. Activation of lamp test switch shall turn on LED indicators, LCD display, and local sounding device in panel, and then return to previous condition.
- H. Audible alarm-indicating appliances may be silenced, after one minute, by operating alarm silence switch or by use of the key-operated switch at remote annunciators. A subsequent zone alarm shall reactivate signals. Audible alarm-indicating appliances and visual alarm indicating devices shall automatically be silenced after 4 minutes of operation.
- I. Elevator lobby smoke detectors shall, in addition to operations listed above, cause elevator cars to be recalled as follows:
 - 1. Elevator cars shall be recalled to main level of egress.
 - 2. Elevator cars shall be recalled to predetermined alternate level if main lobby smoke detector is activated.
- J. Detection and signaling circuits shall be monitored against open/short circuit and trouble conditions and shall be indicated while remaining circuits continue to operate normally.

1.06 POWER REQUIREMENTS

- A. Control panel shall receive 120 VAC power, 60 Hz, 20A through a dedicated circuit. Circuit breaker protection for the dedicated fire alarm control panel circuit shall be of the lock-on type and be labeled with FACP location at the electrical panel. Electric panel location and circuit number shall be clearly labeled in the fire alarm control panel cabinet. Transient voltage surge suppression shall be provided at the 120VAC input terminal.
- B. System shall be provided with sufficient battery capacity to operate entire system upon loss of normal 120 VAC power, in a normal supervisory mode, for a period of 24 hours with 5 minutes of alarm indication at end of this period. System shall automatically transfer to standby batteries upon power failure. Battery charging and recharging operations shall be automatic. Batteries, once discharged, shall recharge at a rate to provide a minimum of 70 percent capacity in 12 hours.
- C. Circuits requiring system operating power shall be 24 VDC and shall be

individually fused at control panel.

1.07 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Component Plan Submittal: Availability and listing for its application shall be verified for all system components before presentation of the submittal. Include the following information and details as applicable:
 - 1. Installer name, address, telephone number.
 - 2. List of system components, equipment and devices, including manufacturer model numbers and California State Fire Marshal listing numbers, mounting heights, and symbols per LAUSD symbol list.
 - 3. Copies of manufacturer specification sheets for equipment and devices indicated.
 - 4. Voltage Drop Calculations: Include the following information for the worst case:
 - a. Point-to-point or Ohms law calculations.
 - b. Zone used in calculations.
 - c. Voltage drop percent. Voltage drop shall not exceed manufacturer's requirements. If voltage drop exceeds 10 percent, indicate manufacturer listed operating voltage ranges for equipment and devices.
 - 5. Battery types, amp hours, and load calculations including the following:
 - a. Normal operation: 100 percent of applicable devices for 24 hours to equal control panel amps plus list of amps per device that draw power from the panel during standby power condition including, but not limited to, zone modules, detectors and devices as identified.
 - b. Alarm condition: 100 percent of applicable devices for 5 minutes to equal control panel amps plus list of amps per device that draw power from panel during alarm condition including, but not limited to, the following:
 - (1) Zone modules.
 - (2) Signal modules.

- (3) Detectors.
 - (4) Signal devices.
 - (5) Annunciator.
 - (6) Other devices as identified.
- c. Normal operation plus alarm operation load calculation shall include total amp hours required and total amp hours provided.
6. Provide one copy of testing procedures.
- C. Shop Drawings: Provide Shop Drawings, in the same size as the design Drawings, Shop Drawings shall include the following:
1. Provide, drawn to scale, elevations of all system enclosures, and actual layout of the Fire Alarm Control Panel, power supply, annunciators.
 2. Site Plan
 3. One line drawing for the entire system network indicating panel to panel conductors including gauge, quantity, conduit size and type (designation) and specific function.
 4. System panel one-line drawings indicating the quantity and type (designation) of conductors exiting the enclosure for initiating, notification, or other command control functions required for complete system operation:
 - a. Individual floor/building plan view drawings indicating all device locations in accordance with the legend provided.
 - b. Individual point addresses for all initiation and notification devices.
 - c. Device “typical” wiring diagrams. These drawings shall indicate specific termination details for all peripheral equipment and/or interface devices.
 5. Provide interfacing with equipment furnished by others including voltages, and other required coordination items.
 6. Each of the pictorial diagrams included shall appear identical to the products they are intended to depict, in order to speed installation of the system, and to enhance the accuracy of the installation Work. Typical wiring diagrams or catalog sheets are not permitted.
 7. Background Drawings may be obtained from the Architect in electronic

version. Shop Drawings shall be prepared in the latest version of AutoCad with 3 – CD ROM electronic copies submitted along with full sized Shop Drawings.

