SPECIFICATIONS

City of Beverly Hills –
Roxbury Park Restroom Facility

471 S. ROXBURY DRIVE
BEVERLY HILLS, CALIFORNIA

DECEMBER 20, 2013
RTK PROJECT NO. 12-07103

Prepared by:

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RTK

SECTION 00002

PROJECT DIRECTORY

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SECTION 01050

FIELD ENGINEERING

PART 1 - GENERAL

1.01 SUMMARY

A. Provide such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:
   1. Establishing and maintaining lines and levels;
   2. Structural design of shores, forms, and similar items provided by the Contractor as part of his means and methods of construction.

1.02 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Upon request of the Architect, submit:
   1. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.
   2. Documentation verifying accuracy of field engineering work.
   3. Certification, signed by the Contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance or nonconformance with requirements of the Contract Documents.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

1.04 PROCEDURES

A. In addition to procedures directed by the Contractor for proper performance of the Contractor's responsibilities:

   1. Locate and protect control points before starting work on the site.
   2. Preserve permanent reference points during progress of the Work.
   3. Do not change or relocate reference points or items of the Work without specific approval from the Architect.
   4. Promptly advise the Architect when a reference point is lost or destroyed, or requires relocation because of other changes in the Work.
      a. Upon direction of the Architect, require the field engineer to replace reference stakes or markers.
      b. Locate such replacements according to the original survey control.

END OF SECTION

SECTION 01090

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:
   1. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.
   2. Where materials or workmanship are required by these Contract Documents to meet or exceed the specifically named code or standard, it is the Contractor's responsibility to provide materials and workmanship which meet or exceed the specifically named code or standard.
   3. Proof:
      a. It is also the Contractor's responsibility, when so required by the Contract Documents or by written request from the Architect, to deliver to the Architect all required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard.
      b. Such proof shall be in the form requested by the Architect, and generally will be required to be copies of a certified report of tests conducted by a testing agency approved for that purpose by the Architect.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and other Sections of Division One of these Specifications.
   2. Specific naming of codes or standards occurs on the Drawings and/or in these Specifications.

1.02 QUALITY ASSURANCE

A. In procuring all items used in this Work, it is the Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and to verify that the items procured for use in this Work meet or exceed the specified requirements.

B. Rejection of non-complying items:
   1. The Architect reserves the right to reject items incorporated into the Work which fail to meet the specified minimum requirements.
   2. The Architect further reserves the right, and without prejudice to other recourse the Architect may take, to accept non-complying items subject to an adjustment in the Contract Amount as approved by the Architect and the Owner.

C. Applicable reference standards include, but are not necessarily limited to, standards of agencies and associations who may be referred to in the Specifications by the following abbreviations.

   1. "AA" = Aluminum Association
   2. "AABC" = Associated Air Balance Council
   3. "AAMA" = American Architectural Manufacturers' Association
   4. "AASHTO" = American Assoc. of State Highway and Transportation Officials
   5. "ACI" = American Concrete Institute

6.	"ADC"	=	Air Diffusion Council
7.	"AGC"	=	Associated General Contractors of America
8.	"AI"	=	Asphalt Institute
9.	"AIA"	=	American Institute of Architects
10.	"AISC"	=	American Institute of Steel Construction, Inc.
11.	"AISE"	=	Association of Iron and Steel Engineers
12.	"AISI"	=	American Iron and Steel Institute
13.	"AITC"	=	American Institute of Timber Construction
14.	"ANSI"	=	American National Standards Institute
15.	"APA"	=	American Plywood Association
16.	"API"	=	American Petroleum Institute
17.	"ARI"	=	Air Cond. and Refrigeration Institute
18.	"ASCE"	=	American Society of Civil Engineers
19.	"ASHRAE"	=	American Institute of Heating, Refrigerating, and Air Conditioning Engineers
20.	"ASME"	=	American Society of Mechanical Engineers
21.	"ASTM"	=	American Society for Testing and Materials
22.	"AWI"	=	Architectural Woodwork Institute
23.	"AWS"	=	American Welding Society
24.	"AWWA"	=	American Water Works Association
25.	"BIA"	=	Brick Institute of America
26.	"BOCA"	=	Building Officials and Code Administrators, International
27.	"CDA"	=	Copper Development Association
28.	"CRSI"	=	Concrete Reinforcing Steel Institute
29.	"CS"	=	"Commercial Standards" of the U. S. Department of Commerce Office of Industry and Commerce Commodity Standards Division
30.	"CSA/CAN"	=	Canadian Standards Association
31.	"DOE"	=	United States Department of Energy
32.	"DOT"	=	United States Department of Transportation
33.	"FGMA"	=	Flat Glass Marketing Association
34.	"NEMA"	=	National Electrical Manufacturers' Assoc.
35.	"NFPA"	=	National Fire Protection Association
36.	"PCI"	=	Precast/Prestressed Concrete Institute
37.	"SMACNA"	=	Sheet Metal and Air Conditioning Contractors' National Association
38.	"SSPC"	=	Steel Structures Painting Council
39.	"TCA"	=	Tile Council of America, Inc.
40.	"UL"	=	Underwriters Laboratory

END OF SECTION

SECTION 01100

SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: City of Beverly Hills – Roxbury Park Restroom Facility

B. Owner's Name: City of Beverly Hills

C. Contacts: Alan Schneider – Director of Project Administration
Donielle Kahikina – Project Manager

D. Design Professional's Name: RTK Architects, Inc.

E. Contact: Mandana Motahari, AIA.

F. The Project consists of the construction of a new single story restroom facility to replace existing facility at same location.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00500 - Agreement.

B. The work of each separate prime contract is identified in this section and on the Drawings.

1.03 WORK BY OWNER

A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion. Some items include:
1. Data / communication cabling.

B. Owner will supply and install the following:
1. Security Cameras.
2. Signage (other than required ADA signage)

1.04 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site and premises to allow:
1. Owner occupancy.
2. Work by Others.
3. Work by Owner.

4. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Owner:
   1. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Time Restrictions:
   1. Limit conduct of especially noisy exterior work to weekends, 8 a.m. to 6 p.m.
   2. Limit conduct of especially noisy interior work to after hours, 9 p.m. to 7 a.m.

1.06 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

1.07 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.
B. Section 01200 – Project Meetings.
C. Section 01210 - Allowances.
D. Section 01230 - Alternatives.
E. Section 01300 - Administrative Requirements.
F. Section 01315 - Mechanical and Electrical Coordinator.
G. Section 01325 - Construction Progress Schedule.
H Section 01565 - Security Measures.
I. Section 01400 - Quality Requirements.
J. Section 01090 - Reference Standards.
K. Section 01500 - Temporary Facilities and Controls.
L. Section 01510 - Temporary Utilities.
M. Section 01525 - Field Offices.
N. Section 01550 - Vehicular Access and Parking.
O. Section 01585 - Project Signs.
P. Section 01600 - Product Requirements.
Q. Section 01700 - Execution Requirements.
R. Section 01780 - Closeout Submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01170

REQUESTS FOR INFORMATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section describes procedures for requesting information other than that shown in the Contract Documents, and discusses conditions under which such requests will be considered.

1.02 REQUESTS FOR INFORMATION

A. Assumption of prior knowledge:
   1. Instructions to Bidders for this Work state requirements that, prior to submitting a bid, bidders become thoroughly familiar with the proposed Contract Documents and that they request and secure clarification of all matters on which there may be any question as to design intent.
   2. Reasons for these requirements include the Owner's wish:
      a. That bidders have complete and adequate knowledge of the proposed Work in order to propose a fair and proper bid price;
      b. To avoid unnecessary time-consuming and effort-consuming requests for information during progress of the Work; and
      c. To discourage frivolous requests for information while encouraging acquisition of complete familiarity with the Drawings, Specifications, and other Documents of the Contract.

B. However, the Owner and the Architect recognize that data may inadvertently have been omitted from the Contract Documents or require clarification of alleged conflict of data, and the following procedures are established for requesting such data.

C. Procedures:
   1. Prior to requesting information, conduct a thorough search of the Contract Documents and determine that the information is apparently missing from the Contract Documents or requires clarification of an alleged conflict of data.
   2. Fill out a "Request for Information" form and deliver it to the Architect.
   3. The Architect will conduct the necessary search.
   4. Within five (5) calendar days, the Architect will respond to the Request for Information.
      a. Should the information be missing, or require clarification, the Architect will respond by giving the proper information to the Contractor.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: To enable orderly review during progress of the Work, and to provide for systematic discussion of problems, the Construction Manager will conduct project meetings throughout the construction period.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. The Contractor's relations with his subcontractors and materials suppliers, and discussions relative thereto, are the Contractor's responsibility and normally are not part of project meetings content.

1.02 SUBMITTALS

A. Agenda items: To the maximum extent practicable, advise the Architect at least 24 hours in advance of project meetings regarding items to be added to the agenda.

B. Minutes:
   1. The Construction Manager will compile minutes of each project meeting, and will furnish required copies to the Contractor and required copies to the Owner.
   2. Recipients of copies may make and distribute such other copies as they wish.

1.03 QUALITY ASSURANCE

A. For those persons designated by the Contractor to attend and participate in project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings.

PART 2 - PRODUCTS

(No products are required in this Section)

PART 3 - EXECUTION

3.01 MEETING SCHEDULE

A. Except as noted below for Preconstruction Meeting, project meetings will be held weekly, or as designated by the Construction manager.

B. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.02 MEETING LOCATION

A. The Construction manager will establish meeting location. To the maximum extent practicable, meetings will be held at the job site.

3.03 PRECONSTRUCTION MEETING

A. Preconstruction Meeting will be scheduled to be held within -- working days after the Owner has issued the Notice to Proceed.
   1. Provide attendance by authorized representatives of the Contractor and major subcontractors.
   2. The Architect will advise other interested parties, including the Owner, and request their attendance.

B. Minimum agenda: Data will be distributed and discussed on at least the following items:
   1. Organizational arrangement of Contractor's forces and personnel, and those of subcontractors, materials suppliers, Construction manager and Architect.
   2. Channels and procedures for communications.
   3. Construction schedule, including sequence of critical work.
   4. Contract Documents, including distribution of required copies of original Documents and revisions.
   5. Processing of Shop Drawings and other data submitted to the Architect for review.
   6. Processing of Bulletins, field decisions, and Change Orders.
   7. Rules and regulations governing performance of the Work; and
   8. Procedures for safety and first aid, security, quality control, housekeeping, and related matters.
   9. Record drawings and payment schedules.

3.04 PROJECT MEETINGS

A. Attendance:
   1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work.
   2. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the Work is involved.

B. Minimum agenda:
   1. Review, revise as necessary, and approve minutes of previous meetings.
   2. Review progress of the Work since last meeting, including status of submittals for approval.
   3. Identify problems which impede planned progress.
   4. Develop corrective measures and procedures to regain planned schedule.
   5. Complete other current business.

C. Revisions to minutes:
   1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
   2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
   3. Challenge to minutes shall be settled as priority portions of "old business" at the next regularly scheduled meeting.

END OF SECTION

SECTION 01230

ALTERNATIVES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Alternative submission procedures.
B. Documentation of changes to Contract Sum and Contract Time.

1.02 RELATED SECTIONS

A. Document 00200 - Instructions to Bidders: Section 2, Instructions for preparation of pricing for alternatives.
B. Document 00433 – Appendix B - Alternatives: List of alternatives as supplement to Bid Form.

1.03 ACCEPTANCE OF ALTERNATIVES

A. Alternatives quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted alternatives will be identified in the Owner-Contractor Agreement.
B. Coordinate related work and modify surrounding work to integrate the Work of each alternative.

1.04 SCHEDULE OF ALTERNATIVES

A. **Alternative No. 1:**
Alternative Item: Include a deductive Alternate for material cost only where Resysta siding has been called out on the documents. In the event that the deductive alternate is selected, the material will be provided by the owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01310

PROGRESS SCHEDULES

PART 1 - GENERAL

1.01 SUMMARY

A. To assure adequate planning and execution of the Work so that the Work is completed within the number of calendar days allowed in the Contract, and to assist the Architect in appraising the reasonableness of the proposed schedule and in evaluating progress of the Work, prepare and maintain the schedules and reports described in this Section.

B. Related work:
   1. Requirements for progress schedule: Bid Package.
   2. Construction period: Form of Agreement.

1.02 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Preliminary analysis: Within ten calendar days after the Contractor has received the Owner's Notice to Proceed, submit one digital file and four prints of a preliminary construction schedule prepared in accordance with Part 3 of this Section.

C. Construction schedule: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit one reproducible copy and four prints of a construction schedule prepared in accordance with Part 3 of this Section.

D. Periodic reports: On the first working day of each month following the submittal described in Paragraph 1.2-C above, submit four prints of the construction schedule updated as described in Part 3 of this Section.

1.03 QUALITY ASSURANCE

A. Employ a scheduler who is thoroughly trained and experienced in compiling construction schedule data, and in preparing and issuing periodic reports as required below.

B. Reliance upon the approved schedule:
   1. The construction schedule as approved by the Architect and the Owner will be an integral part of the Contract and will establish interim completion dates for the various activities under the Contract.
   2. Should any activity not be completed within 15 days after the stated scheduled date, the Owner shall have the right to require the Contractor to expedite completion of the activity by whatever means the Owner deems appropriate and necessary, without additional compensation to the Contractor.
   3. Should any activity be 30 days or more behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate.
   4. Costs incurred by the Owner and by the Architect in connection with expediting construction activity under this Article shall be reimbursed by the Contractor.
   5. It is expressly understood and agreed that failure by the Owner to exercise the option either to order the Contractor to expedite an activity or to expedite the activity by other means shall not be considered to set a precedent for any other activities.

PART 2 - PRODUCTS

2.01 CONSTRUCTION ANALYSIS

A. Graphically show by bar-chart, or other means acceptable to the Architect, the order and interdependence of all activities necessary to complete the Work, and the sequence in which each activity is to be accomplished, as planned by the Contractor and his project field superintendent in coordination with all subcontractors whose work is shown on the diagram.

B. Include, but do not necessarily limit indicated activities to:
   1. Project mobilization;
   2. Submittal and approval of Shop Drawings and Samples;
   3. Procurement of equipment and critical materials;
   4. Fabrication of special material and equipment, and its installation and testing.
   5. Final cleanup;
   6. Final inspecting and testing; and
   7. All activities by the Architect that effect progress, required dates for completion, or both, for all and each part of the Work.

PART 3 - EXECUTION

3.01 PRELIMINARY ANALYSIS

A. Contents:
   1. Show all activities of the Contractor under this Work for the period between receipt of Notice to Proceed and submittal of construction schedule required under Paragraph 1.2-C above;
   2. Show the Contractor's general approach to remainder of the Work;
   3. Show cost of all activities scheduled for performance before submittal and approval of the construction schedule.

3.02 CONSTRUCTION SCHEDULE

A. As required under Paragraph 1.2-D above, update the approved construction schedule.
   1. Indicate "actual" progress in percent completion for each activity;
   2. Provide written narrative summary of revisions causing delay in the program, and an explanation of corrective actions taken or proposed.

3.03 REVISIONS

A. Make only those revisions to approved construction schedule as are approved in advance by the Architect.

END OF SECTION

SUBMITTALS & SUBSTITUTIONS
SCHEDULE FOR SUBMITTALS
01340

		Shop Drawings	Samples	Manufacturer literature	Material List	Tests
Division 2 – Site Construction						
02010	Subsurface Investigation					X
02210	Finish Grading					X
02225	Demolition	X				
02372	Storm Water Pollution Prevention Control				X	
02505	Decomposed Granite Paving		X	X		
02520	Concrete Paving		X		X	X
02710	Sanitary Sewer				X	
02720	Storm Drainage			X	X	
02810	Irrigation System	X		X	X	
Division 3 – Concrete						
03100	Concrete Forms and Accessories	X		X	X	X
03200	Concrete Reinforcment	X		X	X	X
03300	Cast-In-Place Concrete			X	X	X
Division 4 – Masonry						
04200	Masonry	X	X	X	X	X
Division 5 – Metals						
05300	Metal Decking	X		X	X	X
05400	Cold-Formed Metal Framing	X		X	X	
Division 6 - Wood and Plastics						
06152	Fiber-Reinforced Hybrid Decking / Fences	X	X	X		
Division 7 - Thermal, Moisture and Acoustical						
07140	Cold Fluid-Applied Waterproofing			X	X	X
07190	Water Repellents			X	X	X
07265	Concrete Slab Vapor Emissions Treatment			X	X	X
07540	PVC Thermoplastic Membrane Roofing (Sika Sarnafil)	X	X	X	X	X
07600	Flashing and Sheet Metal	X			X	X
07920	Sealant & Caulking	X	X	X	X	
Division 8 - Doors and Windows						
08110	Steel Doors and Frames	X		X	X	X
08710	Door Hardware	X		X	X	

		Shop Drawings	Samples	Manufacturer literature	Material List	Tests
Division 9 – Finishes						
09900	Painting and Coatings		X	X	X	X
09912	Painting (Professional Line Products)		X	X	X	X
Division 10 – Specialties						
10170	Toilet Partitions	X	X	X	X	X
10800	Toilet Room Accessories	X		X	X	
Division 11 – Equipment						
Division 15 – Mechanical and Plumbing						
15300	Fire Protection (Design/Build – Deferred Approval Item)	X			X	
15400	Plumbing	X		X	X	
15800	HVAC Systems	X		X	X	
Division 16 – Electrical						
16000	Electrical General Requirements			X	X	
16010	Basic Electrical Requirements			X	X	
16050	Basic Electrical Material & Methods			X	X	
16110	Raceways			X	X	
16111	Conduit			X	X	
16120	Conductors			X	X	
16123	Building Wire and Cable			X	X	
16130	Boxes			X	X	
16140	Wiring Devices		X	X	X	
16170	Grounding and Bonding			X	X	
16190	Supporting Devices			X	X	
16195	Electrical Identification			X	X	
16440	Disconnect Switches			X	X	
16441	Enclosed Switches			X	X	
16470	Panelboard	X		X	X	
16500	Lighting	X		X	X	

SECTION 01400

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Quality assurance submittals.

C. Mock-ups.

D. Control of installation.

E. Tolerances.

F. Testing and inspection services.

G. Manufacturers' field services.

1.02 RELATED SECTIONS

A. Document 00300 - Information Available to Bidders: Soil investigation data.

B. Document 00700 - General Conditions: Inspections and approvals required by public authorities.

C. Section 01210 - Allowances: Allowance for payment of testing services.

D. Section 01300 - Administrative Requirements: Submittal procedures.

E. Section 01425 - Reference Standards.

F. Section 01600 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCES

A. ASTM C 1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2001.

B. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2005b.

C. ASTM C 1093 - Standard Practice for Accreditation of Testing Agencies for Unit Masonry; 2006.

D. ASTM D 3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2004a.

E. ASTM E 329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing; 2005b.

F. ASTM E 543 - Standard Practice for Agencies Performing Nondestructive Testing; 2004.

1.04 SUBMITTALS

A. Testing Agency (Services retained by the owner):
   1. Prior to start of Work, agency name, address, and telephone number, and names of full time registered Engineer and responsible officer will be published.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

B. Test Reports: After each test/inspection, promptly submit two copies of report to Design Professional and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Conformance with Contract Documents.
      k. When requested by Design Professional, provide interpretation of results.
   2. Test reports are submitted for Design Professional's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Design Professional, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Design Professional.

D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

E. Manufacturer's Field Reports: Submit reports for Design Professional's benefit as contract administrator or for Owner.
   1. Submit report in duplicate within 30 days of observation to Design Professional for information.
   2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

F. Erection Drawings: Submit drawings for Design Professional's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Design Professional or Owner.

1.05 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until

Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Design Professional before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Design Professional shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 TESTING AND INSPECTION AGENCIES

A. Owner will employ and pay for services of an independent testing agency to perform specified and other required testing.

B. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E 329, ASTM E 543, ASTM C 1021, ASTM C 1077, and ASTM C 1093.
   2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
   3. Laboratory: Authorized to operate in Project Location.
   4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
   5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

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

B. Comply with manufacturers' instructions, including each step in sequence.

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

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

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

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

3.02 MOCK-UPS

A. Tests will be performed under provisions identified in this section and identified in the respective

product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Design Professional and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Design Professional before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Design Professional and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Design Professional and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by Design Professional.
   6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Design Professional and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.

   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Design Professional. Payment for re testing will be

charged to the Contractor by deducting testing charges from the Contract Price.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment, and to initiate instructions when necessary.

B. Submit qualifications of observer to Design Professional 30 days in advance of required observations.
   1. Observer subject to approval of Design Professional.
   2. Observer subject to approval of Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

END OF SECTION

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section describes testing and inspecting to be provided by the Contractor.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Requirements for testing may be described in various Sections of these Specification.

PART 2 - PRODUCTS

2.01 PAYMENT FOR TESTING

A. The Owner will pay for all testing and inspecting required under this Section of these Specifications, and to cover all testing and inspecting required by governmental agencies having jurisdiction.

B. When tests requested by the Architect indicate noncompliance with the Contract Documents, all testing and subsequent retesting occasioned by the noncompliance shall be performed by the same testing laboratory and the costs thereof shall be paid by the Contractor.