8. Other installation and coordination drawings specifically related to this section shall be included as follows:
 - a. Size A (8-1/2 inch x 11 inch) and size B (11 inch x 17 inch) shall be bound into the manual.
 - b. Larger drawings shall be folded and inserted into transparent envelopes and bound into the manual.
 9. Installation and coordination drawings for items in other sections shall be included with submittal of Shop Drawings. Submit blue line copies and one reproducible copy of installation and coordination drawings.
 10. Samples: Provide Samples of material and equipment as required by the Architect. If Samples are requested, they shall be submitted within 10 days from date of request.
- D. In addition to the above requirements, provide submittals to meet any additional requirements of DSA.

1.08 QUALITY ASSURANCE

- A. Installer shall have successfully completed at least 5 projects of equal scope in the past 5 years, and have been in business of furnishing and installing fire alarm systems of this type for at least 5 years.
- B. Installer shall be a factory authorized distributor and service provider for the brand of equipment offered and shall provide documentation to the Architect upon request.
- C. Installer shall maintain a fully equipped service organization capable of furnishing repair service to the equipment and shall maintain a spare set of major parts for the system at all times.
- D. Furnish a letter from manufacturer of equipment certifying equipment has been installed according to factory standards and that system is operating properly.
- E. Certifications: Submit certification from the equipment manufacturer indicating the installer is an authorized representative of the equipment manufacturer and is trained on network applications.
- F. Electrical materials and equipment installed shall be new.
- G. All of the equipment in this specification shall be furnished and installed by the

Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of all major equipment, which certifies that the installing contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.

- H. The fire alarm contractor shall be UL listed company under the UL classification of (UUJS). The installation company shall UL certify this installation.
- I. The fire alarm contractor shall have a NICET Certified Technicians on staff in their facility directly involved with this project to ensure technical expertise to this project and adherence with these specifications.
- J. Material and equipment shall pass a City of Los Angeles Fire Chiefs Regulation 4 test administered by Owner personnel.
- K. System startup and testing shall be performed under the direct observation of the IOR.
- L. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment with the most current software package available at the time of installation. At the time of Owner Acceptance of the installation, all equipment, including any and all updated software and a laptop computer which is to include the appropriate operating system and all software, pass-codes, electronic keys and program discs, manuals and cables employed in the installation of the system, shall be delivered to the IOR.. In addition, when the software is available in disk format, a backup copy of the most up to date revision, in disk format, shall be handed to the Owner at the completion of the project. A software license agreement shall be made available for the responsible District representative to sign at the time of training.

1.09 WARRANTY

- A. Manufacturer shall provide a 3 year material warranty. Installer shall provide a 3 year labor warranty.
- B. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer for a period of 5 years after expiration of the warranty.

1.10 MAINTENANCE PERIOD

- A. Maintenance Service: Provide, as part of the Work of this section, a 12 month maintenance service period commencing from the date of Substantial Completion.
- B. Maintenance and testing shall be as required by local authorities having jurisdiction. A preventive maintenance schedule shall be provided, describing the

plan for preventive maintenance of devices and subassemblies requiring regular maintenance. The schedule shall include:

1. Systematic examination, adjustment and cleaning of detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and accessories of the fire alarm system.
2. Circuits in the fire alarm network shall be tested semiannually.
3. System shall be tested in accordance with the requirements of NFPA 72.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fire alarm equipment shall be standard products of the Gamewell Co., to match existing system components. Deviations from intended functions of specified system are not permitted. Equipment shall not be ordered or installed until such equipment has been reviewed and approved by the Architect.