2.02 SPECIFIC TESTS AND INSPECTIONS

A. Tests and inspections will be performed where required by governmental agencies having jurisdiction, required by provisions of the Contract Documents, and such other tests and inspections as are directed by the Architect. List of special inspection is identified on Structural drawings Sheet #S-0.0

B. Tests include, but are not necessarily limited to, those described in detail in Part 3 of this Section.

PART 3 - EXECUTION

3.01 TAKING SPECIMENS

A. Except as may be specifically otherwise approved by the Architect, have the testing laboratory secure and handle all samples and specimens for testing.

3.02 COOPERATION WITH TESTING LABORATORY

A. Provide access to the Work at all times and at all locations where the Work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.

3.03 SOIL INSPECTING AND TESTING

A. Make required inspections and tests including, but not necessarily limited to:
   1. Visually inspect on-site and imported fill and backfill, making such tests and retests as are necessary to determine compliance with the Contract requirements and suitability for the

proposed purpose;

2. Make field density tests on samples from in-place material as required;
3. As pertinent, inspect and test the scarifying and recompacting of cleaned subgrade; inspect the progress of excavating, filling, and grading; make 90% density tests at fills and backfills; and verify compliance with provisions of the Contract Documents and governmental agencies having jurisdiction.

B. Make and distribute necessary reports and certificates.

3.04 CONCRETE INSPECTING AND TESTING

A. Portland cement:
1. Secure from the cement manufacturer Certificates of Compliance delivered directly to the concrete producer for further delivery directly to the testing laboratory.
2. Require the Certificates of Compliance to positively identify the cement as to production lot, bin or silo number, dating and routing of shipment, and compliance with the specified standards.
3. If so required by the Architect, promptly provide such other specific physical and chemical data as requested.

B. Aggregate:
1. Provide one test unless character of material changes, material is substituted, or additional test is requested by the Architect.
2. Sample from conveyor belts or batching gates at the ready-mix plant:
   a. Sieve analysis to determine compliance with specified standards and grading;
   b. Specific gravity test for compliance with specified standards.

C. Laboratory design mix:
1. After approval of aggregate, and whenever character or source of materials is changed, provide mix design in accordance with ACI 613.
2. Provide designs for all mixes prepared and signed by a registered California engineer.

D. Molded concrete cylinders:
1. Provide three test cylinders for each 115 cu m (150 cu yds), or fraction thereof, of each class of concrete of each day's placement.
2. Test one cylinder at seven days, one at 28 days, and one when so directed.
3. Report the mix, slump, gage, location of concrete in the structure, and test results.
4. Take specimens and make tests in accordance with the applicable ASTM standard specifications.

E. Core tests:
1. Provide only when specifically so directed by the Architect because of low cylinder test results.
2. Cut from locations directed by the Architect, securing in accordance with ASTM C42, and prepare and test in accordance with ASTM C39.

F. Placement inspections:
1. Provide continuous or other inspection of concrete if required by governmental agencies having jurisdiction.

2. Throughout progress of concrete placement, make slump tests to verify conformance with specified slump.
3. Using all required personnel and equipment, throughout progress of concrete placement verify that finished concrete surfaces will have the level or slope that is required by the Contract Documents.

3.05 CONCRETE REINFORCEMENT INSPECTING AND TESTING

A. Prior to use, test all reinforcement steel bars for compliance with the specified standards.
   1. Material identified by mill test reports, and certified by the testing laboratory, does not require additional testing.

   2. Require the supplier to furnish mill test reports to the testing laboratory for certification.
   3. Tag identified steel at the supplier's shop.
   4. When steel arrives at the job site without such tags, test it as unidentified steel.

B. Unidentified steel:
   1. Have the testing laboratory select samples consisting of two pieces, each 450 mm (18") long, of each size.
   2. Have the testing laboratory make one tensile test and one bend test for each 2250 kg (2-1/2 tons) or fraction thereof of each size of unidentified steel.

C. Provide continuous inspection for all welding of reinforcement steel.

3.06 STRUCTURAL STEEL INSPECTING AND TESTING

A. Prior to use, test all structural steel for compliance with the specified standards.
   1. Material identified by mill test reports, and certified by the testing laboratory, does not require additional testing.
   2. Require the supplier to furnish mill test reports to the laboratory for certification.
   3. Tag identified steel at the supplier's shop.
   4. When steel arrives at the job site without such tags, test it as unidentified steel.

B. Unidentified steel:
   1. Have testing laboratory make one tensile test and one bend test for each 4500 kg (five tons) or fraction thereof of each shape and size of unidentified structural steel.

C. Shop welding:
   1. Provide qualified testing laboratory inspector.
   2. On single pass welds, inspect after completion of welding and prior to painting.
   3. On multiple pass welds, and on butt welds with cover pass on the back side, provide continuous inspection.

D. Field welding: Continuous inspection will be required.

3.07 ROOFING AND WATERPROOFING INSPECTING AND TESTING

A. Prior to start of membrane waterproofing and membrane roofing installation, conduct a job site meeting attended by representatives of the installing subcontractors, the Contractor's field superintendent, the testing laboratory inspector, the manufacturers representative and the Architect, to agree upon procedures to be followed.

B. Prior to start of installation, verify that materials at the job site comply with the specified standards, that the subcontractor is qualified to the extent specified, and that the installing personnel are fully informed as to procedures to be followed.

C. During installation, verify that materials are installed in strict accordance with the manufacturers' recommendations as approved by the Architect.

D. When so directed by the Architect, make test cuts to verify conformance with the specified requirements.

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary telephone and facsimile service.

B. Temporary Controls: Barriers, enclosures, and fencing.

C. Security requirements.

D. Vehicular access and parking.

E. Project identification sign.

F. Field offices.

1.02 RELATED SECTIONS

A. Section 01525 - Field Offices.

B. Section 01550 - Vehicular Access and Parking.

C. Section 01565 - Security Measures.

D. Section 01585 - Project Signs.

1.03 TEMPROARY UTILITIES – NOT USED

1.04 TEMPORARY SANITARY FACILITIES – Not Used

1.05 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

A. Construction: Contractor's option.

B. Construction: Commercial grade chain link fence.

C. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.07 EXTERIOR ENCLOSURES

A. Contractor to provide barricades and temporary construction in order to provide access to the building during work on the exterior improvements of the building.

1.08 SECURITY - See Section 01565

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.09 VEHICULAR ACCESS AND PARKING - See Section 01550

A. Coordinate access and haul routes with governing authorities and Owner.

B. For contractor's parking, see General Conditions published by the Owner.

C. Do not allow vehicle parking on existing pavement.

1.10 WASTE REMOVAL

A. See Section 01732 - Waste Management, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

D. locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.11 PROJECT SIGNS - See Section 01585

1.12 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on Drawings.

B. No other signs are allowed without Owner permission except those required by law.

1.13 FIELD OFFICES – Not Used

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Restore existing facilities used during construction to original condition.

B. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01620

STORAGE AND PROTECTION

PART 1 GENERAL

1.01 SUMMARY

A. Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
   2. Additional procedures also may be prescribed in other Sections of these Specifications.

1.02 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.03 MANUFACTURERS' RECOMMENDATIONS

A. Except as otherwise approved by the Architect, determines and comply with manufacturers' recommendations on product handling, storage, and protection.

1.04 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
   1. Maintain packaged materials with seals unbroken and labels intact until time of use.
   2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

B. The Architect may reject as non-complying such material and products that do not bear identification satisfactory to the Architect as to manufacturer, grade, quality, and other pertinent information.

1.05 PROTECTION

A. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.

B. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.

C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

1.06 REPAIRS AND REPLACEMENTS

A. In event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner.

B. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify an extension in the Contract Time of Completion.

END OF SECTION

SECTION 01700

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, except payment procedures.

1.02 RELATED SECTIONS

A. Section 01100 - Summary:

B. Section 01300 - Administrative Requirements: Submittals procedures.

C. Section 01400 - Quality Requirements: Testing and inspection procedures.

D. Section 01500 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 01500 - Temporary Facilities and Controls: Temporary interior partitions.

F. Section 01510 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

G. Section 01732 - Waste Management: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

H. Section 01780 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

I. Section 02225 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

J. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

K. Section 13284 - Removal and Disposal of U.S. Federal Toxic Substances: Removal of equipment containing substances regulated under the Federal Toxic Substances Control Act (TSCA), including but not limited to PCB- and mercury-containing equipment.

1.03 SUBMITTALS

A. See Section 01340 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

B. For survey work, employ a land surveyor registered in Project Location and acceptable to Design Professional. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Project Location.

1.05 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

G. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.06 COORDINATION

A. See Section 01100 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01600.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means

acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Design Professional four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Design Professional, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK – Not Used

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

A. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.

B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

E. Restore work with new products in accordance with requirements of Contract Documents.

F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07840, to full thickness of the penetrated element.

H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

I. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

J. Patch or replace surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.07 PROGRESS CLEANING

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

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

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

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

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

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.09 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Design Professional and owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Section 15950 and 01400.

3.12 FINAL CLEANING

A. Owner will provide comprehensive cleaning after final acceptance.

B. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

C. Use cleaning materials that are nonhazardous.

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

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

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

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

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

J. Clean Owner-occupied areas of work.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Design Professional.
   2. Provide copies to Owner.
   3. Provide copies to Design Professional and Owner.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.

C. Notify Design Professional when work is considered ready for Substantial Completion.

D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Design Professional's review.

E. Owner will occupy all of the building as specified in Section 01100.

F. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

G. Accompany Project Coordinator on preliminary final inspection.

H. Notify Design Professional when work is considered finally complete.

I. Complete items of work determined by Design Professional's final inspection.

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Summary
B. Form of Warranty
C. Submittal Requirements
D. Form of Submittal
E. Time of Submittals
F. Submittals Required

1.02 RELATED REQUIREMENTS:

Section 01780 - Contract Closeout
Sections 02000 through 16000

1.03 INCLUDED:

A. Summary

1. Warranties between Contractor and manufacturers and between Contractor and suppliers shall not affect warranties between Contractor and the Owner.

2. In addition to other requirements specified:
   a. Compile specified service and maintenance contracts.
   b. Co-execute submittals when so specified.
   c. Review submittals to verify compliance with Contract Documents.
   d. Submit to the Architect for review and transmittal to the Owner.

B. Form of Warranty

1. Submit two (2) originals of the warranty form provided as Attachment “A”, typed on the Contractor’s letterhead, for the entire Work or special warranties, typed on Subcontractor’s letterhead and notarized, when required by a Specification Section. All work in place shall be guaranteed, at a minimum for one (1) year <u>after</u> date of Substantial Completion.

C. Submittal Requirements

1. Assemble warranties, bonds, and service and maintenance contracts executed by each of the respective manufacturers, suppliers, and Contractors.

2. Number of Original Signed Copies Required: Two (2) each.

3. Table of Contents: Neatly typed; in orderly sequence. Provide complete information for each item; include:
   a. Product or work item.
   b. Firm (Subcontractor or supplier) name with name of principal, address, and telephone number.
   c. Scope of work or service covered.

d. Date of beginning of warranty, bond, or service and maintenance contract.]
e. Duration of warranty, bond, or service and maintenance contract.

f. Provide the following information for the Owner.
   (1) Proper procedure in case of failure.
   (2) Circumstances which might affect the validity of warranty or bond.
g. Contractors' name, name of responsible principal, address, and telephone number.

D. Form of Submittal

1. Prepare in duplicate packets: four (4) complete Submittals; two (2) originals and two (2) copies.

2. Format:
   a. Size: 8 ½ " x 11" sheets punched for three-ring binder. Fold larger sheets to fit into binders.
   b. Cover: Identify each packet with typed or printed title, "WARRANTIES AND BONDS." List:
      (1) Title of Project.
      (2) Name of Contractor.

3. Binders: Commercial quality three-ring, with durable and cleanable plastic covers.

E. Time of Submittals

1. Within thirty (30) days after date of Substantial Completion, prior to final request for payment.

2. For items of work, where acceptance is delayed more than thirty (30) days beyond the date of Substantial Completion, provide updated submittal within ten (10) days after Final Completion, listing the date of Final Completion as the start of the warranty period.

F. Submittals Required

1. Submit special warranties, bonds, and service and maintenance contracts specified in the individual Sections.

SECTION 01740
ATTACHMENT "A"
(SAMPLE FORM OF WARRANTY - SUBMIT ON CONTRACTOR/SUBCONTRACTOR LETTERHEAD)

CITY OF BEVERLY HILLS – Roxbury Park Restroom Facility

WRITTEN WARRANTY
FOR_____
(Entire work, in the case of the Contractor, or a specific Specification Section, in the case of a Subcontractor.)

We hereby warrant
_____
(Description of work, equipment, product, etc.)

Which we have provided in
_____
(Description of location:)

has been completed in accordance with the Specification Section stated above and the Contract Documents requirements and is hereby warranted for a period of
_____
(Indicate overall duration)

commencing on _____and ending on _____.
(Start date) (End date)

We agree to repair or replace any or all of our Work, together with any other adjacent work which may be displaced or damaged by so doing, which may prove to be either patently defective in its workmanship or materials within the period of time prescribed by law or latently defective in its workmanship or materials within the period of time prescribed by law from date established in the Certificate of Substantial Completion of the above-named structure, ordinary wear and tear and unusual abuse or neglect excepted.

We also agree to repair any damages resulting from such defects.

In the event of our failure to comply with above-mentioned conditions within a reasonable time but in no case longer than fourteen (14) calendar days after being notified in writing by the Owner, we collectively and separately do hereby authorize the Owner to have said defective work and damages repaired or replaced and made good at our expense and will honor and pay the costs and charges therefor upon demand.

SIGNED_____
(Subcontractor's name, address, license number, and date of signing)

or

SIGNED_____
(Subcontractor's name, address, license number, and date of signing)

COUNTERSIGNED_____
(Contractor's name, address, license number, and date of signing

SECTION 01780

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED SECTIONS

A. Section 00700 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01300 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01700 - Execution Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Design Professional with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Design Professional will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit 1 copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Design Professional comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
   2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Conversion of schematic layouts:
   1. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items, are shown schematically and are not intended to portray precise physical layout.
      a. Final physical arrangement is determined by the Contractor, subject to the Architect's approval.
      b. However, design of future modifications of the facility may require accurate information as to the final physical layout of items that are shown only schematically on the Drawings.

D. Store record documents separate from documents used for construction.

E. Record information concurrent with construction progress.

F. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

G. Final project record documents.
   1. The purpose of the final Project Record Documents is to provide factual information regarding all aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation, and examination.
   2. Approval of recorded data prior to transfer:
      a. Following receipt of the electronic file (CADD – latest version), and prior to start of transfer of recorded data thereto, secure the Architect's approval of all recorded data.
      b. Make required revisions.
   3. Transfer of data to Drawings:
      a. Carefully transfer change data shown on the job set of Record Drawings to the corresponding transparencies, coordinating the changes as required.
      b. Clearly indicate at each affected detail and other Drawings a full description of changes made during construction, and the actual location of items in 3.01-C above.
      d. Call attention to each entry by drawing a "cloud" around the area or areas affected.
      d. Make changes neatly, consistently, and with the proper media to assure longevity and clear reproduction.
   4. Transfer of data to other Documents:
      a. If the Documents other than Drawings have been kept clean during progress of the Work, and if entries thereon have been orderly to the approval of the Architect, the job set of these Documents other than Drawings will be accepted as final Record Documents.
      b. If any such Document is not so approved by the Architect, secure a new copy of that Document from the Architect at the Architect's usual charge for reproduction and handling, and carefully transfer the change data to the new copy to the approval of the Architect.

5. Review and submittal:
    a. Submit the completed set of Project Record Documents to the Architect.
    b. Participate in review meetings as required.
    c. make required changes and promptly deliver the final Project Record Documents to the Architect.

H. Changes subsequent to acceptance:
1. The Contractor ahs no responsibility for recording changes in the Work subsequent to Final Completion, except for changes resulting from work performed under Warranty.

3.02 OPERATION AND MAINTENANCE DATA

A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

C. Include color coded wiring diagrams as installed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Include test and balancing reports.

O. Additional Requirements: As specified in individual product specification sections.

3.05 OPERATION AND MAINTENANCE MANUALS

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

B. Prepare data in the form of an instructional manual.

C. Binders: Commercial quality, 8-1/2 x 11 inch (216 x 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

I. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Design Professional, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Air and water balance reports.
   c. Certificates.
   d. Photocopies of warranties and bonds.

J. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

K. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Design Professional, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

F. Manual: Bind in commercial quality 8-1/2 x 11 inch (216 x 279 mm) three D side ring binders with durable plastic covers.

G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

I. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01900

SEISMIC BRACING AND ANCHORING

PART 1 - GENERAL

1.01 SUMMARY

A. Provide bracing and anchoring for all cabinets, casework, wall-hung and ceiling-hung equipment and specialties, floor-supported and floor-attached equipment, conveying systems, mechanical equipment, electrical equipment, and all other non-portable items essential to operation and use of the facility including items furnished by the Contractor and items furnished by the Owner but installed by the Contractor.

B. For Owner-Furnished-Contractor-Installed items, the Owner will furnish such additional information as is required by the Contractor for preparation of Shop Drawings and calculations.

1.02 SUBMITTALS

A. Where design of bracing and anchoring is completely shown on the Drawings, no submittal is required.

B. Where design of bracing and anchoring is not completely shown on the Drawings, and for equipment and/or items shown as "deferred," prepare and submit the following in accordance with the approved Contract Schedule:
   1. Shop Drawings clearly defining the proposed method for bracing and anchoring the pertinent item or items, and interface of the bracing and anchoring with adjacent materials;
   2. Calculations, prepared, signed, and stamped by a registered civil or structural engineer, employed and paid by the Contractor, supporting the proposed bracing and anchoring design and demonstrating its adequacy.

C. Secure the Architect's approval and approval of all governmental agencies having jurisdiction prior to fabrication and installation.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. In addition to complying with pertinent requirements of governmental agencies having jurisdiction, brace and anchor to resist horizontal forces acting in any direction using the following criteria:

1.	Light fixtures	100% of weight;
2.	Fixed equipment	50% of operating weight;
3.	Emergency power and communication	75% of operating weight;
4.	Flexibly-mounted equipment	Use two times the above values;
5.	Simultaneous vertical force	Use 1/3 times the horizontal force.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide materials, equipment, labor, and all other items as needed to comply with requirements of the governmental agencies having jurisdiction.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

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

3.02 FABRICATION AND INSTALLATION

A. Fabricate and install bracing and anchoring in accordance with the approved design and all other requirements of the Contract.

END OF SECTION

SECTION 02010

SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section describes soils investigation at the site, and use of data resulting from that investigation.

1.02 SOILS INVESTIGATION REPORT

A. General:
   1. A soils investigation report has been prepared for the site of this Work by the soil investigation engineer selected by the Owner.
   2. The soils investigation report may be inspected at the office of the Owner (City of Beverly Hills - Project Administration), and copies may be obtained at the cost of reproduction and handling upon request addressed to the Architect and accompanied by full payment.

B. Use of data:
   1. This report was obtained only for the Architect's use in design and is not a part of the Contract Documents.
   2. The report is available for bidders' information, but is not a warranty of subsurface conditions.
   3. Bidders should visit the site and acquaint themselves with existing conditions.
   4. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but such investigations may be performed only under time schedules and arrangements approved in advance by the Architect.

1.03 QUALITY ASSURANCE

A. A construction soil engineer will be retained by the Owner to observe performance of work in connection with excavating, trenching, filling, backfilling, and grading, and to perform compaction tests.

B. Readjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific and written approval from the Architect.

END OF SECTION

SECTION 02110

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing/abandoning site utilities

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security and protection facilities, and temporary erosion/sedimentation and storm water pollution control measures.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Tree-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions. Provide copy to Engineer of Record.

1.6 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct conference at project site.

1.7 PROJECT CONDITIONS

A. Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

1. Protect improvements on adjoining properties, public right-of-way and on Owner's property.
2. Restore damaged improvements to their original condition, as acceptable to property owners. The full width of pavements damaged due to construction access and other construction-related activities shall be replaced with a structural section (pavement and base) at least equal to the adjacent existing section.
3. Protect existing utility lines indicated to remain. Notify Architect immediately of any damage to or encounter with an unknown existing utility line. Immediately repair damage to existing utility lines.

B. Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
2. Provide protection for roots over 1-1/2 inch in diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt or other acceptable coating formulated to use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
3. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to Architect. Employ a licensed arborist to repair damage to trees and shrubs.
4. Replace trees that cannot be repaired and restored to full-growth status, as determined by arborist.

C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

D. Improvements on Adjoining Property: no work shall be performed on adjoining property.

1. Contractor shall delineate the property line with construction stakes,

2. Contractor shall document the pre-construction condition and photograph the existing conditions.

3. Do not proceed with work on adjoining property unless directed by Architect.

E. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises per owner's direction.

F. Utility Locator Service: Notify UNDERGROUND SERVICE ALERT for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 02 "Earthwork."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Tree Wound Paint: Bituminous based paint of standard manufacture specially formulated for the intended use.

PART 3 - EXECUTION

3.1 SITE CLEARING

A. Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.

1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
2. Unless specifically designated to remain, strip the upper two inches (minimum) of soil containing vegetation and root growth within the Limits of Work shown on the Drawings.

B. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings. Removing abandoned underground piping or conduits interfering with construction is included under this Section.
2. Contractor shall refer to the project's Asbestos Abatement Report for removal of asbestos containing materials and other potential hazardous materials.

C. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.

1. Completely remove stumps, roots, and other debris protruding through ground surface.
2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
   a. Place fill material in horizontal layers not exceeding 6 to 8 inch loose depth, and thoroughly compact each layer and compact in accordance with the requirements specified in Section 02300 "Earthwork" to make the new surface conform with the existing adjacent surface of the ground.
4. Trim trees, designated to be left standing within the cleared areas, of dead branches 1-1/2 inches or more in diameter; and trim all branches to heights and in a manner as indicated. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branches. Paint cuts more than 1-1/4 inches in diameter with specified tree-wound paint.

D. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.
   a. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
2. Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind and sediment erosion.
3. Dispose of unsuitable or excess topsoil as specified for disposal of waste material.

E. Protect and maintain benchmarks and survey control points from disturbance during construction.

F. Locate and clearly identify trees, shrubs, and other vegetation to remain.

3.2 EXISTING UTILITIES

A. Arrange with Owner for disconnecting and sealing of all overhead and underground utilities that serve adjoining existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
2. Arrange with owner scheduling of utilities shut off.

C. Locate, identify, and disconnect utilities indicated to be removed.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

F. Contractor shall note that various unknown and undocumented underground utilities exist at the project site. Contractor shall ensure that utilities are inactive or shut off prior to removal or abandonment. Contractor shall document all found underground utilities and notify engineer of record for further direction.

3.3 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.4 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 02210

FINISH GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:
   1. Weeding.
   2. Finish grading of lawn and planting areas.

1.3 DEFINITIONS

A. Finish grading: finish grading shall consist of adjusting and finishing soil surfaces with site or imported topsoil, raking grades to a smooth, even, uniform plane. Remove and legally dispose of all extraneous matter off site. Facilitate natural run-off water and establish grades and drainage indicated as part of the contract work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Refer to Division 02; Landscape Planting.

B. Obtain imported topsoil from approved local sources.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions: Prior to commencing the finish grading, review the installed work of other trades and verify that their work is complete.
   1. Rough Grading: Grading in planting areas (except raised planter areas) shall be established to within plus or minus 0.10 foot prior to beginning of finish grading.

B. Import topsoil only when necessary to supplement site soil to achieve grades shown on drawings, or if site soil is unsuitable for planting.

3.2 PREPARATION

A. Weeding: Before finish grading, weeds and grasses shall be dug out by the root or sprayed with an herbicide and disposed of off-site. This procedure is outlined under the Landscape Planting Section.

B. Debris: Remove stones and debris 1 inch in diameter and greater and clumps of earth that do not break up. Dispose of off-site.

3.3 INSTALLATION

A. General: When rough grading and weeding have been completed, and the soil has dried sufficiently to be readily worked, lawn and planting areas shall be graded to the elevations indicated on the Drawings.

1. Grades indicated on Drawing are grades that will result after thorough settlement and compaction of the soil.
2. Grades not otherwise indicated shall be uniform finish grades and, if required, shall be made at the direction of the Architect.
3. Finish grades shall be smooth, even, and a uniform plane with no abrupt change of surfaces.
4. Soil areas adjacent to buildings shall slope away from the building to allow a natural run-off of water, and surface drainage shall be directed as indicated on the drawings by remodeling surfaces to facilitate the run off water at 2% minimum grade.
5. Low spots and pockets shall be graded to drain properly.

B. Drainage: Finish grade with proper slope to drains.

1. Flow lines, designated or not, shall be graded and maintained to allow free flow of surface water.
2. If any drainage problems arise during construction period due to Contractor's work (such as, but not limited to, low spots, slides, gullies and general erosion), the Contractor shall be responsible for repairing these areas to a condition equal to their original condition, and in so doing shall prevent further drainage problems from occurring.

C. Toe of slope: To prevent soil creep or erosion across pavement, where pavement (walk, curb, etc.) is at the toe of a slope, finish grade is to level out or swale slightly at least 6” before reaching pavement.

D. Moisture Content: The soil shall not be worked when the moisture content is so great that excessive compaction occurs, nor when it is so dry that dust may form in the air or that clods do not break readily. Water may be applied, if necessary, to provide moisture content for tilling and planting operations. It is the Contractor’s responsibility to control dust that is spread as a result of grading operations.

E. Grades: The finish grade in areas to be planted with turf shall be 2- inches below grade of adjacent pavement and walks.

F. Compaction: Soils in planted areas shall be loose and friable, yet firm enough that no settling occurs from normal foot traffic or irrigation.

3.4 FIELD OBSERVATION

A. It is the Contractor's responsibility to contact the Architect 48 hours or two working days in advance of each agreed observation or conference.

B. Schedule for On-Site Reviews: at completion of finish grading and prior to any planting operations.

END OF SECTION

SECTION 02225

DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building demolition excluding removal of hazardous materials and toxic substances.

B. Selective demolition of building elements for alterations purposes.

C. Abandonment and removal of existing utilities.

1.02 RELATED SECTIONS

A. Section 00300 - Information Available to Bidders: Existing building survey conducted by Owner; information about known hazardous materials.

B. Section 01100 - Summary: Limitations on Contractor's use of site and premises.

C. Section 01100 - Summary: Sequencing and staging requirements.

D. Section 01100 - Summary: Description of items to be removed by Owner.

E. Section 01500 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

F. Section 01600 - Product Requirements: Handling and storage of items removed for salvage and relocation.

G. Section 01732 - Waste Management: Limitations on disposal of removed materials; requirements for recycling.

1.03 REFERENCES

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Vegetation to be protected.
   2. Areas for temporary construction and field offices.
   3. Areas for temporary and permanent placement of removed materials.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 QUALITY ASSURANCE

A. Demolition Firm: Company specializing in the type of work required.

1.06 PROJECT CONDITIONS

A. Minimize production of dust due to demolition operations.

B. Comply with other requirements specified in Section 01700.

PART 2 PRODUCTS

2.01 MATERIALS – Not Used.

PART 3 EXECUTION

3.01 SCOPE

A. Removal work shall be as indicated on the drawings.

B. Remove paving and curbs as required to accomplish new work.

C. Remove concrete slabs on grade, as indicated on the drawings.

D. Remove other items indicated, for salvage, relocation, recycling.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect, and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.
   9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Do not begin removal until built elements to be salvaged or relocated have been removed.

D. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.

E. If hazardous materials are discovered during removal operations, stop work and notify Design Professional and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

F. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Comply with requirements of Section 01732 - Waste Management.
   2. Dismantle existing construction and separate materials.
   3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

H. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

A. Protect existing utilities to remain from damage.

B. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

C. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

D. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.04 SELECTIVE DEMOLITION

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Design Professional before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions.

B. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications). Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. See Section 01100 for other limitations on outages and required notifications.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

C. Protect existing work to remain.
   1. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   2. Repair adjacent construction and finishes damaged during removal work.
   3. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site; comply with requirements of Section 01732 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

END OF SECTION

SECTION 02372

STORM WATER POLLUTION PREVENTION CONTROL

1.1 SUMMARY

A. This section includes the following:
   1. Requirements for compliance with the Storm Water Pollution Prevention Plan (SWPPP) developed specifically for this Project are the responsibility of the Contractor.
      a. SWPPP satisfies the mandates of Federal Clean Water Act as enforced by State of California Water Resources Control Board and its Regional Water Quality Boards.
      b. In accordance with the State Water Resources Control Board's (SWRCB) General Construction Activities Storm Water Permit, Order No. 2009-0009-DWQ, NPDES No. CAS000002, the SWPPP Major objective is to:

         (1) Identify the sources of sediment and other pollutants that affect the quality of storm water discharges

         (2) Describe and ensure the implementation of Best Management Practices, (BMPs) to reduce or eliminate sediment and other pollutants in storm water as well as non-storm water discharges.

B. Related Sections
   1. Contractor shall retain a California State Certified Qualified SWPPP Practitioner (QSP) to implement and maintain the SWPPP and file all necessary documents to the State.
   2. SWPPP requires compliance of all trades on Project that use or manipulate materials of any nature which can potentially enter storm-water drainage system.
   3. Representative materials controlled by the SWPPP include erosion of native soils and fill materials, groundwater, leakage or spills from construction vehicles and machinery, stored fuels, concrete truck washout, chemical treatments, curing, compounds, paints, plasters, paving materials, adhesives and sealants, trash and general construction debris, pesticides, fertilizers, and any other material which can be carried by running water or percolate into earth.

1.2 SUBMITTALS

A. Provide name and certification documents of the Qualified SWPPP Practitioner (QSP).

B. Trough the entirety of construction, prepare inspection reports, rain gauge readings, stormwater sampling and analysis, bio assessment reports, Annual Reports and submit through the State's Storm Water Multiple Application and Report Tracking System (SMARTS) as required by the General Construction Permit.

C. Closeout Submittals: Submit to owner documentation certifying compliance with the SWPPP, site monitoring reports, and notification of Agencies of completion of operations as required by the General Construction Permit.

D. Provide a Rain Event Action Plan (REAP) if project is considered a RISK LEVEL 2 or 3. REAP shall be prepare by the project QSP.

E. SWPPP plan.
   1. The SWPPP will be prepared by a Qualified SWPPP Developer (QSD) certified by the RWQCB, as required by the General Construction Permit.
   2. Implementation and report processing of the SWPPP shall be conducted by a Qualified SWPPP Practitioner as required by the General Construction Permit.

1.3 REGULATORY BACKGROUND

A. As required by Federal Water Pollution Control Act (Clean Water Act) and regulations of U.S. Environmental Protection Agency and of State of California Water Resources Control Board current General construction Permit, any construction activity of ONE acre or more must be covered by National Pollutant Discharge Elimination System (NPDES) permit.

B. The Act further decrees fines of as much as $37,500 per day per violation.

C. It is implicit that SWPPP satisfies requirements of NPDES permit.

D. If Owner is cited for violation of Clean Water Act due to failure of SWPPP to address requirement, Contractor shall be liable for any fines or penalties that might be imposed by regulatory agency, he shall be obligated to perform mandated corrective measures at his own expense.

E. If Owner, Architect, or Owner's Inspector becomes aware of violations of SWPPP, they will immediately inform Contractor in writing. Contractor shall immediately cease violation and shall restore site, at his own expense, to same conditions it was in before violation, to approval of Owner.

F. Should Contractor continue to violate requirements of SWPPP, or refuse to comply, or refuse to repair results of violation to Owner's approval, for purposes of this Contract it shall be considered as any other violation of Contract. Owner will take necessary measures as set forth in General Conditions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide all temporary and permanent Best Management Practices (BMP's) storm water pollution prevention equipment, material, and facilities as required by or as necessary to comply with the SWPPP and meet the General Construction Permit requirements.

PART 3 - EXECUTION

3.1 IMPLEMENTATION

A. Measures required in SWPPP shall be executed as dictated by SWPPP itself.

B. Contractor shall not commence construction until a Notice of Intent has been issued to the State and project WDID number has been issued.
   1. Concurrent with commencement of construction activities, Contractor shall implement and retain at project site, the Storm Water Pollution Prevention Plan and a monitoring program and reporting plan throughout construction in accordance with the General Permit.

C. Contractor shall be responsible for paying the necessary permit fees and complying with State Water Resources Control Board Order No. 2009-009-DWQ, implementing provisions of the Clean Water Act relating to storm water discharges.

D. The plan will address all potential sources of pollutants which may enter the storm water system, it must explain what steps will be taken during construction to minimize the risk of storm water contamination and must address management procedures to be utilized during construction to prevent pollution discharges such as spills, leaking, and dumping.

E. A copy of said plan shall be provided to owner and upon request contractor shall certify, in writing, compliance with the relevant rules, regulations and laws.

G. Additional information regarding State Water Resources Control Board requirements can be obtained from State Water Resources Control Board, Division of Water Quality, Attention: Storm Water Permit Unit, P.O. Box 1977, Sacramento, CA 95812-1977. Telephone Number (916) 657-1146.

H. During construction, make changes as necessary for proper functioning of SWPPP measures. Notify QSP on recommended changes.

I. At completion of work, Contractor shall remove temporary SWPPP measures and dispose of any pollutants in legal manner offsite, or as otherwise required by SWPPP

3.2 PERFORMANCE

A. Minimum Water Quality Protection Requirements
   1. The Contractor is required to meet the following minimum standards of good housekeeping:
      a. Eroded sediments and other pollutants must be retained on site and may not be transported from the site via sheet flow, swales, area drains, natural drainage, or wind.
      b. Stockpiles of earth and other construction-related materials must be protected from being transported from the site by wind or water.
      c. Fuels, oils, solvents, and other toxic materials must be stored in accordance with their listing and are not to contaminate the soil nor the surface waters. All approved toxic storage containers are to be protected from the weather. Spills must be cleaned up immediately and disposed of in a proper manner. Spills may not be washed into the drainage system.
      d. Excess or waste concrete may not be washed into the public way or any drainage system. Provisions shall be made to retain concrete wastes on-site until they can be appropriately disposed of or recycled.
      e. Trash and construction-related solid wastes must be deposited into a covered receptacle to prevent contamination of rainwater and dispersal by wind.
      f. Sediments and other materials may not be tracked from the site by vehicle traffic. The construction entrance roadways must be stabilized so as to inhibit sediments from being deposited into the public ways. Accidental depositions must be swept up immediately and may not be washed down by rain or by any other means.

B. Stormwater Pollution Prevention Plan
   1. The Contractor shall comply with The Stormwater Pollution Prevention Plan (SWPPP). The Contractor shall implement Best Management Practices (BMPs) necessary to control stormwater pollution from sediments, erosion, and construction materials leaving the construction site.
   2. The BMPs contained in the Development Best Management Practices Handbook – Part A, Construction Activities cover the following categories of construction activities:
      a. Site preparation/earth removal
      b. Underground structures
      c. Aboveground structures
      d. Roadways, walkways and parking lots
      e. Planting and landscaping
   3. The SWPPP document shall include the following information:
      a. The name, location, period of construction, and a brief description of the Project.
      b. Contact information for the Contractor, including name, address, and telephone number.
      c. Name, location, and description of any environmentally sensitive areas located on or adjoining the Project.
      d. A list of major construction materials, waste, and activities.
      e. A list of BMPs to be used to control pollutant discharges from major construction materials, wastes, and activities.

f. A site plan (a construction plan may be used) indicating the location of BMPs where appropriate.

g. A developer's certification statement that all required and selected BMPs will be effectively implemented.

4. Whenever the Contractor is required to get any type of permit from the Department of Building and Safety (DBAS), the Contractor shall submit the SWPPP document to the DBAS for review and approval before obtaining the permit. At least one copy of the approved SWPPP shall be kept at the construction site and accessible to City inspectors.

5. Publication on the General Construction Permit details are available at:

   State Water Resources Control Board Website:
   http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

   California Stormwater Quality Association
   http://www.cabmphandbooks.com

END OF SECTION

SECTION 02505
DECOMPOSED GRANITE PAVING

PART 1 – GENERAL

1.01 GENERAL CONDITIONS

A. The requirements of the "General Provisions of the Contract" and of Division 1, "General Requirements", shall apply to all work of this Section with the same force and effect as though repeated in full herein.

1.02 SUMMARY

A. Work included: All labor, materials, equipment, and services necessary to provide decomposed granite paving, complete as shown, and as specified.

B. Related work:
   1. Section 02810 – Irrigation.
   2. Section 02900 – Landscape Planting.

1.03 REFERENCES

A. Standard Specifications - Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, Caltrans.

B. ASTM - American Society for Testing and Materials.

1.04 DEFINITIONS

A. Percent Compaction: ASTM D1557, percentage of the maximum in-place dry density of the same material as determined by Soils Engineer.

1.05 SUBMITTALS

A. Product Data: Manufacturer's current catalog cuts and specifications for decomposed granite and stabilizer.

B. Samples: Half a pound for each size and color range of decomposed granite.

C. Mock-up: Six foot by six foot sample, full depth to match finish condition.

D. Test Reports: Certified copies of field tests of compressive strengths of decomposed granite paving.

1.06 QUALITY ASSURANCE

A. Qualifications: Submit certified documentation of successful experience of no less than three years in the installation of similar crushed stone paving.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect from contamination with foreign materials. Isolate stockpiles to prevent mixing of different aggregate grades. Prevent contamination of organic materials.

1.08 SITE CONDITIONS

A. Environmental Requirements: Do not install decomposed granite during rain or while subbase is wet from rain.

B. Existing Conditions: For protection of existing plants to remain, see Section 02120 – Tree Protection.

1.09 SEQUENCING

A. Acceptance: Do not install work under this section prior to acceptance of sub-grade preparation under another section.
B. Coordination: Coordinate with other trades to insure the following:
   1. Irrigation Sleeving: To be placed prior to placement of aggregate base.
   2. Trees in Paving: To be installed prior to headers and paving. Do not mix soil with
   3. decomposed granite.

1.10 MAINTENANCE

A. Service: Immediately repair all damage to the work as the result of weather or traffic conditions. Report all damage resulting from work of other trades after acceptance of decomposed granite work. Repair to match adjacent undisturbed work.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Decomposed Granite:

   1. 1/4" Minus Aggregate Surface:

Screen Size	Passing
3/8" (9.5 mm)	100
No. 4 (4.75 mm)	90
No. 8 (2.36 mm)	71
No. 16 (1.18 mm)	55
No. 30 (0.6 mm)	42
No. 50 (0.3 mm)	31
No. 100 (0.15 mm)	21
No. 200 (0.075 mm)	13

   2. Color: California.

B. Non-toxic organic binder is a colorless, odorless concentrated powder that naturally binds Crushed Aggregate Screenings (CAS).

2.02 EQUIPMENT

A. Mixing Equipment: Pug mill with a weight belt feeder.
B. Compaction Equipment: Power roller with weight between one to five tons.

2.03 ACCESSORIES

A. Water: Fresh, clean, potable water as available from the Owner. Transport as required.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Sub-grades shall have been rough graded to within one-tenth foot of finish grades less depth of decomposed granite paving.

B. Verify that concrete bands or adjacent paving and irrigation sleeving have been installed and accepted under another Section prior to commencement of work.

3.02 PREPARATION

A. Compaction: After completion of soil sterilization, compact sub-grade to minimum 90% compaction.

3.03 INSTALLATION

A. Stabilized Decomposed Granite Paving:

1. Lines and Levels:
    a. Install stabilized decomposed granite work true to grade, properly coinciding with adjacent work and elevation. Install in maximum two-inch lifts.
    b. Provide a finished surface uniform in texture and appearance. Do not permit finished work to vary more than eighth-inch in ten feet from true profile and cross section.
2. Mixing:
    a. General: Paving shall consist of a mixture of decomposed granite, stabilizer, thoroughly and continuously mixed with a pug mill. A bucket mix or rototiller is not acceptable. Mix at a rate of twelve pounds (pedestrian loading) or fourteen pounds (vehicular loading) of stabilizer per ton of crushed aggregate screenings.
    b. Water: Adjust quantity of water added to the mixture to permit maximum compaction of the materials after it is placed on the sub-grade. Moisture shall permeate full depth. After water application test with a minimum of one core sample per one thousand square feet; repair sample area to match adjacent section.
3. Depth:
    a. Decomposed granite shall be placed to a minimum three inches compacted depth (foot traffic) and four inches compacted depth (vehicular traffic) unless otherwise noted on drawing.
4. Compacting: Thoroughly compact each two-inch lift to a minimum ninety percent. Compact each area with at least four passes of the compacting equipment. After compacting, screed smooth. Do not use a wacker or vibratory roller to compact the decomposed granite.
5. Contaminated Areas: Do not permit mixture to contaminate planting areas. Clean up immediately all mixtures spilled on adjacent paving.
6. Grading: When surface areas have been rolled and it becomes necessary to add thin layer of material to bring the surface to grade, the previously rolled or compacted area shall be raked to provide a bond with the added material.
7. Finish Paving Surface: Provide a uniform texture and color and without a cement mortar film on the exposed surface. Finished surface shall not vary more than two one-hundredths of a foot from the lower edges when measured with a ten-foot straightedge.
8. Curing: After installation, keep moist for a period of seven days. Apply water in a fine mist or spray and in such a manner that it will not damage the finished surface.
9. Damaged or Defective Installation: Repair and replace in accordance with these Specifications at no additional cost.

10. Replacement:
    a. If compression tests of samples fail to meet specified compressive strength, immediately remove and replace decomposed granite paving with material conforming to Specifications.
    b. Pay cost of all work required for removing and replacing the decomposed granite.
11. Keep decomposed granite off of adjacent paved areas.

3.04 FIELD QUALITY CONTROL

A. Tests: For each lift, have the testing laboratory verify the degree of compaction. Recompact filed areas until specified compaction is achieved. Testing to be paid by contractor.

3.05 PROTECTION

A. Protect the paving against traffic, injury or defacement, or damage (by rain) and subsequent construction operations until Final Acceptance.

END OF SECTION

SECTION 02510

WATER DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes piping and specialties for potable and fire protection water service outside the building.