B. Network Cables:

1. Indoor Network Applications in conduit, or in surface mounted raceway where it is indicated on drawings: West Penn No. D980, one pair 18 gage solid copper, unshielded, copolene II insulated and PVC jacketed.
2. Indoor SLC Applications in conduit, or in surface mounted raceway where it is indicated on drawings: West Penn No. D990, one pair 16 gage solid copper, unshielded, copolene II insulated and PVC jacketed.
3. Indoor Annunciator Applications in conduit, or in surface mounted raceway where it is indicated on drawings: West Penn No. D975, one pair 18 gage solid copper, shielded, copolene II insulated and PVC jacketed.
4. Outdoor/Underground Network Applications: West Penn AQ224, 2-conductor 18 gage standard copper, unshielded, water-blocked construction and PVC insulated.
5. Outdoor/Underground SLC Applications: West Penn AQ225, 2-conductor 16 gage standard copper, unshielded water-blocked construction and PVC insulated.

PART 3 - EXECUTION

3.01 SYSTEM INSTALLATION

- A. Install required conductors to devices indicated on Drawings. Provide required conductor terminations to devices for a complete system to function as specified and indicated on Drawings. Refer to Section 16120: Low-Voltage Wire 600 Volt AC, for wire type and wire color for device types.
- B. Splices shall not be provided in junction boxes. Terminations shall be in terminal cabinets or on equipment terminals.
- C. Conductors shall be installed within conduits, boxes, and terminal cabinets in a totally enclosed installation. Furnish and install conductors required to connect incoming and outgoing circuits, including spare conductors, to terminal strips within terminal cabinets.
- D. Wiring within equipment and terminal cabinets shall be installed to conform to standard engineering practice, and shall be terminated on terminal blocks having terminals for required connections. Wiring shall be cabled, laced, and securely fastened in place so that no weight is imposed on equipment or terminals.
- E. Install required terminal blocks within terminal cabinets. Terminal blocks shall be installed on inside back of cabinets only, not on side. Incoming wiring shall be terminated on the left side of terminal blocks, outgoing wiring shall be terminated on the right side of the terminal blocks.
- F. Conductors shall be color-coded and tagged with code markers at terminal cabinets, junction boxes, pull boxes and equipment. A wire index shall be typed and installed on terminal cabinet doors. Index shall be covered with clear plastic adhesive covers. Wiring shall be identified as to building and location of devices in the index.
- G. Wiring within equipment and terminal cabinets shall be carefully strapped, and shall be formed in rectangular configuration. Wires shall be properly numbered in numerical order and shall maintain same number throughout the Project site.
- H. Complete installation shall comply with local building codes and applicable provisions of the California Electrical Code.
- I. Location of outlet boxes and equipment on Drawings is approximate, unless dimensions are indicated. Do not scale Drawings to determine locations and routing of conduits and outlet boxes. Location of outlet boxes and equipment shall conform to architectural features of the building and other Work already in place, and must be ascertained in the field before the start of Work.
- J. Drawings generally indicate Work to be provided, but do not indicate all bends, transitions or special fittings required to clear beams, girders or other Work already in place. Investigate conditions where conduits are to be installed, and furnish and install required fittings.
- K. Provide a laminated engraved bakelite, or etched metal tag, approximately ½”

wide x 1” long for each indicating device that is hidden from view, and notification devices that contain an end of line resistor. Tags shall include an abbreviation for the type of device: HD for heat detector, EOL for end of line resistor, DSD for duct smoke detector. Tags shall be permanently attached on access panel or t-bar grid which is used to access a hidden device. Tags for notification devices containing end of line resistors shall be attached to the device or adjacent surface.

3.02 SYSTEM OPERATION

- A. Unless otherwise specified, actuation of manual stations, smoke detectors, heat detectors or waterflow switches shall cause the following operations to occur:
 - 1. Activate audible circuits.
 - 2. Actuate strobe units until the panel is reset.
 - 3. Release magnetic door holders to doors to adjacent zones on the floor from which the alarm was initiated.
 - 4. Duct type smoke detectors shall, in addition to the above functions, shut down the ventilation system or close associated control dampers as required.
- B. Alarm signals will only be transmitted to U.L central station by activating via a normally open contact in the fire alarm control panel a Fire Alarm Communicator, installed under this section.