B. Related Sections include the following:
   1. Section 02300 - Earthwork for trench excavation and backfill.
   2. Drawings for potable and fire protection piping inside the building.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Working Pressures: The following are minimum pressure requirements for piping and specialties, unless otherwise indicated:
   1. Combined Potable Water and Fire Protection Water Service: 200 psig (1380 kPa).

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data: For the following:
   1. Pipe, joint restraints and fittings.
   2. Valves and covers
   3. Backflow preventer
   4. Fire Department Connection
   5. Post Indicator Valve
   5. Fire Hydrants

C. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," for materials, installations, tests, flushing, and valve and hydrant supervision.

B. Comply with NSF Standard 61, “Drinking Water System Components”, for material, installation, and testing requirements.

C. Comply with City of Beverly Hills requirements for tapping of water mains.

D. Comply with City of Beverly Hills standards for potable water-service piping for testing and disinfections.

E. Comply with City of Beverly Hills Fire Department installation and testing requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves according to the following:
   1. Ensure that valves are dry and internally protected against rust and corrosion.
   2. Protect valves against damage to threaded ends and flange faces.
   3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves according to the following:
   1. Do not remove end protectors, unless necessary for inspection; then reinstall for storage.
   2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

1.7 PROJECT CONDITIONS

A. Verify existing utility locations and meters. Contact utility locating service.

B. Verify that it is possible to install water service piping to comply with original design and referenced standards.

C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

D. Obtain necessary connection permits with local water company as required.

E. Obtain necessary street excavation and encroachment permits from the City of Beverly Hills Dept. of Public Works.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.

B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building fire-protection water piping.

C. Coordinate with other site utility work.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. PVC Plastic, Socket Fittings: ASTM D 2466, Schedule 40.

C. PVC Plastic, Fire Service Pipe: UL 1285 and AWWA C900, Class 200. Include elastomeric seal according to ASTM F 477.

2.2 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. PVC Plastic, Socked Fittings: ASTM D2466, Schedule 40.

C. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111.

2.3 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

B. Primers for PVC Piping Solvent-Cement Joints: ASTM F 656.

C. Solvent Cement for PVC Piping Solvent-Cement Joints: ASTM D 2564.

2.4 PIPING SPECIALTIES

A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.
   1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
   2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C). Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
   3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum pressure to suit system pressures.
   4. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
      a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure to suit system pressures.
   5. Dielectric Couplings: Galvanized-steel couplings with inert and non-corrosive thermoplastic lining, with threaded ends and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
   6. Dielectric Nipples: Electroplated steel nipples with inert and non-corrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig (2070-kPa) working pressure at 225 deg F (107 deg C).

2.5 POLYETHYLENE ENCASEMENT

A. Polyethylene Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

2.6 VALVES

A. All Gate Valves, 4-Inch NPS (DN80) and Larger in size shall conform to AWWA Standard Specifications C500. All valves, including those over 12", shall be rated to a minimum working pressure of 200 psi. All valves shall be iron body, bronze mounted, double-disk, parallel scat gate valves. All valves shall open by turning the stem counterclockwise. Buried valves shall be non-rising type with O-ring seal equipped with 2 inch square operating nut, and shall be bituminous coated. End connections shall be flanged or mechanical joint as required for the type of pipe used. Buried valves shall have stem extensions to place operating nut within 6" of top of valve box.

B. Valve Boxes shall be precast concrete with cast iron traffic rated cover with lettering "WATER", bottom section with base of size to fit over valve and barrel approximately 5 inches (125 mm) in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
   1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut. After installation of valve box cover and after installation of adjacent paving, if any, covers shall be sandblasted or wire-brushed as necessary and painted with bituminous black paint, unless another color is required by the Architect.

C. Indicator Posts: UL 789, FM-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve. Posts above and including connection to riser shall be sandblasted, if necessary, after installation and painted red, unless another color is required by the Architect. Install monitoring device and interconnect with building fire alarm system per electrical plans and specifications.

D. Tapping Sleeve and Tapping Valve: Complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. Use sleeve and valve compatible with tapping machine.
   1. Tapping Sleeve: Cast- or ductile-iron, 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical-joint ends with rubber gaskets or sealing rings in sleeve body. Include sleeve matching size and type of pipe material being tapped and of outlet flange required for branch connection.

2.7 BACKFLOW PREVENTERS

A. General: Manufactured backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

B. Working Pressure: 200 psig (1380 kPa) minimum, unless otherwise indicated.

C. 2-Inch NPS (DN50) and Smaller: Bronze body with threaded ends.

D. Interior Lining: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.

E. Interior Components: Corrosion-resistant materials.

F. Strainer on inlet if strainer is indicated.

G. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

H. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.
   1. Pressure Loss: 12 psig (83 kPa) maximum through middle third of flow range.
   2. Double Detector Check Assembly: 15 psi (103.75 kPa) entry loss.

I. Exterior Finish: Red or yellow (as directed by Water Purveyor or local Fire Department) alkyd-gloss enamel paint. Entire device above and including connection to riser shall be sandblasted, if necessary, after installation and re-painted.

Manufacturer	Model	Size
Cia-Val	RP-LEX	2",2 1/2",3",4",6",8",10"
Cia-Val	RP-2	3/4",1",1-1/4",1-1/2"
Cia-Val	RP4	6 "
Febco	825YD2	2-1/2",3",4",6",8",10"
Febco	825Y	3/4",1",1-1/4",1-1/2",2"
Febco	825YA	3/4",1",1-1/2",2"
Febco	845	3/4",1"
Mueller	H-9506	4",6",8",10"
Orion	80-0069	1-1/2"
Orion	BRP	3/4,1",3",4"
Orion	9-2929	2 "
Rain Bird	RPA-075-R	3/4"
Rain Bird	RPA-100-R	1"
Rain Bird	RPA-125-R	1-1/4"
Rain Bird	RPA-150-R	1-1/2"
Rain Bird	RPA-200-R	2"
Rain Bird	RPA-250-R	2-1/2"
Rain Bird	RPA-400-R	4 "
Rain Bird	RPA-600-R	6"
Rain Bird	RPA-800-R	8"
Rain Bird	RPA-1000-R	10"
Watts	909 PCQT	3/4"-2"
Watts	909HWQT	3/4",1",1-1/4",1-1/2",2"
Watts	909 PCRW	2-1/2"-10"
Watts	909 RW Bronze	2-1/2",3"
Watts	009QT	3/4",1",1-1/4",1-1/2",2"
Watts	009SSQT	3/4",1",1-1/4",1-1/2",2"
Wilkins	575A	3/4",1
Wilkins	575	3/4",1",1-1/4",1-1/2",2"
Wilkins	575 (MOD-III)	2-1/2",3",4",6"
Wilkins	575M	8" (4"x4"x8" manifold)
Wilkins	575M	10" (6"x6"x10" manifold)

2.7 FIRE DEPARTMENT CONNECTIONS

A. Exposed Fire Department Connections: UL 405, cast-brass body, with thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- (460-mm-) high brass sleeve; and round escutcheon plate.
   1. Connections: Two 2-1/2-inch NPS (DN65) inlets and 6-inch NPS (DN150) outlet.
   2. Inlet Alignment: Inline, horizontal.
   3. Finish Including Sleeve: Polished chrome-plated.
   4. Escutcheon Plate Marking: "AUTO SPKR."

2.8 ANCHORAGES

A. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig (20.7 MPa).
   1. Cement: ASTM C 150, Type I.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

2.9 IDENTIFICATION

A. Refer to Division 02 "Earthwork" for underground warning tape materials.

B. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

C. Nonmetallic Piping Label: Engraved, plastic-laminate label at least 1 by 3 inches (25 by 75 mm), with caption "CAUTION--THIS STRUCTURE HAS NONMETALLIC WATER-SERVICE PIPING," for installation on main electrical meter panel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Section 02300 "Earthwork" for excavation, trenching, and backfilling.

B. Refer to Section 02511 "Asphaltic Concrete Paving" for cutting and patching of existing paving.

C. Refer to Section 02520 "Concrete Paving" for cutting and patching of paving.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

C. Do not use flanges or keyed couplings for underground piping.

D. Fire-Protection Water-Service Piping: Use the following:

4- to 8-Inch NPS (DN100 to DN200): UL 1285 and AWWA C900, Class 200. Include elastomeric seal according to ASTM F 477.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Underground Valves, 3-Inch NPS (DN80) and Larger: AWWA, gate valves, non-rising stem, with valve box.
   2. Underground Valves, 4-Inch NPS (DN100) and Larger: UL/FM, gate valves, non-rising stem, with indicator post.

3.4 JOINT CONSTRUCTION

A. Ductile-Iron Piping, Gasketed Joints for Fire-Service Piping: According to UL 194 and AWWA C600.

B. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, OD, and system working pressure. Refer to "Piping Systems - Common Requirements" Article below for joining piping of dissimilar metals.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Install piping as indicated, unless deviations to layout are approved in advance by the Architect or USC.

B. Install components with pressure rating equal to or greater than system operating pressure.

C. Install piping free of sags and bends.

D. Install fittings for changes in direction and branch connections.

G. Piping Connections: Unless otherwise indicated, make piping connections as specified below:
   1. Install dielectric fittings to connect piping of dissimilar metals.

3.6 SERVICE ENTRANCE PIPING

A. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.
   1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water piping systems when those systems are installed.

B. Sleeves and mechanical sleeve seals are specified in Drawings.

C. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.7 PIPING INSTALLATION

A. Make connections larger than 2-inch NPS (DN50) with tapping machine according to the following:
   1. Install tapping sleeve and tapping valve according to manufacturer's written instructions.
   2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
   3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
   4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.

B. If hot tap is not possible, install cut-in tee with C-110 fittings.

C. Comply with NFPA 24 for fire-protection water-service piping materials and installation.

D. Install ductile-iron piping according to AWWA C600.
   1. Encase piping with PE film according to ASTM A 674 or AWWA C105.

   2. Install encasement per manufacturer's written instructions. Close seams and overlaps in the polyethylene tubes with polyethylene compatible adhesive tape. The tape shall be approximately two inches wide and shall have the ability to bond securely to a metal surface and the polyethylene material. Repair all rips, tears and other damage with suitable adhesive tape.

E. Bury piping with depth of cover over top at least 30 inches (750 mm) and according to the following:
   1. Under Driveways: With at least 36 inches (900 mm) cover over top.
   2. If trenching before rough grading is completed would result in a lesser depth of cover than specified above, then trenching for water piping installation shall not be done until the specified minimum cover depth can be effected. If construction traffic will be allowed to pass over completed water piping installations prior to finish paving, then a protective

pavement blanket at least equivalent to the final pavement and base thickness shall be constructed within the vehicle access area for a minimum distance of three feet on either side of the pipe. As an alternative to the temporary pavement blanket, the water pipe shall be installed at a minimum of two (2) feet deeper than specified within construction traffic areas.

3.8 ANCHORAGE INSTALLATION

A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
   1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.
   2. Fire-Service Piping: According to NFPA 24.

B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.9 VALVE INSTALLATION

A. General Application: Use mechanical-joint-end valves for 3-inch NPS (DN80) and larger underground installation. Use non-rising-stem UL/FM gate valves for installation with indicator posts.

B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.

C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

3.10 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install fire department connection of type and features indicated.

3.11 IDENTIFICATION INSTALLATION

A. Install continuous plastic underground warning tape during back-filling of trench for underground water-service piping. Locate 6 to 8 inches (150 to 200 mm) below finished grade, directly over piping.

3.12 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.
   1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

C. Prepare reports for testing activities.

3.13 CLEANING

A. Clean and disinfect water distribution piping as follows:
   1. Purge new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:
   a. Comply with NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
      1) Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine. Isolate system or part thereof and allow to stand for 24 hours.
      2) Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
      3) Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.
      4) Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports for purging and disinfecting activities.

END OF SECTION

SECTION 02520

CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes exterior Portland cement concrete paving for the following:
   1. Curbs and gutters
   2. Walkways
   3. Driveways
   3. Concrete pavement
   4. Concrete wheel stops

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 02300: Earthwork for subgrade preparation, grading and base course.
   2. Section 03300: Cast-in-Place Concrete for general building applications of concrete.

1.3 SYSTEM DESCRIPTION

A. Provide concrete pavement according to the materials, workmanship, and other applicable requirements of the following standard specifications:
   1. Reference Specification: Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", 2009; and City of Beverly Hills Standard drawings. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.
   2. Measurement and payment provisions and safety program submittals included in Reference Specifications do not apply to this Section.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Description of Methods and Sequence of Placement. For each type of specially-finished concrete provide description of methods and sequence of placement.

D. Submit manufacturer's product data for the following:
   1. Form release agent.
   2. Concrete coloring additive.
   3. Prefabricated control joint.
   4. Preformed joint filler.
   5. Sealants.
   6. Slip plane joint.
   7. Concrete mix design.

E. Submit two (2) 12” x 12” mockup samples of colored concrete in colors selected by the Architect.

1.5 QUALITY ASSURANCE

A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.
   1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
   2. ACI 318, "Building Code Requirements for Reinforced Concrete."
   3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
   4. Standard Specifications for PWC (Green Book) latest edition, section 201-1.

B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Paving work, base course etc., shall be done only after excavation and construction work, which may damage them, have been completed. Damage caused during construction shall be repaired before acceptance.

D. Existing paving area shall, if damaged or removed during the course of this project, be repaired or replaced under this section of the specification. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work.

E. Pavement, base, or subbase shall not be placed on a muddy subgrade.

F. Provide control joints as required to construct 100 sq. ft. maximum panel sizes. Provide sawcut joints. Note on shop drawings.

G. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

1.7 TESTING AND INSPECTION

A. The owner reserves the right to inspect and test paving and associated work.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves of a 100-foot or less radius.

B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
      a. Debond Form Coating, L & M Construction Chemicals.
      b. Crete-Lease 880 VOC, Cresset Chemical Company.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 40 for #3 bars and Grade 60 for bars larger than #3, deformed.

B. Plain, Cold-Drawn Steel Wire: ASTM A 82.

C. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

D. Dowel Sleeves: Speed Dowel, Aztec Concrete Accessories, Inc.

E. Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

F. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications.
   1. Use supports with sand plates or horizontal runners where base material will not support chair legs.

G. Welded wire fabric reinforcement shall conform to the applicable requirements of ASTM A185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II
   1. Use one brand of cement throughout Project. Coordinate with Division 03 Section "Cast-In-Place Concrete."

B. Normal-Weight Aggregates: ASTM C 33, Class 4M non-reactive, and as follows. Provide aggregates from a single source.
   1. Maximum Aggregate Size: 1-inch.
   2. Do not use fine or coarse aggregates that contain substances that cause spalling.
   3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.

C. Water: Potable.

D. Admixtures: Comply with requirements specified in Division 03 Section "Cast-In-Place Concrete."
   1. Do not use admixtures containing calcium chloride or chloride ions.

2.4 COLOR ADMIXTURE

A. Refer to Architectural plans for concrete color.

B. Color admixture shall be suitable for flatwork concrete and shall meet or exceed the requirements set by Portland Cement Association (PCA) and ATSM C 494.

B. Color admixture shall be of a type and quality which will not adversely affect workability, setting, or strength of concrete. Color pigments shall consist of chemically inert, non-fading, alkali-fast mineral oxides, finely ground and specially prepared for the use in both cement and mortar. Admixture shall not contain calcium chloride.

C. Color admixture shall be Chromix admixture, manufactured by L.M. Scofield Company, Los Angles, CA 90040.

D. Mix design shall conform to manufacturer's recommendations, and directions of the Architect to achieve proposed color. Strictly monitor additive / cement ratio throughout job to ensure uniform color.

2.5 CURING MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
   1. Waterproof paper.
   2. Polyethylene film.
   3. White burlap-polyethylene sheet.

C. Liquid Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B. Moisture loss not more than 0.55 kg./sq. meter in 72 hours when applied at a rate of 200 sq. ft./gal.
   1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. L & M Cure R, L & M Construction Chemicals, Inc.
      b. 1100-Clear, W.R. Meadows, Inc.
   3. Do not use sodium silicate type curing agents.

D. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Eucobar; Euclid Chemical Co.
      b. E-Con; L&M Construction Chemicals, Inc.
      c. Confilm; Master Builders, Inc.

2.6 RELATED MATERIALS

A. Bonding Agent: Acrylic or styrene butadiene, complying with ASTM C 1059, Type 2.

B. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.

C. Products: Subject to compliance with requirements, provide one of the following:
   1. Bonding Agent:
      b. SBR Latex; Euclid Chemical Co.
      c. Daraweld C; W.R. Grace & Co.
      d. Everbond; L&M Construction Chemicals, Inc.
      e. Acryl-Set; Master Builders Inc.
   2. Epoxy Adhesive:
      a. Burke Epoxy M.V., The Burke Co.
      b. Concresive Standard Liquid; Master Builders, Inc.
      c. Rezi-Weld 1000; W.R. Meadows, Inc.

D. Concrete Sealer: Water-based, deep penetrating, non-staining, non-darkening silane micro emulsion.
   1. Positive chloride-ion screening, prevents water intrusion, minimizes rebar corrosion and potential concrete spalling, and protects against damaging effects of alkalis and other contaminants.
   2. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.

   3. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. Pentane WB, L & M Construction Chemicals, Inc. This product is intended to establish the characteristics and level of quality intended for this Project.

D. Expansion and Isolation Joint Fillers: ASTM D 1751, cellulosic fiber.

2.7 CONCRETE MIX

A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.
   1. Do not use the Owner's field quality-control testing agency as the independent testing agency.

B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28-Day): 2500 psi for concrete for non-vehicular sidewalks; 3200 psi for concrete for traffic areas, curbs and gutters.
   2. The minimum cement content shall be 5-1/4 sacks per cubic yard.
   3. The maximum concrete slump shall be 3 inches, plus or minus 1/2 inch, for all walks; and 4 inches, plus or minus 1 inch for all other Portland cement concrete paving.
   4. Water/Cement Ratios:
      a. 0.5 maximum for concrete for pavement and site flatwork.
      b. 0.45 maximum for all other concrete.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

D. Admixtures: Comply with requirements specified in Division 03 Section "Cast-In-Place Concrete".

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
   1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.9 GROUT

A. Grout shall be mixed in the proportions of one part Portland cement to two parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Sand for grout shall be "Fine Aggregate", conforming to ASTM C 33.

B. Non-shrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 5,000 psi minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of the COE CRD-C 621 (558). Grout permanently exposed to view shall be non-oxidizing; metallic grout may be used in other locations.
   1. Non-shrink grout shall be one of the following or approved equal:

Manufacturer	Product
Gifford-Hill Co.	Supreme
Master Builders Co.	Embeco
U.S. Grout Corporation	Five Star Grout

2.10 SANDBLASTING MATERIAL

A. Material for sandblasting shall be 16/20 mesh sand.

2.11 HERBICIDE TREATMENT

A. Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid, or wettable powder form.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:
      a. Ciba-Geigy Corp.
      b. Dow Chemical U.S.A.
      c. E.I. Du Pont de Nemours & Co., Inc.
      d. FMC Corp.
      e. Thompson-Hayward Chemical Co.
      f. U.S. Borax and Chemical Corp.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Areas to be paved shall be compacted and brought to subgrade elevation per soils report before work of this section is performed. Final fine grading, filling, and compaction of areas to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.

C. Subgrade of areas to be paved shall be re-compacted per soils report.

D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade, base, or pavement, subsequent backfill and compaction shall be performed per soils report.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and re-compacted before placing pavement.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated under this section, and material unsuitable for or in excess of requirements for completing work of this section shall be disposed of off-site.

H. Prepared subgrade will be inspected by Soils Engineer. Subgrade shall be approved before installation of gravel base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this section of the specification.

I. Proof-roll subgrade or base surface prepared by others to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

J. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subgrade prior to installation of base course.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork and screeds for grade and alignment to following tolerances:
   1. Top of Forms: Not more than 1/8 inch in 10 feet.
   2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.

C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, or other bond-reducing materials. Where there is delay in placing concrete after reinforcement is in place, bars shall be re inspected and cleaned when necessary.

C. Any bar showing cracks after bending shall be discarded.

D. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

F. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Architect.

3.4 JOINTS

A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
   1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
   2. Make joints, including sawed joints, full depth required and from edge to edge of paving.

B. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as shown on Drawings. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, as follows:
   1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks.
   3. Inserts: Form contraction joints by inserting pre-molded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.

C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
   1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
   2. Provide tie bars at sides of paving strips where indicated.
   3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

D. Isolation Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
   1. Locate expansion joints at intervals of 50 feet, unless indicated otherwise.
   2. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
   3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
   4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

E. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one half of dowel length to prevent concrete bonding to one side of joint.

F. Where spacing is not shown, locate expansion joints at 10-foot maximum spacing.

G. Where plastic "zip strips" are used to construct concrete joints, cut and remove, as a minimum, the top 1/4 inch of these strips after concrete has cured, and coordinate installation of joint filler, if shown on the Drawings.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Moisten subgrade or base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

C. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.

D. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

E. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.

G. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

H. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.

I. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

J. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
   1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
   3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
   1. Burlap Finish: Drag a seamless strip of damp burlap across concrete, perpendicular to line of traffic, to provide a uniform gritty texture finish.
   2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish.
   3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
   4. Do not use troweling machines within 12 inches of electrical junction and outlet boxes which are set to finish flush with concrete slabs. Float and trowel such areas by hand with wood floats and steel trowels, taking care to see that concrete is finished flush with box cover and matches adjacent surfaces.

B. Slip-Resistant Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface in accordance with manufacture's written instructions
   1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
   2. After Curing, lightly work surface with a steel wire brush or abrasive stone and water to expose non-slip aggregate.

C. Finishing formed surfaces:
   1. Curb forms shall leave a smooth face.
   2. Remove all fins.

D. Provide steel trowel finish on tops of curbs and flow lines of curbs, gutters and integral curb and gutters.

E. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
   1. Radius: 1/4 inch.
   2. Radius: 3/8 inch.

F. Finish surfaces to produce a uniform appearance throughout area involved and throughout adjacent areas with the same treatment.

G. Sandblast finish shall be consistent finish throughout and match approved mock-up.

H. Where concrete finishing occurs adjacent to finished metal or other surfaces, particularly where serrated or indented surfaces occur, remove all traces of cement film before allowing to harden.

I. Apply integral wood float and broom finish to the all concrete pavements and walkways, unless otherwise shown on the Drawings.
   1. After screeding and compacting, finish with a wood float using a circular motion to produce a uniform texture and finish throughout.
   2. For vehicular traffic areas, the finish shall be coarse enough to provide a non-slip surface with a minimum static friction coefficient of 0.6.
   3. For pedestrian traffic areas, finish shall be a non-slip surface with a minimum static coefficient of friction of 0.6.
      a. For ramps, the static coefficient of friction shall be a minimum of 0.8. Ramps are defined as any sloping path of travel with a slope in the direction of travel of 5.0%, or greater.
   4. Tests for coefficient of friction shall be either ASTM C-1028 (field test) or ASTM D-2047 (laboratory test).

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.

B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
   1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.

   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within

3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

E. Spray-apply concrete sealer to all concrete pavement. Comply with sealer manufacturer's application instructions.

3.8 CURING COLORED CONCRETE

A. Colored concrete shall not, under any circumstances, be cured using water fog misting or ponding, burlap, plastic sheeting, or other wet covering.

B. Curing material and method shall be in strict conformance with manufacturer's guidelines and recommendations.

C. Only if additional protection is absolutely required, the surface should remain uncovered for at least 4 days, after which time new and unwrinkled non-staining reinforced waterproof kraft curing paper may be used.

3.9 FIELD QUALITY CONTROL TESTING

A. The Owner will employ a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include the following:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
   a. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
   b. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test but no less than one test for each day's pour of each type of air-entrained concrete.
   c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
   d. Compression Test Specimens: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless directed otherwise. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
   e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. Test one specimen at 7 days, test two specimens at 28 days, and retain one specimen in reserve for later testing if required.
2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
3. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

B. Test results will be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at

28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.

C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

D. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

E. Manufacturer's Field Service: When placing integral colored concrete, arrange for the services of a qualified technical representative of the color pigment manufacturer, equipped with wet-batch color control test devices to ensure concrete of uniform color and matching approved mock-up.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section. Concrete which is not true to line and plane, which is not thoroughly troweled and properly surfaced as required, which varies in excess of 1/4-inch along a 10-foot straight edge, which is scuffed or has a rough top surface, except where required, or which does not connect properly to adjoining work, does not slope as required for drainage or is not properly cured, will be deemed defective.

1. General: Patch defective areas immediately following form removal. Remove defective concrete to a width and depth necessary for proper patching, but in no case less than 1 inch deep. Make the walls of the cut area perpendicular to the surface and do not feather out the edge. Dampen the patch area and the adjacent area 6 inches around the patch area.
2. Exposed concrete: Prepare a patching mortar of one part Portland cement, adjusted to match the color of the surrounding concrete, and 2-1/2 parts sand with the least water required to produce a workable mass. Re-work this mortar until it is the stiffest consistency that will permit placing. Brush the patch area with a bond of neat cement and water paste and apply patching mortar when the water sheen is off the bond. Strike off the mortar slightly higher than the surrounding surface, let set for 1 hour and finish flush with the surrounding surface.

B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 02710

SANITARY SEWER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sanitary drainage piping, fittings and accessories.

B. Connection of building sanitary sewer drainage system to site sewer systems

C. Cleanout access.

1.2 REFERENCES

A. ASTM D3034 - Polyvinyl Chloride (PVC), SDR 35, for solvent-cemented or gasketed joints.

B. SSPWC - Standard Specifications for Public Works Construction, latest Edition.

1.3 REGULATORY REQUIREMENTS

A. Conform to Section 306, Standard Specifications for Public Works Construction, for materials and installation of Work of this Section.

1.4 SUBMITTALS

A. Shop drawings indicating dimensions, locations and elevations of manholes, cleanouts and sub-surface structures.

B. Product data for pipe and pipe accessories.

C. Inspection and test reports specified.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record location of existing and proposed pipe runs, connections, manholes, cleanouts and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 - PRODUCTS

2.1 SEWER PIPE MATERIALS

A. Gravity-Flow, Nonpressure Plastic Pipe: Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: ASTM D 3034, SDR 35, for gasketed joints. Gaskets: ASTM F 477, elastomeric seal.

B. PVC pipe is for outside conditions.

C. Cleanouts: PVC.

2.2 PIPE ACCESSORIES

A. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required "T", bends, elbows, cleanouts, reducers, traps and other configurations required.

B. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D3034, SDR 35, for solvent-cemented or gasketed joints.

1. Gaskets: ASTM F477, Elastomeric seals.
2. Primer: ASTM F 656.
3. Solvent Cement: ASTM D 2564

2.3 CLEANOUTS

A. Lid and Frame: Cast iron construction, removable lid, closed checkerboard grill lid design; nominal lid and frame diameter as required for pipe sizes. [SPPWC 204-2]

2.4 FILL MATERIAL

A. Bedding and Fill: As specified in Section 02300 “Earthwork”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut or excavation base is ready to receive work, excavations, dimensions and elevations are as indicated on Drawings.

B. Beginning of installation means acceptance of existing conditions.

C. Verify that existing invert elevations on site will allow proper tie in to new work with proper positive slope. Ascertain accuracy prior to trenching and installation of sanitary sewer system.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with approved fill material.

B. Remove large stones or other hard matter that could damage sewer pipe or impede consistent backfilling or compaction.

3.3 INSTALLATION - PIPE

A. Prior to commencing Work, Contractor shall pothole existing utilities at points of connection. Notify Architect in event of discrepancies.

B. Install pipe, fittings and accessories in accordance with Section 306, SSPWC and manufacturer's instructions. Seal joints watertight.

C. Place pipe on bedding as shown on construction plan details and specified in Division 02 “Earthwork”.

D. Lay pipe to slope gradient noted on Drawings with maximum variation from true slope of 1/8 inch in 10 feet.

E. Do not displace or damage pipe when compacting.

F. Connect to site sewer outlet system through installed sleeves.

G. Do not cover joints until lines have been tested and approved.

3.4 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Establish elevations and pipe inverts.

C. Mount lid and frame level in grout secured to top cone section to elevation indicated.

3.5 PROTECTION

A. Protect pipe cover from damage or displacement until backfilling operation is in progress.

3.6 TESTING

A. After installation, test each sanitary drain and/or sewer and each section between successive manholes for either infiltration or exfiltration. Test shall be conducted in accordance with Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.

B. Where excessive ground water is encountered test the pipeline for infiltration.

C. When infiltration or exfiltration exceeds allowable amounts as set forth in the Section 306 formula, perform repairs or replacements as necessary to comply with the required limits.

END OF SECTION

SECTION 02720

STORM DRAINAGE

PART 1 - GENERAL

RELATED DOCUMENTS

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

B. Reference Specification: Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", 2009 Edition. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.

1.2 SUMMARY

A. This Section includes gravity-flow, non-pressure storm drainage pipe and drainage structures outside the building.

1.3 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Non-pressure, Drainage-Piping Pressure Rating: At least equal to system test pressure

1.4 SUBMITTALS

A. Product Data for the following:
   1. Pipe and fittings
   2. Storm water quality devices: catch-basin insert filters
   3. Drain inlets

B. Shop drawings for pre-cast concrete structures. Include frames, covers, and grates.

C. Shop drawings for cast-in-place concrete or field-erected masonry structures. Include frames, covers, and grates.

D. Reports and calculations for design mixes for each class of cast-in-place concrete.

E. Coordination drawings showing structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench. Indicate interface and spatial relationship between piping and proximate structures.

F. Inspection and test reports specified in the "Field Quality Control" Article.

1.5 QUALITY ASSURANCE

A. Environmental Agency Compliance: Comply with regulations pertaining storm drainage systems.

B. Utility Compliance: Comply with regulations pertaining to storm drainage systems. Include standards of water and other utilities where appropriate.

C. Product Options: Drawings indicate sizes, profiles, connections, and dimensional requirements of system components and are based on specific manufacturer types indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Section "Product Requirements."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures in direct sunlight.

B. Do not store plastic pipe or fittings in direct sunlight.

C. Protect pipe, pipe fittings, and seals from dirt and damage.

D. Handle precast concrete manholes and other structures according to manufacturer's rigging instructions.

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Notify architect of potential utility conflicts prior to installation of pipe system.

B. Locate existing structures and piping to be closed and abandoned.

C. Prior to commencing construction in public right-of-way and connecting to any public storm drain systems, contractor shall contact the agency of authority and obtain necessary permits.

C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.

1. Notify Architect not less than 48 hours in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without receiving Architect's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PVC PIPE AND FITTINGS

A. PVC Storm Drain Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

B. PVC Storm drain Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.3 CAST-IRON PIPE AND FITTINGS

A. Hub and Spigot, Cast-Iron Pipe and Fittings: ASTM A74, Service class, gray cast iron for gasketed joints. Include ASTM C564, rubber compression-type gaskets.

2.4 NONPRESSURE-TYPE PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
   2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded Flexible Couplings: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.
   1. Manufacturers:
      a. Dallas Specialty & Mfg. Co.
      b. Fernco Inc.
      c. Logan Clay Products Company (The).
      d. Mission Rubber Company; a division of MCP Industries, Inc.
      e. NDS Inc.
      f. Plastic Oddities, Inc.

D. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
   1. Manufacturers:
      a. Cascade Waterworks Mfg.
      b. Dallas Specialty & Mfg. Co.
      c. Mission Rubber Company; a division of MCP Industries, Inc.
      d. Any equivalent manufacturer.

E. Ring-Type Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.
   1. Manufacturers:
      a. Fernco Inc.
      b. Logan Clay Products Company (The).
      c. Mission Rubber Company; a division of MCP Industries, Inc.
      d. Any equivalent manufacturer.

2.5 CATCH BASINS

A. Standard Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete, of depth indicated, with provision for sealant joints. Precast units shall meet H-20 traffic loading condtions.
   1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
   2. Top Section: Eccentric-cone type unless flat-slab-top type is indicated.
   3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16 (heavy traffic) structural loading unless otherwise indicated. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter flat grate with small square or short-slotted drainage openings, unless otherwise indicated.

1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

C. Flo-Gard Filter Inserts provided by Kristar Enterprise Inc.

D. Round Brass Grate with PVC Collar Model 909B: NDS, Inc., 851 North Harvard Avenue, PO Box 339, Lindsay, California 93247. Toll Free (800) 726-1994. Toll Free Fax (800) 726-1998. Phone (559) 562-9888. Fax (559) 562-4488. Website www.ndspro.com

2.6 TRENCH DRAINS

A. 8” Trench Drain Model FG200: ACO USA, Tel: (888) 490-9552. Website www.acousa.com

2.7 CLEAN OUTS

A. Cleanout Covers: Alhambra Foundry Company, Inc. Model No. A-1240 or A1242, heavy duty lamp pole frame and cover, or equal approved.

2.8 SUB-DRAINAGE MATERIALS

A. Filter Fabric: Supplied by prefabricated drainage structure manufacturer, 4.5 oz/sq. yd. min.

B. Waterproof Sheeting: Polyvinylchloride sheeting, minimum 20 mils thick, with waterproof adhesive supplied or recommended by sheeting manufacturer.

C. Perforated Subdrain Plastic Pipe:

1. Acrylonitrile-Butadiene-Styrene (ABS) Pipe: ASTM D 2751, with a maximum SDR of 35.

2. Polyvinyl Chloride (PVC) Pipe: ASTM D 3034, with maximum SDR of 35 and with flexible elastomeric seal joint.

3. Perforations: Perforations in ABS and PVC pipe shall be circular, not more than 5/16" or less than 3/16" in diameter, and arranged in rows parallel to the longitudinal axis of the pipe. Perforations shall be approximately 3 inches center-to-center, along rows. The rows shall be approximately 1-1/2" inches apart and arranged in a staggered pattern so that all perforations lie at the mid-point between perforations in adjacent rows. The rows shall be spaced over not more than 90 degrees of circumference. The spigot or tongue end of the pipe shall not be perforated for a length equal to the depth of the socket and perforations shall continue at uniform spacing over the entire width of the pipe. Manufacturer's standard ABS or PVC pipe essentially meets these requirements and may be substituted upon approval. Wall thickness as required for earth loads and as approved by Soils Engineer, 4" diameter minimum.

4. Acrylonitrile-butadiene-styrene (ABS) pipe shall be joined using solvent cement or elastomeric joints and shall be in accordance with ASTM D 2751.

5. Polyvinyl Chloride (PVC) pipe joints shall be in accordance with ASTM D 3212.

6. Furnish subsoil drainage pipe pre-wrapped or wrap pipe with Mirafi 140N Filter Fabric, or Bidim C22 or C28 fabric manufactured by Monsanto; or equal.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section "Earthwork."

3.2 IDENTIFICATION

A. Materials and their installation are specified in Section "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground structures.
   1. Use warning tapes or detectable warning tape over ferrous piping.
   2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

A. General: Include Silt tight joints, except where water tight and soil tight joints are indicated.

B. Pipe Couplings: Use where indicated and where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods. Pipe couplings and fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
   1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure storm drain piping, unless otherwise indicated.
      a. Shielded flexible couplings for same or minor difference OD pipes.
      b. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.4 PIPING INSTALLATION

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of underground sewerage and drainage systems piping. Location and arrangement of piping layout take into account many design considerations. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed. Verify existing elevations prior to extensive excavating and notify Architect of any discrepancies. Contractor shall be liable for any premature construction which must be modified due to unforeseen existing conditions.

C. Install gravity-flow-systems piping at constant slope between points and elevations indicated. Install straight piping runs at constant slope, not less than that specified, where slope is not indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install manholes for changes in direction if shown on plan, otherwise use fittings. Use fittings for branch connections unless direct tap into existing storm drain is indicated.

F. Extend drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

G. Install gravity-flow, nonpressure drainage piping according to the following:
   1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
   2. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
   3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

H. Clear interior of piping and manholes of dirt and superfluous material as work progresses.

3.5 PIPE JOINT CONSTRUCTION

A. General: Join and install pipe and fittings according to the following.

B. Install with top surfaces of components, except piping, flush with final finished surface.

C. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings: As follows:
   1. Join solvent-cement-joint pipe and fittings with solvent cement according to ASTM D 2855 and ASTM F 402.
   2. Join pipe and gasketed fittings with elastomeric seals according to ASTM D 2321.
   3. Join profile pipe and ribbed drain pipe and gasketed fittings with elastomeric seals according to ASTM D 2321 and manufacturer's written instruction.
   4. Install according to ASTM D 2321.

D. System Piping Joints: Make joints using system manufacturer's couplings, except where otherwise specified.

E. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and fit both systems' materials and dimensions.

3.6 TRENCH DRAINAGE SYSTEM INSTALLATION

A. Assemble and install components according to manufacturer's written instructions and as indicated.

B. Assemble and install components according to manufacturer's written instructions, ASME A112.3.1, and as indicated.

C. Install with top surfaces of components, except piping, flush with final finished surface.

D. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

E. Embed channel sections and appurtenances in a 4-inch (100-mm) minimum depth of concrete around bottom and sides.

F. Fasten grates to channel sections if indicated.

G. Assemble trench sections with flanged joints.

H. Embed trench sections and appurtenances in a 4-inch (100-mm) minimum depth of concrete around bottom and sides.

I. Make piping connections and install stainless-steel piping with gasketed joints between system components.

3.7 CATCH BASIN INSTALLATION

A. Set frames and grates to elevations indicated. Ensure catch basin walls are properly sealed at the drain pipe penetrations.

3.8 CONNECTIONS

A. Make connections to existing piping and underground manholes.
   1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3250 psi.

3.9 FIELD QUALITY CONTROL

A. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to requirements of authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Submit separate report for each test.
   5. Hydrostatic Tests: Test storm drain according to requirements of authorities having jurisdiction and the following:
      a. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
      b. Close openings in system and fill with water.
      c. Purge air and refill with water.
      d. Disconnect water supply.
      e. Test and inspect joints for leaks.
   6. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig.
   7. Air Tests: Test storm drainage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
      a. Option: Test plastic gravity sewer piping according to ASTM F 1417.

B. Leaks and loss in test pressure constitute defects that must be repaired.

C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

SECTION 02810

IRRIGATION SYSTEM

1.01 RELATED DOCUMENTS

A. General Conditions and Supplementary Conditions apply to this section, including all requirements by Los Angeles County Health Department for the use of reclaimed water.

1.02 WORK INCLUDED

A. Supply material, pipe, pipefittings, automatic valves, wiring, and labor to install a fully automatic sprinkler system. Restore any existing landscaping disturbed during the installation.

1.03 RELATED SECTIONS

1. Section 02505 – Decomposed Granite Paving.
2. Section 02900 – Landscape Planting

1.04 QUALITY ASSURANCE & REQUIREMENTS

A. Obtain and pay for any and all permits and inspections as required.

B. Follow manufacturer's directions and detailed drawings in all cases when the manufacturers of products used in this contract furnish directions covering points not included in the drawings and specifications.

C. All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed as conflicting with any such rules and regulations, or the requirements of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by such rules and regulations, the provisions of these specifications and drawings shall take precedence.

D. Superintendent:
   1. A superintendent satisfactory to the Owner's Representative shall be present on the site at all times during progress of the work.
   2. Do not change the Superintendent except with the consent of the Architect.
   3. The Superintendent shall be authorized to represent the Contractor.

E. Explanation of Drawings:
   1. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. Carefully investigate the structural and finish conditions affecting this work and plan work accordingly, furnishing such offsets, fittings, sleeves, etc., as may be required to meet site conditions. Drawings are generally diagrammatic and indicative of the work to be installed. Install the work in such a manner as to avoid conflicts between irrigation systems, planting and architectural features.
   2. The word Architect as used herein refers to the Owner's authorized representative.
   3. Furnish and install all work called for on the drawings by notes or details whether or not specifically mentioned in the specifications.
   4. Do not install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Bring such obstructions or differences to the attention of the Architect. Failure to do so will mean the Contractor is responsible for any revisions necessary.

5. Do not purchase or install materials as noted in legend on drawing when it is obvious there is an oversight or discrepancy. Failure to obtain prior material approval may result in rejection by the Architect. The Contractor will be responsible for any revisions necessary due to his failure to bring material discrepancies to the attention of Architect, or failure to comply with material submittals.
6. Coordinate as necessary the work of this Section which is allied with the work of other trades.
7. It is the intent of the drawings and specifications to describe a complete irrigation system providing uniform water coverage. If the plans or specifications appear in any way to be incomplete, misleading, conflicting, or subject to misinterpretation, it is the Contractor's responsibility to bring these concerns to the Architect's attention before bidding. If the Contractor fails to do so, the Contractor must accept the Architect's interpretation and any potential related financial impact that may occur.

F. Electrical wiring, controls, motors, and devices shall be Underwriters Laboratories listed, and labeled U.L.

1.05 SUBMITTALS

A. Material List:

1. Furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. Substitution is allowed only with prior written approval of the Architect.
2. Submit complete material list prior to performing any work. Material list shall include the manufacturer name, model number and description of all proposed materials and equipment.
3. Equipment or materials installed or furnished without prior approval of the Architect may be rejected and the Contractor required to remove such materials from the site at the Contractor’s own expense.
4. If equipment proposed for use is as specified, a material list ONLY is required, and it is UNNECESSARY to submit manufacturer descriptive catalogs with submittal.

B. Record Drawings:

1. Provide and maintain up to date and complete project record documents (set of blueline prints). Update daily and show all changes from the original drawings and specifications, as well as exact "as-built" locations, and sizes and types of equipment. Prints for this purpose may be acquired from the Architect. Keep this set of drawings on site and use only for such recording.
2. These drawings shall also serve as work progress prints and shall be the basis for measurement and payment for work completed. Drawings must be available at all times for site reviews, in a location designated by the Architect. Should the record blueline progress prints be unavailable for review or fail to be up to date at the time of any site reviews, it will be assumed no work has been completed and the Contractor will be assessed the cost of that site visit at the current billing rate of the Architect. No other inspections will take place until payment of that assessment.
3. Make neat and legible notations daily on the record progress prints as the work proceeds, showing the work as actually installed. Should equipment location differ from plan, indicate the new location in a graphic manner, matching the original symbols in the irrigation legend.
4. Before the final site review, transfer all information from the record prints to computer-generated reproducible drawings (or other approved method), and submit these reproducible drawings along with related CAD disk to the Architect for approval prior to preparing controller chart.
5. Dimension the following locations from two permanent points of reference (building corners, sidewalks, road intersections, etc.):
   a. connection to existing water lines
   b. connection to existing electrical power supply
   c. gate valves
   d. sprinkler pressure line routing and directional turns (dimension maximum 100 feet along routing).

e. automatic controller
f. remote control valves
g. control wire routing
h. quick coupling valves
i. master valve
j. flow sensor
k. lightning protection (rod, plate, etc.)
l. tracer wires (main line routing)
m. irrigation water meters
n. electrical meters

6. On or before the date of the final site review, deliver the updated and completed reproducible drawings to the Architect. Delivery of these drawings does not relieve the Contractor of responsibility for furnishing any required information that may have been omitted from the prints.

C. Controller Charts:

1. Record drawings must be approved by the Architect before controller charts are prepared.
2. Provide two controller charts for each controller installed.
3. The chart shall show the area controlled by the automatic controller and shall be the maximum size controller door will allow.
4. The chart shall be based on a record drawing, reduced to the maximum size that will fit inside controller housing (printed on two sides if required for graphic clarity).
5. The chart shall be a photocopy or black line print with colors to differentiate areas of coverage for each hydrozone, using pastel or transparent colors.
6. When completed and approved, hermetically seal the chart between two pieces of plastic (thickness of each piece being minimum 10 mils).
7. These charts must be completed and approved prior to final acceptance of the irrigation system. Installation will not be accepted without charts.

D. Operation and Maintenance Manuals:

1. Prepare and deliver to the Architect within 10 calendar days prior to completion of construction two hardcover three ring binders containing the following information:
   a. Index sheet stating Contractor's address and telephone number.
   b. List of equipment with names, addresses, and telephone numbers of local manufacturer representative.
   c. Catalog and parts sheets regarding material and equipment installed under this contract.
   d. Warranty statement.
   e. Complete operating and maintenance instruction on all major equipment.
2. In addition to these maintenance manuals, instruct Owner's maintenance personnel regarding operation of major equipment and show written evidence to the Architect at the conclusion of the project that this service has been rendered.

E. Equipment to be Furnished:

1. Supply as part of this contract the following tools:
   a. Two keys for each automatic controller
   b. Two keys for opening valve boxes
   c. One quick coupler key and matching hose swivel (per five quick coupling valves)
   d. One 5 foot valve key for operation of gate valve
   f. One remote hand-held radio control unit (transmitter and receiver) compatible with controller specified
   g. Two Rain Bird pressure gauges, RBG-L160-D
   h. One rotor maintenance kit per 100 brass gear driven rotor heads (minimum of one if less than 100 heads
2. Turn over this equipment to the General Manager's Representative at the conclusion of the project. Before final acceptance can occur, written evidence that the General Manager's Representative has received materials must be shown to the Project Manager.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Exercise care in handling, loading, unloading, and storing p.v.c. pipe and fittings. Transport p.v.c. pipe in a vehicle which allows the length of pipe to lie flat, to avoid undue bending or concentrated external load at any point. Any section of pipe dented or damaged must be discarded or, if installed, must be replaced with new piping.

B. Cover any pipe stored outdoors to protect it from sunlight.

1.07 SUBSTITUTIONS

A. To request substitution of any equipment or material in lieu of equipment or material listed on the irrigation drawings and in the specifications, provide the following information to the Architect for approval:
   1. Statement indicating the reason for making the substitution, using a separate sheet of paper for each requested substitution.
   2. Descriptive catalog literature and performance charts (if available) for each requested substitution.
   3. Hydraulic calculations for proposed substitution, as applicable.
   4. Itemized list of proposed substitution(s), noting difference in material and labor costs between substitution and item originally specified.
   5. Written confirmation that Owner's Representative has received any credit resulting from approved substitution (with a copy sent to Project Manager)

B. Approval of any substitution or alternate will be based on information and/or samples provided by the Contractor.

C. Responsibility for the total performance of any substitution to equal or surpass the item originally specified in every respect rests with the Contractor.

D. If the Owner's Representative determines the substitution has proven to be unsatisfactory, it shall be removed and replaced with the originally specified item as part of the work of this contract (both materials and labor).

E. The Owner's Representative shall be solely responsible for accepting or rejecting any substitution as equal to equipment and materials listed on the irrigation drawings and in the specifications.

1.08 WARRANTY

A. The general and supplementary conditions of these specifications shall be filed with the Owner's Representative or his representative prior to acceptance of the irrigation system.

B. Manufacturer warranties do not relieve the Contractor of his liability under the warranty. Such warranties only supplement the warranty.

C. Include a copy of the warranty form in the Operations and Maintenance Manual.

D. The entire sprinkler irrigation shall be warranted to be free from defects in material and workmanship, and installed in accordance with this Notice to Contractors. The Contractor shall be required to repair or replace any defects in material or workmanship which may develop with one calendar year from the date of acceptance, ordinary wear and tear and unusual abuse or reflect expected. Further, the Contractor shall be required to make any necessary repairs within 24 hours of notification at no cost to the Owner. If the Contractor or his agent fail to make such repairs within the stipulated time, the Department shall make such repairs or have repairs made by a third party, and bill the Contractor for all expense that accrue from making such repairs.

E. If settlement occurs along main line, lateral lines, at valve boxes, or other irrigation related appurtenances within one calendar year from date of acceptance, and adjustments in pipes, valves, or sprinkler heads are required to bring system, sod, or paving to the level of the permanent grade, the Contractor shall make all adjustments without additional cost to the Owner, including complete restoration of any planting, paving, or other improvements damaged as a result of settlement.

F. If within one calendar year from the date of acceptance, settlement occurs along main lines, lateral lines, at valve boxes, or other irrigation related appurtenances, and adjustments in pipes, valves and sprinkler heads are required to bring the system, sod or paving to the level of the permanent grades, the Contractor shall make all adjustments without additional cost to the Owner, including complete restoration of any planting, paving or other improvements damaged as a result of settlement.

1.09 TEMPORARY REPAIRS

A. The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner will not relieve the Contractor of responsibilities under the terms of the guarantee as herein specified.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Use only new materials of manufacturer and type noted on drawings and as specified herein, or approved equal.

2.02 PIPE & FITTINGS

A. Pressure main line piping 4 to 10 inches in size shall be class 150, DR18, C-900 p.v.c. with Pacific Western "Twin Seal" joints or equal. All fittings shall be ductile iron, AWWA C153, compact configuration, with mechanical joints. All ductile iron compact configuration fittings shall be of U.S. manufacture. All fittings to pipe joints shall be restrained with an EBAA 2000 series "Megalug" retainer gland wrench.

B. Pressure main line piping and fittings sizes 2 to 3 inch in size shall be p.v.c. class 315 solvent weld type.

C. Pressure main line piping and fittings up to 1-1/2 inch in size shall be p.v.c. Schedule 40.

D. Pressure main line piping and fittings (surface) shall be Schedule 40 galvanized steel.

E. Non-pressure lines (buried) shall be p.v.c Schedule 40. (1/2 inch pipe is not permitted.)

F. Non-pressure lines (surface) shall be p.v.c. Schedule 40, u.v.r.

G. Non-pressure lines (drip) shall be p.v.c. Schedule 40.

H. Sleeves or conduit lines 2 inches and smaller shall be p.v.c. Schedule 40. Sizes 2-l/2 inches and larger shall be class 200.

I. All p.v.c. pipe and fittings shall be purple in color in accordance with IRWD requirements for reclaimed water and conform to following specific requirements:
   1. P.v.c. (Solvent Weld)
      a. Pipe shall be manufactured from virgin polyvinyl chloride compound in accordance with ASTM D 1784 or ASTM D 2241, cell classification 12454 B, hydrostatic design stress rating not less than 2,000 p.s.i.

b. Fittings (solvent weld or thread) shall be standard weight, Schedule 40, side gated, injection molded p.v.c., complying with ASTM D 1784, cell classification 13454 B, including threads when required.

2. P.v.c. nipples shall be Schedule 80, with molded threads.
3. All p.v.c. pipe must bear the following markings:
   a. Manufacturer name
   b. Nominal pipe size
   c. Schedule or class
   d. Date of extrusion
4. Surface installed p.v.c. pipe and fittings shall be Schedule 40 and contain additional compound for ultra-violet resistance.
5. Solvent cement and primer for p.v.c. solvent-weld pipe and fittings shall be of type and installation method prescribed by the manufacturer.
6. Brass Pipe & Fittings:
   a. Brass pipe shall be 85 percent red brass, American National Standard Institute (ANSI), Schedule 40 screwed pipe.
   b. Fittings shall be medium brass, screwed 125 pound class.
7. Copper Pipe & Fittings:
   a. Pipe shall be Type K, hard tempered.
   b. Fittings shall be wrought copper, solder joint type.
   c. Joints shall be soldered with silver solder, 45 percent silver, 15 percent copper, 16 percent zinc, 24 percent cadmium, solidus at 1125 F. and liquidus at 1145 F.

2.03 TRACER WIRES

A. Install No. 14 polyethylene coated copper tracer wire with all non-metallic irrigation main lines, Paige P7079D or equal.

2.04 ELECTRICAL (HIGH VOLTAGE)

A. All high voltage electrical services required for automatic controller and other irrigation system equipment noted on drawing shall be provided by Electrical Contractor. The metered controller enclosure shall be double door design positioned front and back, vandal and weather resistant, manufactured entirely of stainless steel. The front section shall house a UL listed, E.U.S.E.R.C. approved 100 amp rated commercial meter socket with test block bypass provision. The back section shall be louvered upper and lower body to allow for cross, flow ventilation. The back section shall have a stainless steel backboard provided for the purpose of mounting a controller. The backboard shall be mounted on four stainless steel bolts that will allow for removal of the backboard. The inside door area shall provide adequate storage for plans, operating instructions, and scheduling information. The enclosure shall have continuous stainless steel piano hinges on one side of each door, and a three point locking mechanism on the other side of each door. The handles controlling the locking mechanisms shall be located at the base of the doors and be concealed within the surface of the doors. The provision for padlocks shall be included with the locking mechanisms.

B. Electrical equipment installed outside building shall be NEMA 4 type.

C. All connections between electrical services and equipment shall be in rigid galvanized electrical conduit, with conduit and wiring sizes as required.

2.05 ELECTRICAL (LOW VOLTAGE)

A. Control wire connections shall be made with 3-M brand DBY or DBR direct burial splice kits, or approved equal. The splice kit shall consist of a one piece malleable plastic bulb body with internal locking fingers, filled with re-enterable gel sealant and a Scotchlok Electrical Spring Connector. Connector shall be flame retardant p.v.c. insulator with a steel spring and shell within. Tube material shall be polypropylene. Gel material shall be hixotropic calcium organic complex. Wire sizes and numbers or wires shall be as shown below.

CONNECTOR	COLOR	NO. AND SIZE OF WIRE
3 M Model DBY	Yellow	Max. 4 - 12 gauge UF wires
3M Model DBR	Red	Max. 3 - 14 gauge UF wires

B. Controller decoder wire pair shall be IDWIRE-2: 12/2 AWG/2mm and decoder to solenoid wire shall be 18 AWG/1.024mm.

2.06 GATE VALVES

A. Valves 21/2 inches and smaller shall be ASTM B 62 brass/bronze body, 150 pound saturated steam rated with screwed joints, non-rising stem, screwed bonnet, and solid disc, unless otherwise noted on drawings. Provide with hand wheel.

B. Valves 3 inches and larger shall be ASTM A 126 Class B, iron body, 150 pound w.o.g. with flanged joints, non-rising stem, bolted bonnet, and double disc, equipped with operating nut, or as other approved or noted on drawings.

2.07 QUICK COUPLING VALVES

A. Quick couplers shall be 1 inch i.p.s., two piece, brass construction equipped with a purple cover, unless otherwise specified on plans.
   1. Coupler threads shall be lug type (acme type).
   2. Provide with rubber-like vinyl hinge cover.

2.08 STRAINER ASSEMBLY

A. Basket strainer assembly shall be 125 pound class cast brass with 40 mesh monel screen, unless otherwise noted on drawing.

2.09 AUTOMATIC CONTROLLER

A. Controller shall be fully automatic and capable of operating the required number of stations, flow sensors, master valves, and moisture sensors. Controller shall be pedestal mount type, in a stainless steel housing with locking hinged cover. Fuse and chassis ground all controller components. Automatic controller shall include the following:

   1. 117 volt pump starter relay for each controller being served.
   2. Surge protection.
   3. Copper clad lightning protection device (specific type to be coordinated with General Contractor).
   4. Permanent connection outside controller housing for quick connection of remote hand-held radio controls.
   5. Remote rain switch assembly mounted on the right hand side of enclosure, with interconnect wire harness pre-wired through a bypass switch into the controller and to the terminal strip.
   6. Master valve relay assembly pre-wired to the terminal strip. If more than one controller is served off master valve, provide additional relays for each such controller.

B. Provide the controller assembly with a terminal strip clearly marking the positions for one rain sensor and four moisture sensing devices. Wire the terminal strip through five clearly marked on/off switches mounted on the face of the controller to provide sensing bypass capability.

C. Each exterior controller enclosure shall have a ground rod installed if detailed on the controller installation detail.

2.10 REMOTE CONTROL VALVES

A. Valve shall be spring-loaded, packless diaphragm activated, normally closed type with glass filled nylon body, scouring filter mechanism, flow control and pressure regulation capabilities when noted on drawing.

B. Valve solenoid shall be 24 volt a.c. 4.5 watt maximum, 500 mili-amp maximum surge, corrosion-proof, stainless steel construction, epoxy encapsulated to form a single integral unit.

C. When valves called for are not equipped with a flow control, provide a ball valve on discharge side of valve.

D. Valve shall be equipped with an internal/external bleeder to permit operation in the field without power at the controller.

2.11 SMALL TURF SPRINKLER HEADS

A. Sprinklers shall be similar in all respects to type noted in legend on drawing.

B. Heads shall have screw adjustments.

C. Nozzle shall rise a minimum of 6 inches.

D. Body shall be equipped with a built-in check valve.

E. Provide pressure compensating screens (pcs) as noted on drawing.

F. Provide variable arc nozzles as necessary in irregular corners and due to planting area configuration.

G. Use pressure regulating type heads where noted.

2.12 SMALL SHRUB/GROUND COVER SPRINKLER HEADS

A. Sprinklers shall be similar in all respects to type shown on drawing.

B. Where noted, use pop-up type body with height per legend on drawing.

C. When noted, body shall be equipped with a built-in check valve.

D. Provide pressure compensating screens (pcs) as noted on drawing.

E. Provide variable arc nozzle as necessary

F. Use pressure regulating type heads where noted.

2.13 ROTARY SPRINKLER HEADS

A. Heads shall be gear driven pop-up sprinkler heads, with rubber cover and built-in check valve.

B. Part circle heads shall have variable arc setting.

2.14 VALVE BOXES

A. Valve boxes shall be purple in color and manufactured from low pressure structural foam with locking covers. Boxes shall be manufactured by Carson Industries with model numbers as indicated on the drawings, or approved equal. The covers shall be permanently embossed "GV" for gate valve, "RCV" for remote control valve, "QC" for quick coupling valve, "MV" for master valve, and "FM" for flow meter. Print is not acceptable. Install box per detail.

2.15 MASTER VALVE

A. Master valve shall be spring-loaded, packless diaphragm activated, normally open normally closed type, equipped with flow control and pressure regulation capabilities when noted on drawing.

2.16 FLOW SENSOR

A. Flow sensor size shall be based on the lowest flow demand through the sensor, with the piping size per dimensions noted in construction detail. Verify size of sensor with Manufacturer Representative.

B. Install sensor per manufacturer's recommendations. Retain a factory-trained representative to check installation and perform start-up services, including adjustment of all equipment. Provide General Manager's Representative with proof of compliance.

2.17 TREE IRRIGATORS/BUBBLER HEADS

A. Bubbler heads shall be similar in all respects to type shown in detail and sprinkler legend.

B. Provide assemblies as indicated on drawings (including vents) for tree well applications.

C. See drawing for construction detail regarding height and typical assembly of bubbler on fixed head riser.

D. Install head a minimum of 6 inches above finish grade unless otherwise noted.

E. Use Teflon tape on all threaded fittings.

F. Install bubbler head away from walkway to minimize pedestrian hazard and unsightly conditions whenever possible.

G. In slope areas, install bubbler head on uphill side of plant material.

H. Nozzles shall be as specified in legend.

I. Install check valve on riser as required for low head drainage.

J. Provide pressure compensating screens (pcs) as noted on drawing.

K. Refer to typical spacing of heads per drawing and adjust as required for actual field conditions.

L. Weatherproof enclosure, with magnetic starter. Provide fusible disconnect switch, HOA selector switch, control transformer, and relays as required.

M. Enclose pumps in a 14 gauge enclosure of a size to fit pump and fittings as shown in detail. Paint unit with two coats of Rust-o-leum. dark green purple color.

PART 3 – EXECUTION

3. 01 SITE CONDITIONS

A. All scaled dimensions are approximate. Check and verify all dimensions per Architect's approval prior to proceeding with work under this section.

B. Exercise extreme care in excavating and working near existing utilities. Coordinate excavations with underground service alert and utility companies. Damage to utilities caused by operations or neglect shall be repaired at Contractor's expense. Check existing utility drawings for locations.

C. Coordinate installation of sprinkler irrigation materials, including pipe, so there will be NO interference with utilities or other construction, or difficulty in planting trees, shrubs, and ground covers.

D. Carefully check all grades to ensure work on the sprinkler irrigation system may safely commence.

3.02 PREPARATION

A. Water Supply:
   1. The General Manager's Representative will provide new meters and pay all costs incurred.
   2. Connect sprinkler irrigation system to water supply points of connection as indicated on the drawings. Verify exact location on site.
   3. Connections as shown on drawings are approximate. Minor deviations (plus or minus 20 feet) required by actual site conditions shall be a part of this contract.
   4. Coordinate connection to meters, water outlets, etc. with General Contractor and other trades on site to ensure proper connection.
   5. Coordinate pipe crossing hardscapes, walks, etc., with appropriate trades to minimize disturbance to finish product. If a preferable route is noted on site, contact Architect to discuss alternative and obtain approval of same.

B. Observation Schedule:

   1. Notify the Owner's Representative in advance for the following observation meetings, according to the time indicated:
      a. Pre-job conference - 10 days
      b. Backflow assembly and automatic controller location - 72 hours
      c. Pressure supply line and control wire installation and testing - 72 hours
      d. Lateral line and sprinkler installation - 72 hours
      e. Coverage test - 72 hours
      f. Final site review - 10 days
   2. When observations are conducted by other than the Architect, show evidence in writing when and by whom these observations were made.
   3. Maintain a set of current and up to date plans on the job site at all times. No site observations will commence without record drawings and current plans. In the event the Contractor calls for a site visit without record drawings, without current plans, without completing previously noted corrections, or without preparing the system for said visit, he shall be responsible for reimbursing the Owner's Representative based on his current billing rates per hour (portal to portal, plus transportation costs) for the inconvenience. No subsequent site visits will be scheduled until this charge has been paid.

C. Piping Inspection:

   1. Arrange for continuous inspection of piping by the Los Angeles County Health Department, (213) 881-4140, Cross Connection Program, 2525 Corporate Place, Room 150, Monterey Park, CA 91754..

D. Physical Layout:

1. All piping or equipment shown diagrammatically on drawings outside planting areas shall be installed inside planting area whenever possible, to exact dimensions noted in construction details unless otherwise approved.
2. Prior to installation, stake out all pressure supply line routing and sprinkler head locations.
3. Entire layout shall be approved by Owner's Representative prior to installation.

3.03 INSTALLATION

A. Piping:

1. Install all plastic pipe and fittings according to manufacturer instructions.
2. All lines shall have a minimum horizontal separation of 12 inches from each other and from lines of other trades. Parallel lines shall not be installed directly over one another. Pipe lines crossing each other shall be separated vertically a minimum of 3 inches.
3. Install concrete thrust blocks in accordance with pipe manufacturer recommendations for pressure supply piping 3 inches and larger.
4. Coordinate installation of piping shown through walls as required with General Contractor to avoid penetrating walls if possible. If penetration is necessary, coordinate and waterproof.
5. Scale of drawing may not permit indicating all sleeving required. Provide sleeves for all piping under paved areas. Refer to sections that pertain to sleeving material, size, etc.
6. All major plumbing work using copper pipe shall be performed by a licensed and bonded Plumbing Contractor. Irrigation Contractor shall obtain all permits required.
7. All outlets from main line shall be accomplished with line sized tees, with an outlet of the specified size. No Saddle tees are permitted.
8. Retainer gland bolts shall be tightened as specified in the manufacturer's instructions. All bolts shall be tightened using a torque wrench only. Tighten each "Megalug" wedge nut in an alternate sequence with torque wrench. The maximum torque on the on the "Megalug" wedge nuts shall be 30 ft./lbs. Verify the torque of the bolts with the Project Inspector using a torque wrench, and have a torque wrench available on site until job acceptance.