3.03 TESTING

- A. A 24 hour notice shall be provided to the IOR before final testing.
- B. Testing of fire detection system shall be as required by the State Fire Marshal and local authorities having jurisdiction. Installer is responsible for identifying required testing, coordinating, scheduling, and conducting tests before Substantial Completion. Tests shall include the following:
 - 1. Operation of signal-initiating devices (smoke detectors, heat detectors and pull stations).
 - 2. Operation of indicating devices (alarm horns and alarm lamps).
 - 3. Operation of system features under normal operation.
 - 4. Operation of system supervisory features.
 - 5. Operation of system features on standby power, with primary power off.

6. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 7. Open initiating device circuits and verify that trouble signal actuates.
 8. Open signaling line circuits and verify that trouble signal actuates.
 9. Open and short notification appliance circuits and verify that trouble signal actuates.
 10. Open and short (wire only) network communications and verify that trouble signals are received at network annunciators or reporting terminals.
 11. Ground initiating device circuits and verify response of trouble signals.
 12. Ground signaling line circuit and verify response of trouble signals.
 13. Ground notification appliance circuit and verify response of trouble signals.
 14. Check alert tone to alarm notification devices.
 15. Check installation, supervision, and operation of intelligent smoke detectors using walk test.
 16. Alarm conditions that the system is required to detect shall be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
 17. When the system is equipped with optional features, consult the manufacturer manual to determine proper testing procedures.
- C. Upon completion of installation of fire alarm equipment, provide to the IOR a signed, written statement confirming that fire alarm equipment was installed in accordance with the Specifications, Shop Drawings, instructions and directions provided by the manufacturer.
- D. Demonstrate in presence of the IOR that circuit and wiring tests are free of shorts and grounds and that installation performs as specified herein and within manufacturer's guidelines.
- E. Software Modifications:
1. If required, provide the services of a factory trained and authorized technician to perform system software modification, upgrades or changes. Response time of the technician to the Project site shall not exceed 24

hours.

2. If required, provide hardware, software, programming tools, and documentation necessary to modify the fire alarm network on the Project site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modification on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modification are being provided.
- F. Complete the inspection and testing form as required by NFPA 72, and submit one copy of the completed form to the Architect and IOR.

3.04 OPERATING/SERVICE MANUALS

- A. Submit 5 copies of service manuals including the following:
1. Detailed explanation of the operation of the system.
 2. Instructions for routine maintenance.
 3. Detailed instructions for repair of major components of the system.
 4. Pictorial parts list and part numbers.
 5. Pictorial and schematic electrical drawings of wiring systems, including operating and safety control panels, annunciators and major components.
 6. Installation instructions for system components.
 7. Programming instructions.
 8. Program listing.
 9. Final test report.
 10. A single reproducible set of record drawings reflecting the system exactly as it was installed including exact location of components.

3.05 SPARE PARTS

- A. The following new spare parts shall be furnished in unopened boxes:
1. 5 percent spare pull stations (minimum one spare pull station per type).

2. 5 percent spare smoke and heat detectors (minimum one spare smoke and heat detector per type).
3. 5 percent spare audible devices (minimum one spare audible device per type).
4. 5 percent spare strobe devices (minimum one spare strobe device per type).

3.06 INSTRUCTION PERIODS

- A. Before Substantial Completion, provide three instruction periods, one for Project site Owner operators and system users and two for Owner maintenance personnel. As a minimum, the following shall be provided:
 1. Provide a minimum of one 4 hour Project on-site instruction period for Owner operators including a complete set of written operating instructions, which shall remain on the Project site.
 2. Provide a minimum of one 8 hour Project site instruction period for Owner maintenance personnel, consisting of a Project site walk-through indicating all device locations and demonstrating all system functions.
 3. Provide a minimum of 16 hour classroom instruction period for owner maintenance personnel consisting of field programming, uploading and downloading data, troubleshooting, cable connections, installing and deleting pass-codes, adding or removing addressable devices or components and general operation. Eight hours of this training shall be actual hands-on training using a laptop computer on system mockups.
 4. All instruction periods shall be scheduled and coordinated by the IOR.

3.07 PROTECTION

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

3.08 CLEANUP

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

END OF SECTION