B. Trenching:

1. Excavate trenches to required depths. Follow approved layout for each system. Pipe layout as shown on irrigation plan is schematic. Route piping in the most avoidance of tree roots. Adhere to as-built requirements stated herein.
2. Trench bottom shall be flat to ensure piping is supported continuously at prepared grade.
3. Where lines occur under paved areas, consider dimension to be below the subgrade.
4. Trenching shall pass no closer than 10 feet from base of any tree without the prior written approval of the City Arborist. Do not cut tree roots larger than 2 inches in diameter without the prior written approval of the City Arborist.
5. Maximum trench width is two and a half diameter of the pipe.
6. Provide minimum coverage as follows:
   a. Pressure supply lines (3 inches and smaller): 24 inches, unless otherwise noted on drawing.
   b. Pressure supply lines (4 to 10 inches): 36 inches, unless otherwise noted on drawing.
   c. Pressure supply lines under paving (2 inches and smaller): 24 inches, unless otherwise noted on drawing.
   d. Pressure supply lines under paving (2-1/2 inches and larger): 36 inches, unless otherwise noted on drawing.
   e. Non-pressure lines: 12 inches, unless otherwise noted on drawing.
   f. Non-pressure lines under paving: 18 inches, unless otherwise noted on drawing.
   g. Control wire: 18 inches, unless otherwise noted on drawing.

C. Tracer Wires:

1. Carefully place tracer wire on bottom of trench under vertical projection of pipe, avoiding stress from backfilling and running wire continuously throughout the length of pipe.
2. Tracer wire shall follow main line pipe and branch lines, terminating in a yard box with a gate valve that controls these main irrigation lines. Provide sufficient wire to reach surface grade, bending back end of wire to form a loop, and attach a Dymo-Tape type plastic label noting "TRACER WIRE."
3. All splices shall be made using Scotchlok or equal, encased in epoxy resin to provide a permanent U.L. approved watertight connection.
4. Record locations of tracer wires and their termination points on record drawings.

D. Backfilling:

1. Buried pipe in trenches shall be center loaded only until all required tests are performed.
2. Pipe bedding shall surround pipe 1 foot above the top of the pipe. Place bedding in 6 inch lifts. Denify bedding by water jetting sufficient to thoroughly wet bedding material around the pipe. Place no rocks over 1/2 inch in largest dimension and nor organic matter in bedding material. Backfill shall be the material placed above the bedding. Place backfill in 1 foot lifts and densify by water jetting. Continue jetting until backfill collapses and water is forced to surface. Pipe trenches thoroughly densified by water jetting shall have a minimum relative compaction of 85 percent. Place no rocks over 2 inches in greatest dimension shall be subject to compaction tests as requested by the Owner. All such compaction tests shall be at the expense of the Contractor. Additional test may be required until the 85 percent, minimum compaction is achieved. Finished trenches shall match finish grades, flush with adjacent finish grades. The Contractor shall be responsible for maintaining the trenches flush and smooth until final acceptance of the project. Repair trenches in existing lawn to match finish condition.
3. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn, planting, etc. are necessary, make all such adjustments without cost to the Owner.

E. Trenching and Backfill Under Paving:

1. Where irrigation piping crosses a vehicular roadway or other paving having a width greater than 25 feet, provide a p.v.c. Schedule 40 sleeve a minimum of two pipe sizes larger than piping to pass through it. Jack under the paving at a minimum depth of 36 inches.
2. Where irrigation piping crosses a vehicular roadway or other paving having a width greater than 25 feet, provide a p.v.c. Schedule 40 sleeve a minimum of two pipe sizes larger than piping to pass through it. Repair trench in the existing paving with a like paving material, and joint the existing paving both horizontally and vertically.
3. All sleeves shall extend 3 feet minimum beyond edge of roadway.
4. Pressure test all piping under paving prior to the paving work.
5. Install piping under existing walks by jacking, boring or hydraulic driving. Cut or break sidewalk and/or concrete as necessary and replace paving as a part of the contract cost. Obtain permission from the Owner's Representative to cut or break sidewalks and/or concrete. No hydraulic driving will be permitted under asphaltic concrete paving.
6. Coordinate installation of piping and sleeves under paved areas with General Contractor.

F. Assemblies:

1. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines and various assemblies to conform with details on plans.
2. Install no multiple assemblies in plastic lines. Provide each assembly with its own outlet.
3. Perform all directional changes on pressure supply line using 45 degree elbows. No 90 degree elbows will be permitted without approval of Owner's Representative.
4. No more than one size may be used when reducing or increasing a fitting outlet, unless approved by Owner's Representative.

5. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice, with prior approval of the Owner's Representative.
6. Thoroughly clean p.v.c. pipe and fittings of dirt, dust and moisture before installation. Prior to application of p.v.c. solvent cement, prepare all surfaces to be solvent welded with tetrahydrofuran primer, tinted purple.
7. On p.v.c. to metal connections, work the metal connections first. Use Teflon tape or approved equal on all threaded p.v.c. to p.v.c. and on all threaded p.v.c. to metal joints, with only light wrench pressure. Where threaded p.v.c. connections are required, use threaded p.v.c. adapters into which the pipe may be welded.
8. Verify exact location of all major equipment with the Owner's Representative before installation.
9. Install remote control valves in shrub areas and perpendicular to hardscape unless otherwise approved.
10. Unless otherwise approved, locate quick coupling valves within 12 inches of hardscape or at separation between shrub and lawn areas.
11. Assemble pressure supply steel pipe and fittings using red lead and boiled linseed oil paste or an approved equivalent, applied to male threads only.
12. Locate tree irrigators at each tree. Install as indicated on drawings, including vents,strainers, etc.

G. Automatic Controller:

1. Install per manufacturer instructions. The foundation of the automatic controller shall be per details. Provide a separate 24 volt control wire from the automatic controller to each remote control valve.

H. Flushing of System:

1. After all new sprinkler pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, open the control valves and flush out the system using adequate pressure.
2. Flushing shall occur in the presence of Owner's Representative. Start flushing at valve closet to the point of connection and proceed with each consecutive valve, toward valve farthest from the point of connection. Each lateral system shall have each riser capped during the flushing, commencing with the riser closest to the valve and proceeding to the farthest riser. After the entire irrigation system has been flushed, the system shall be pressure tested
3. Install sprinkler heads only after the system has been flushed to the complete satisfaction of the Owner's Representative.

I. Sprinkler Heads:

1. Install the sprinkler heads per the drawings and according to their respective detail.
2. Spacing of heads shall not exceed 5 percent of width of planting area. Refer to plan, and bring any discrepancies to the attention of Project Manager.
3. Irrigation plans are designed for head-to-head coverage as a minimum standard. Scale head locations from center of head symbol directly from the irrigation plan. Accuracy of placement shall be within plus or minus 2 feet for rotor heads having a throw 25 feet or greater, and within plus or minus 12 inches for all head types with a throw under 25 feet. Heads located adjacent to paving shall be placed within 3 inches of paving.
4. Install all plastic sprinkler heads on swing joint assemblies or flex pipe as shown on the details.

J. Valve Boxes:

1. Install all buried valves and equipment in the specified box.

2. Fill area under box with a minimum of 3 cubic feet of 3/4 inch gravel for remote control valves and two cubic feet for gate valves and quick coupling valves, before box is installed.
3. Attach identification tags to each remote control valve, showing number that corresponds with controller sequence. Tags shall be manufactured of polyurethane Behr Desopaid, yellow in color with black letters, 2-3/4 inches by 2-1/4 inches.
4. Brand sequence number of each valve in minimum 2 inch high numerals into box top areas unless otherwise approved.
5. Install valve boxes square to one another and to edges of adjacent hardscape, unless otherwise approved by Owner's Representative.
6. Set boxes flush with finish grade, including sloped area. Compact all soil within 12 inches of the perimeter of box by water settlement, as indicated in trench repair section of this specification. Position boxes per construction detail.

K. Electrical Supply:

1. Place low voltage wiring in the same trench and alongside of main lines unless otherwise approved. Do not tape wire to main line. If control wires run same trench as lateral lines or are "dead headed," maintain wire depth at 24 inches.
2. When more than one wire is placed in a trench, tape wires together at maximum 12 feet on center.
3. Provide a 12 inch expansion loop at each connection and directional change for low voltage wires and two feet for stub outs.
4. Use a continuous wire between controller and remote control valves. Except as otherwise approved, do not splice wire at any point. Enclose all approved splices in an U.L. approved junction box.
5. Provide each controller with separate ground wire.
6. Provide pull box for low voltage wires approximately every 200 feet along continuous lineal runs.
7. Where remote control wiring crossed under paving having a width of less than 25 feet, jack a 3 inch p.v.c. Class 315 sleeve under the paving at a minimum depth of 36 inches. All sleeves shall extend a minimum of 3 inches beyond edges of paving.
8. Where remote control wiring crosses under paving having a width of less than 25 feet, install a 3 inch p.v.c. Class 315 under the paving at a minimum depth of 36 inches. All sleeves shall extend a minimum of 3 inches beyond edges of paving.
9. When installing low voltage wire connectors (3-M Corporation DBY or DBR), strip control wires of 12 inch insulation, insert into electrical spring connector, and twist connector in clockwise direction until wires are tight. Insert completed splice into gelfilled tube, and check visually to confirm wire nut has been pushed past the fingers and is seated in the bottom of tube. Position wires in wire channels and close insulator cover.

3.04 FIELD QUALITY CONTROL

A. Adjustment of the System:

1. Set sprinkler heads in lawn areas flush with finish grade at initial installation, and protect during construction. Compact all soil 12 inches from the perimeter of the head of water jetting as indicated in these specifications, or set in sand as shown on details.
2. Adjust all sprinkler heads and valves for optimum performance and to minimize overspray onto walks and roadways. Spray on buildings and/or windows is not permitted.
3. If it is determined that adjustments in the irrigation equipment will provide proper or more adequate coverage, make such adjustments prior to planting. Adjustments may include changes in nozzle sizes or trajectory of spray or degrees of arc, as may be required. Use variable arc nozzles where required.
4. Set all sprinkler heads perpendicular to finish grades unless otherwise designated on the plans, and at height and distance from walks, buildings, etc, as noted or as directed by Owner's Representative.

5. When using master flow monitors sensors, determine exact flow rates and proper operating time to avoid water runoff for each control valve. Program this information into the controller, along with minimum flow of each valve and maximum flow for the largest valve. Provide a written copy of this data to Owner. Fault detection shall be 5 percent greater than actual flow. Show evidence in writing to the Owner's Representative at the conclusion of the project that this service has been rendered.

B. Protect all existing landscaping. Any existing landscaping removed or damaged shall be properly replaced, including sod, as directed by the Owner's Representative.

C. Testing of Irrigation System:

1. Pressure test irrigation main lines following the flushing of the complete system. Test main lines for 8 hours at 150 p.s.i. with all control valves in place and closed. During the test, provide pressure gauges downstream from the backflow device and upstream from the farthest remote control valve in the system. Air pressure testing of the irrigation system is acceptable if approved by Owner's Representative.
2. Testing of pressure main lines must occur prior to installation of electric control valves, quick couplers or any other equipment that might prevent a proper test from being performed.
3. Test all piping under paved areas under hydrostatic pressure of 150 pounds per square inch, and prove watertight prior to paving.
4. If leaks develop (more than 5 percent), replace joints and repeat test until entire system is proven watertight.
5. All hydrostatic tests shall be conducted only in the presence of the Project Manager or other duly authorized representative of the Owner's Representative. Do not completely backfill pipe until it has been inspected, tested and approved in writing.
6. Furnish necessary force pump and all other test equipment, if permanent connection is unavailable.
7. When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Owner's Representative to confirm that water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans, or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate without notifying the Project Manager. This test shall be accomplished before any planting occurs.
8. Provide handheld walkie-talkie or personnel as necessary to accomplish this task expeditiously.
9. Upon completion of each phase of work, test and adjust entire system to meet site requirements.
10. Test any low voltage wiring more than 50 feet long installed under paving for continuity prior to paving.

D. Final Observation Prior to Acceptance:

1. Operate each system in its entirety for the Architect at time of final observation. Any items deemed unacceptable by the Architect due to noncompliance with the specifications and drawings shall be corrected to the complete satisfaction of the Owner's Representative.
2. Operate automatic controller rain sensor moisture sensors at conclusion of maintenance period to confirm proper operation.
3. Evidence must be shown to the Owner's Representative that Owner has received all required equipment, charts, record drawings, etc. before final observation can occur.

E. Termination of Maintenance Period:

1. At end of maintenance period, submit written confirmation to Owner's Representative that the system is operating properly, as per final acceptance, and note any changes/adjustments made during maintenance period. Based on this, Architect may request additional site review.

3.05 FLOW SENSOR AND MASTER VALVE

A. Flow sensor and master valve shall be installed per construction detail on drawing and according to manufacturer recommendation.

3.06 MAINTENANCE

A. The entire sprinkler irrigation system shall be operated automatically for a period of fourteen days prior to any planting.

B. The Owner's Representative reserves the right to waive or shorten the operation period.

C. After maintenance period, demonstrate in presence of the Owner's Representative that the system is in proper operating order.

3.07 CLEANUP

A. Perform cleanup as each portion of the work progresses. Remove refuse and excess dirt from the site, and sweep or wash down all walks and paving. Repair any damage to the work of others and return to original condition.

3.08 OPERATING INSTRUCTIONS

A. Train Owner's maintenance personnel in proper operation of all major equipment, including recommended winterization procedures. Provide written confirmation of the person(s) so trained to the Owner's Representative.

B. During maintenance period, establish infiltration rate of soil in all areas (particularly slopes). Schedule automatic controller to not exceed saturation point, and program repeat cycles as required to meet landscape needs while avoiding runoff. At conclusion of maintenance period, provide a typed record of the watering schedules for each valve during maintenance, including various schedules due to seasonal changes.

3.09 EXISTING TREES

A. Where it is necessary to excavate adjacent to existing trees, use all possible care to avoid injury to trees and tree roots. Excavate by hand in areas where 2 inch and larger roots occur. Tunnel under all roots 2 inches and larger in diameter and heavily wrap with burlap, to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than 2 inches in diameter, hand trim the wall of the trench adjacent to the tree, making clean cuts through. Paint roots 1 inch and larger in diameter with two coats of Tree Seal, or equivalent. Close trenches adjacent to tree within 24 hours. Where this is not possible, shade the side of the trench adjacent to the tree with burlap or canvas.

3.10 SERVICES/DATA TO BE PROVIDED BY THE CONTRACTOR

A. Flow sensor cable test

B. Water schedules

C. Training of Owner's personnel in proper operation of all major equipment

END OF SECTION

SECTION 03100

CONCRETE FORMS AND ACCESSORIES

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. Section Includes:

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

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

B. Related Sections:

1. Section 01420: Testing and Inspection.

2. Section 03200: Concrete Reinforcement.

3. Section 03300: Cast-In-Place Concrete.

1.3 SYSTEM DESCRIPTION

A. Regulatory Requirements: Except as otherwise specified herein, Work of this section shall be in accordance with CBC, Chapter 19, Concrete.

1.4 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating locations of forms, joints, embedded items, and accessories.

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

1.5 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Conform to ACI 347, Chapter 1: Design and Chapter 3: Materials for Formwork.

2. Plywood: Conform to tables for form design and strength in APA Form V 345.

PART 2 - PRODUCTS

2.1 GENERAL

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

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

C. Plywood: PS 1-09, Group I, Exterior Grade B-B Plyform or better, minimum 5-ply and 3/4 inch thick for exposed locations and at least 5/8 inch thick for unexposed locations, grade marked, not mill oiled. Furnished plywood with medium or high density overlay is permitted.

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

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

F. Form Coating: Non-staining clear coating free from oil, silicone, wax, not grain-raising, "Formshield" by A.C. Horn, Inc., "Release" by Burke Concrete Accessories, or "Cast-Off" by Sonneborn Building Products. Where form liners are furnished, provide form coatings recommended by form liner manufacturer.

G. Form Liner: Rigid or resilient type by L.M. Scofield, Labrado Forms, Symons, or Greenstreak

PART 3 - EXECUTION

3.1 GENERAL

A. Forms shall be constructed so as to shape final concrete structure conforming to shape, lines and dimensions of members required by Drawings and Specifications, and shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape. Forms and their supports shall be designed so that previously placed structures will not be damaged. Forms shall be true to line within a tolerance of plus-or-minus 1/250 of the span.

3.2 ERECTION

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

B. Openings for Cleaning: Provide temporary openings at points in formwork to facilitate cleaning and inspection.

3.3 REMOVAL OF FORMS

A. Forms shall not be removed until concrete has sufficiently hydrated to maintain its integrity and not be damaged by form removal operations. Unless noted otherwise and/or permitted by the Design Consultant, forms shall not be removed in less than 5 days. Shoring shall not be removed until member has acquired sufficient strength to support its weight, load upon it, and added load of construction.

B. Compressive strength of in-place concrete shall be determined by testing field-cured specimens representative of concrete location or members, as specified in Section 03300: Cast-In-Place Concrete.

3.4 PROTECTION

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

3.5 CLEAN UP

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

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

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. Section Includes:

1. Concrete steel reinforcement as indicated.

B. Related Sections:

1. Section 01421: Testing and Inspection.

2 Section 03100: Concrete Formwork.

3 Section 03300: Cast-In-Place Concrete.

4. Section 04820: Concrete Unit Masonry.

1.3 SYSTEM DESCRIPTION

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

1.4 SUBMITTALS

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

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

1.5 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

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

2. American Welding Society (AWS).

3. American Concrete Institute (ACI).

4. CBC, Chapter 19, Concrete.

B. Source Quality Control: Refer to Division 01 Sections for general requirements and to following paragraphs for specific procedures. Testing laboratory retained by the Owner shall perform following conformance testing, select test Samples of bars, ties, and stirrups from the material at the Project site or from the place of distribution, with each Sample consisting of not less than two 18 inch long pieces, and perform the following tests according to ASTM A 615.

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

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

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

1.6 DELIVERY, STORAGE AND HANDLING

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

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

PART 2 - PRODUCTS

2.1 GENERAL

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

2.2 MATERIALS

A. Steel Reinforcing Bars: ASTM A 615, or ASTM A 706 deformed grade 60 billet steel unless otherwise specified or indicated. Where welding is required, reinforcing steel shall be conformed to ASTM A 706. In addition, the ultimate tensile stress shall be not less than 1.25 times the actual yield stress (based on mill tests) and the carbon equivalent value shall not exceed 0.65.

B. Bars or Rod Mats: ASTM A 184.

C. Wire Fabric for Reinforcement: ASTM A 185.

D. Tie Wire: ASTM A 82, fully annealed, copper-bearing steel wire, 16 gage minimum.

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

2.3 FABRICATION OF REINFORCING BARS:

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

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

C. Welding: Provide only ASTM A 706 steel where welding is indicated. Perform welding by the direct electric arc process in accordance with AWS D1.4 and specified low-hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is not permitted. Do not tack weld bars. Clean metal surfaces to be welded of loose scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds deemed defective, using chisel, and replace with proper welding. Prequalification of welds shall be in accordance with CBC requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Bars shall be bent cold. Bars partially embedded in concrete shall not be field bent except as indicated on reviewed Shop Drawings. Before installation, clean reinforcing of loose scale, rust, oil, dirt and any coating that could reduce bond.

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

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

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

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

3.2 CLEAN UP

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

3.3 PROTECTION

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

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

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. Provisions of Division 01 apply to this section

B. Section Includes:
1. Cast-in-place concrete placement and finishing.

C. Related Sections include the following:
1. Section 01420: Testing and Inspection.
2. Section 02520: Portland Cement Concrete Paving.
3. Section 03100: Concrete Forms and Accessories.
4. Section 03200: Concrete Reinforcement.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, and other pozzolans.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

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

C. Design Mixes:
1. Submit a concrete mix design for each mix that will be provided for the Work. Mix designs shall be designed by testing laboratory under supervision of a California Registered Civil or Structural Engineer, who shall determine mix designs to fulfill the specified requirements for strength, aggregate size and workability of concrete, and such designs shall be used in proportioning all structural concrete. Mix design shall bear the stamp and signature of the California Registered Civil or Structural Engineer. Mix designs shall include water/ cement ratio, size of coarse aggregate, amount of any admixture, minimum compressive strength, and maximum slump.
2. Manufacturer of ready-mixed concrete shall deliver to the IOR a certificate with each mixer truck. Certificate shall bear the signature of representative of the testing

laboratory, and shall state quantity of cement, water, fine and coarse aggregate and admixtures.

D. Samples: For sealed colored concrete, provide two 12-inch by 12-inch samples of sealed colored concrete with steel trowel finish.

E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Cementitious materials and aggregates.
2. Admixtures.
3. Curing materials.
4. Floor and slab treatments.
5. Bonding agents.
6. Adhesives.
7. Vapor barriers.
8. Epoxy joint filler.
9. Joint-filler strips.
10. Repair materials.

F. Certification by manufacturers that products supplied meet or exceed requirements of applicable referenced ICC Standards which may be different from the ASTM or other standard on which they are based.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.
1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

C. Testing Agency Qualifications: An independent testing agency, acceptable and approved by the Building Department, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated, as documented according to ASTM E548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

E. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
2. ACI 211 - Recommended Practice for Selecting Proportions of Concrete.
3. ACI 301, "Specification for Structural Concrete."
4. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

5. ACI 305 - Recommended Practice for Hot Weather Concreting.
6. ACI 306 - Recommended Practice for Cold Weather Concreting.
7. ACI 308 - Recommended Practice for Curing Concrete.
8. ACI 309 - Recommended Practice for Consolidation of Concrete
9. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. ASTM Standards: Comply with the following, unless more stringent provisions are indicated:
1. ASTM A 185 - Welded Steel Wire Fabric For Concrete Reinforcement.
2. ASTM C 31 - Making and Curing Concrete Test Specimens in the Field.
3. ASTM C 33 - Concrete Aggregates.
4. ASTM C 39 - Compressive Strength of Cylindrical Concrete Specimens.
5. ASTM C 88 - Soundness of Aggregates by use of Sulphate or Magnesium Sulphate.
6. ASTM C 94 - Ready-Mixed Concrete.
7. ASTM C 143 - Slump of Hydraulic Cement Concrete.
8. ASTM C 150 - Portland Cement.
9. ASTM C 171 - Sheet Materials for Curing Concrete.
10. ASTM C 172 - Sampling Freshly Mixed Concrete.
11. ASTM C 173 - Air Content of Freshly Mixed Concrete by the Volumetric Method.
12. ASTM C 227 - Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method).
13. ASTM C 231 - Air Content of Freshly Mixed Concrete by the Pressure Method.
14. ASTM C 260 - Air-Entraining Admixtures for Concrete.
15. ASTM C 289 - Potential Reactivity of Aggregates (Chemical Method).
16. ASTM D 1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

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

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

I. Strength Test of Concrete: Refer to Section 01421: Testing and Inspection.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Mixing and Placing Concrete: Refer to Section 01420: Testing and Inspection.

B. Ready-mix concrete shall be mixed and delivered in accordance with ASTM C 94 and ASTM C 685. Each batch of concrete delivered to the Project site shall be accompanied by a time slip bearing departure time and signature of batch plant supervisor. Concrete shall be placed within 90 minutes after start of mixing.

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

1.7 JOB CONDITIONS

A. Cold Weather Requirements:
   1. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather. Surfaces, in which concrete is to come in contact with, shall be free from frost or ice. No frozen materials or materials containing ice shall be furnished.
   2. When placing concrete during freezing or near-freezing weather the mix shall have a temperature of at least 50 degrees F., but not more than 90 degrees F. when cement is added. Concrete shall be maintained at a temperature of at least 50 degrees F. for at least 72 hours after placing or until it has thoroughly hydrated. When necessary, concrete materials shall be heated before mixing. Special precautions shall be provided for protection of transit-mixed concrete.

B. Hot Weather Requirements:
   1. During hot weather, proper attention shall be provided for ingredients, production methods, handling, placing, protection and curing, to prevent excessive concrete temperatures or water evaporation which could impair required strength or durability

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace sealer/curing compound and flooring material due to moisture migration, excessive vapor emissions or contaminates.
   1. Warranty shall be in effect for 10 years from date of Substantial Completion:

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout the Project:
   1. Portland Cement: ASTM C150, Type II, Sulfate-resisting. Supplement with the following:
      a. Fly Ash: ASTM C618, Class F. Fly ash producer shall have 5 years experience in the production of acceptable fly ash and shall practice an effective quality control program to guard against contamination of the fly ash. Fly ash used shall be from one source throughout the project.

B. Normal-Weight Aggregate: ASTM C33, uniformly graded, and as follows:
   1. Class: Moderate weathering region, but not less than 3M.
   2. Nominal Maximum Aggregate Size: See plans.

C. Water: Potable and free from deleterious matter and complying with ASTM C94.

2.2 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with

other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

1. Water-reducing admixtures of all types, including accelerating and retarding, shall reduce mixing water at least 10 percent without entraining air in excess of 2 percent by volume. If water-reducing admixture entrains more than 2 percent, air-water reduction shall be at least 12 percent, but in no case shall water-reducing admixture entrain air in excess of 4 percent.

B. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other admixtures including fly ash at a 35% rate of replacement.

C. Water-Reducing Admixture: ASTM C494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C494, Type D.

2.3 VAPOR BARRIER

A. Plastic Vapor Barrier: ASTM E1745-09, Class A, with a permeance rating of 0.01 perms [grains/(ft^2*hr*inHg)] or less (per ASTM E 1249 or ASTM E 96) after mandatory conditioning tests (per ASTM E 154 Section 8, 11, 12, 13). Include manufacturer's recommended adhesive or pressure-sensitive tape, but not less than 2 inches wide.

1. Products:
   a. Stego Industries, LLC; Stego Wrap, 15 mils, Class A.
   b. Epro; EcoShield
   c. Griffolyn; VaporGuard
   d. Or equal.
2. Vapor Barrier shall have the following qualities:
   a. Water vapor transmission rate of 0.006 WVTR or lower per ASTM E96.

B. Vapor Barrier Accessories:

1. Seam tape compatible with selected vapor barrier product.
2. Vapor proofing mastic compatible with selected vapor barrier product.

C. Slab Base Course Gravel: Clean mixture of compactable, granular fill; ASTM D448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.4 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

B. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, and plasticizing admixture.

C. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

D. Products: Subject to compliance with requirements, provide one of the following:
   1. Unpigmented Mineral Dry-Shake Floor Hardener:
      a. Non-Metallic Floor Hardener; Burke Group, LLC (The).
      b. Quartz Tuff; Dayton Superior Corporation.
      c. Surflex; Euclid Chemical Co.
      d. Or equal.
   2. Penetrating Liquid Floor Treatment:
      a. Day-Chem Sure Hard; Dayton Superior Corporation.
      b. Euco Diamond Hard; Euclid Chemical Co.
      c. Liqui-Hard; Meadows.
      d. Or equal.

2.5 CURING MATERIALS

A. Clear, Waterborne, Membrane-Forming Curing/Sealing Compound: ASTM C309, Type 1, Class B, minimum 34 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
   1. Products:
      a. CWP, Inc. Creteseal CS 2000 Spray Apply System, with 10 year warranty per Article 1.7 of this Section.
      b. Or equal (no known equal with 10 year warranty).

2.6 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber, or ASTM D1752, cork or self-expanding cork.

B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D2240.

C. Bonding Agent: ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
   1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
   2. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.0217-inch- thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.7 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C109/C109M.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.
   1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C109/C109M.

2.8 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
   1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301 and ACI 318, Section 5.3 and CBC 1905.

B. Use a qualified independent testing agency approved by authorities having jurisdiction for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Footings: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): See plan.
   2. Water-Cementitious Materials Ratio: See plan
   3. Maximum Percentage of Fly Ash: 15% of cement content by weight
   4. Maximum Slump: see plan.
   5. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.

D. Slab-on-Grade: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): see plan.
   2. Maximum Water-Cementitious Materials Ratio: see plan
   3. Maximum Percentage of Fly Ash: 15% of cement content by weight.
   4. Maximum Slump: see plan.
   5. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.
   6. Do not use plasticizers in concrete mix design specified for polished concrete.

E. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2 to 4 percent, unless otherwise indicated.

F. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

G. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
   4. Use corrosion-inhibiting admixture in concrete mixes where indicated.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
   1. Class A, 1/8 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
   1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor bolts, accurately located, to elevations required.
   2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

3.5 VAPOR BARRIER

A. After subgrade is approved by Geotechnical Engineer, level and tamp or roll base course gravel.

B. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643-09.
   1. Unroll vapor barrier with the longest dimension parallel with the direction of the pour.
   2. Lap vapor barrier over footings or seal to foundation walls.
   3. Overlap joints 6 inches and seal with manufacturer's tape.
   4. Seal all penetrations (including pipes) per manufacturer's instructions.
   5. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
   6. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated
   2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groove tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
   1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Architect.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
   1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
   2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab-on-grade surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
2. Do not apply rubbed finish to smooth-formed finish.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
   2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E1155/E1155M for a randomly trafficked floor surface:
      a. Specified overall values of flatness, F(F) 35; and levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and levelness, F(L) 17; for slabs-on-grade.
      b. Specified overall values of flatness, F(F) 30; and levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and levelness, F(L) 15; for suspended slabs.

D. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
   1. Steel trowel and fine-broom finish concrete slabs that are to receive ceramic tile: Maximum permissible variation 1/4-inch in 10 feet from the required plane. Cure concrete slabs that are to receive tile before tile application. Do not use liquid curing compounds or other coatings that may prevent bonding of tile setting materials to slabs. Slab shall be dry at time of tile installation. Since any cracking of the concrete slabs will be transmitted to the finished surface, take all precautions to prevent cracks in the concrete. Use control joints through the slab and tile finish as specified or where cracks are anticipated.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
   2. Medium Textured Broom Finish (medium salt finish): For slopes less than 6 percent, draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish with amplitude of 1/16 inch to 1/32 inch.

3. Heavy Textured Broom Finish (slip resistant finish): For slopes exceeding 6 percent, provide a coarse finish with amplitude of 1/8 inch to 1/16 inch by striating surface with a stiff-bristled broom.
4. See Specification Section 02520 for additional requirements on portland cement concrete paving & concrete finishes.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.12 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days (14 days is preferable for polished concrete) with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days (14 days is preferable for polished concrete). Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

3. Curing Compound (except interior slabs): Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound (except interior slabs): Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than seven days old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Testing Agency: District will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least one composite sample for each 150 cu. yd. or fraction thereof of each concrete mix placed each day.
   2. Slump: ASTM C143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
   3. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
   4. Unit Weight: ASTM C567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
   5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C39; test one laboratory-cured specimen at 7 days and two at 28 days (or 56 days, if appropriate for compressive strength requirement). Hold one specimen in reserve and test only if directed to do so by Architect.

C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days (or 56 days, if appropriate), concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day (or 56-day, if appropriate) tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Architect.

END OF SECTION

SECTION 04200

MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Division 01 Specification Sections, Drawings, General Conditions, Supplementary General Conditions, and Special Conditions apply to this section.

1.02 REFERENCES

A. TMS 602/ACI 530.1/ASCE 6 2008 Specification for Masonry Structures

B. ASTM International (latest versions)
1. ASTM A36/A36M Standard Specification for Carbon Structural Steel
2. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
3. ASTM A307 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
4. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
5. ASTM A951 Standard Specification for Masonry Joint Reinforcement
6. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable
7. ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units
8. ASTM C140 Standard Test Method for Sampling and Testing Concrete Masonry Units
9. ASTM C150 Standard Specification for Portland Cement
10. ASTM C270 Standard Specification for Mortar for Unit Masonry
11. ASTM C476 Standard Specification for Grout for Unit Masonry
12. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete
13. ASTM C1019 Standard Test Method for Sampling and Testing Grout
14. ASTM C1314 Standard Test Method for Compressive Strength of Masonry Prisms
15. ASTM C1586 Standard Guide for Quality Assurance of Mortars
16. ASTM D2287 Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

1.03 SUMMARY

A. Section Includes:
1. Concrete masonry units (CMUs).
2. Mortar and grout.
3. Reinforcing steel.
4. Control joint materials.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.

B. Products installed, but not furnished, under this Section:
1. Section 05120 Structural Steel for steel lintels and shelf angles for unit masonry.
2. Section 076200 Sheet Metal Flashing and Trim.

C. Related Sections:
   1. Section 01420: Testing and Inspection
   2. Section 03100: Concrete Forms and Accessories
   3. Section 03200: Concrete Reinforcement
   4. Section 03300: Cast-in-Place Concrete

1.04 SYSTEM DESCRIPTION

A. Provide materials to achieve the net compressive strength of concrete unit masonry equal to or greater than 1500 psi f'_m.

1.05 SUBMITTALS

A. Obtain written acceptance of submittals prior to use of the following:
   1. Submit mix designs and test reports
      a. Preblended mortar
         1) Mix design indicating types and proportions of materials according to proportion specification of ASTM C270, or
         2) Mix designs and mortar tests performed in accordance with the property specification of ASTM C270
      b. Conventional grout
         1) Mix design indicating types and proportions of materials according to proportion requirements of ASTM C476, or
         2) Mix design and grout strength test performed in accordance with ASTM C476.
   2. Submit material certificates for each of the following certifying compliance.
      a. Concrete masonry units.
      b. Steel reinforcing bars.
      c. Anchors, ties, fasteners, and metal accessories.
      d. Preformed control joint gaskets.

B. Samples for Verification: For each type and color of the following:
   1. Exposed concrete masonry units.
   2. Mortar, for color selection or confirmation.

1.06 QUALITY ASSURANCE`

A. Preconstruction Testing.
   1. Owner will select a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner.
   2. The compressive strength of masonry shall be determined based on strength of the unit and type of mortar specified (Unit Strength Method) per CBC Table 2105.2.2.1.2.
      a. Concrete Masonry Units: Test per ASTM C140.
      b. Grout: Test per ASTM C1019.
   3. The compressive strength of masonry shall be determined by the prism test method in accordance with ASTM C1314. Schedule masonry procurement sufficiently in advance to allow for prism construction and curing.
      a. Prism Test: For each type of construction required, construct and test three prisms per ASTM C1314.

B. Sample Panels: Construct an approximate long by panel for representation of completed masonry, joint tooling, design details, and workmanship. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.
   1. The following shall be installed in the sample panel:
      a.

C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

1.07 DELIVERY, STORAGE, AND HANDLING

A. All materials of this section shall be protected to maintain quality and physical requirements.
B. All masonry units shall be stored on the jobsite so that they are protected from rain, stored off-ground and kept clean from contamination. Prevent units from being otherwise wetted.

C. Store Spec Mix preblended mortar mix in manufacturer's original, unopened, undamaged containers with identification labels intact, covered and protected from weather, or in a Spec Mix dispensing silo.

1.08 FIELD CONDITIONS

A. Securely cover tops of all unsheltered walls and partially completed walls when work is not in progress.

B. Cold-weather procedures when ambient temperature falls below 40°F (4°C) or the temperature of masonry units is below 40°F (4°C):
   1. Wet or frozen units shall not be laid.
   2. Implement cold weather construction procedures in accordance with TMS 602/ACI 530.1/ASCE 6 Article 1.8 C.

C. Hot-weather procedures when ambient temperature exceeds 100°F (38°C), or exceeds 90°F(32°C) with a wind velocity greater than 8 mph:
   1. Implement hot weather construction procedures in accordance with TMS 602/ACI 530.1/ASCE 6 Article 1.8 D.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Orco Block Company.
   1. Type: Standard precision block
      Color: Brown
      Weight: Medium
      Location: Exterior surfaces, Interior surfaces where indicated on the drawings

   2. Type: Standard precision block
      Color: Standard Gray
      Weight: Medium
      Location: Interior surfaces where painting has been called out

B. Preblended mortar.
   1. Spec Mix Preblended Mortar Mix, by E-Z Mix, Inc.
      a. Sun Valley, CA (818) 768-0568
      b. Rialto, CA (909) 874-7686

C. Grout additive.
   1. PRE-MIX Products Grout Additive, by E-Z Mix, Inc.
      a. Sun Valley, CA (818) 768-0568
      b. Rialto, CA (909) 874-7686

2.02 CONCRETE MASONRY UNITS

A. Concrete Masonry Units: ASTM C90
   1. Weight Classification: Grade N-1 Medium-weight unless otherwise indicated.
   2. Color(s) and texture(s):
      a. Glazier White, Burnished MW
   3. Provide open-end units at walls to be grouted.
   4. Provide closed-end units at walls and at openings where ends will be exposed in finish Work; provide bond beam blocks where horizontal reinforcement is indicated.
   5. Provide special shapes and accessory units at locations indicated on Drawings.
   6. Provide units in colors and textures as indicated in the Drawings.
   7. Masonry unit shall have been cured for a minimum of 28 days.
   8. Masonry unit shall have maximum liner shrinkage of 0.065 percent from saturated to oven dry.
   9. Integral Water Repellent: Provide units made with integral water repellent.
      a. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
      b. Active substance: Microemulsion concentrate of silanes and oligomeric alkyl alkoxysiloxanes.

2.03 MORTAR AND GROUT MATERIALS

A. Spec Mix Masonry Mortar preblended factory mix: ASTM C270.
   1. Color to closely match masonry color. Submit samples for approval.
   2. Type S 1,800 psi at 28 days

B. Grout for masonry: ASTM C476.
   1. Fly ash: ASTM C618.
   2. Provide grout with a slump of 8 to 11 inches per TMS 602/ACI 530.1/ASCE 6 Article 2.6 B.
   3. Minimum compressive strength = 2,000 psi at 28 days

C. Water: Potable.

D. Admixtures:
   1. The use of admixtures shall not be permitted except as specified herein, or as approved by the Architect or Engineer of Record and the Building Official.
   2. PRE-MIX Products Grout Additive manufactured by E-Z Mix, Inc. Use per manufacturer's specifications.
   3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Grace Construction Products, a unit of W.R. Grace & Co. – Conn.; Dry-Block Mortar Admixture.
      b. Master Builders, Inc.; Color Cure Mortar Admix or Rheomix Rheopel.
      c. Or equal.
   4. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

2.04 REINFORCEMENT AND METAL ACCESSORIES

A. Metal reinforcement and accessories shall conform to TMS 602/ACI 530.1/ASCE 6 Article 2.4.

B. Steel Reinforcing Bars: ASTM A615, Grade 60 for #5 and larger bars and ASTM A615, Grade 40 for #4 and smaller bars.

C. Masonry Joint Reinforcement: ASTM A951. Maximum spacing of cross wires in ladder-type and points of connection of cross wires of truss-type joint reinforcement shall be 16 in.

D. Anchors, ties, and accessories:
   1. Plate and bent-bar anchors: ASTM A36/A36M.
   2. Sheet-metal anchors and ties: ASTM A1008/A1008M.
   3. Wire mesh ties: ASTM A185/A185M.
   4. Wire ties and anchors: ASTM A82/A82M.
   5. Headed anchor bolts: ASTM A307, Grade A.

E. Coatings for corrosion protection. Unless otherwise required, protect carbon steel joint reinforcement, ties, and anchors from corrosion by galvanizing or epoxy coating in conformance with the following minimums:
   1. Mill galvanized coatings:
      a. Joint reinforcement: ASTM A641 (0.1 oz/ft^2)
      b. Sheet metal anchors and ties: ASTM A653 (1.50 oz/ft^2)
   2. Hot-dipped galvanized coatings:
      a. Joint reinforcement, wire ties, and wire anchors: ASTM A153 (1.50 oz/ft^2)
      b. Sheet metal anchors and ties: ASTM A153 Class B
   3. Epoxy coatings:
      a. Joint reinforcement: ASTM A884 Class A Type 1 — ≥7 mils
      b. Wire ties and anchors: ASTM A899 Class C — 20 mils
      c. Sheet metal anchors and ties: 20 mils per manufacturer's specification

2.05 FLASHING MATERIALS

A. Provide metal flashing in accordance with Section 076200 Sheet Metal Flashing and Trim.

2.06 MISCELLANEOUS MASONRY ACCESSORIES

A. Rubber Preformed Control-Joint Gaskets: per ASTM D2000, Designation M2AA-805, unless noted otherwise on plans.

B. PVC Preformed Control-Joint Gaskets: per ASTM D2287, Type PVC, unless noted otherwise on plans.

2.07 MASONRY CLEANER

A. Use potable water and detergents to clean masonry unless otherwise approved.

B. Do not use acid or caustic solutions unless otherwise approved.

2.08 MIXING

A. Mortar:
   1. Mix Spec Mix Masonry Mortar preblended factory mix per manufacturer's recommendations.

B. Conventional grout:
   1. Mix grout to a consistency that has a slump between 8 and 11 in.

2.09 FABRICATION

A. Fabricate reinforcement per TMS 602/ACI 530.1/ASCE 6 Article 2.7 A.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to the start of masonry installation, verify all conditions pertinent to the performance of work in this Section are acceptable.
   1. Verify foundations are constructed with tolerances conforming to requirements of ACI 117.
   2. Verify that reinforcing dowels are positioned in accordance with Project Drawings.

B. Masonry work shall not proceed until unsatisfactory conditions have been corrected or approved by the Design Professional.

3.02 PREPARATION

A. Clean reinforcement and shanks of anchor bolts by removing mud, oil, or other materials that will adversely affect bond to mortar or grout.
   1. Reinforcement with rust and/or mill scale is acceptable provided attributes of a cleaned sample are in accordance with the applicable ASTM specification.

B. Prior to laying masonry, remove laitance, loose aggregate, and any other material that would prevent mortar from bonding to the foundation.

C. Do not wet units before laying, unless otherwise required. Wet cutting is permitted.

D. Cut units as required to fit; use motor-driven masonry saw. Install cut units with cut surfaces concealed as much as possible.

3.03 INSTALLATION

A. Select and arrange units for exposed masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

B. Comply with construction tolerances in TMS 602/ACI 530.1/ASCE 6.

C. Construct grout spaces free of mortar dropping, debris, and any material deleterious to grouting.

D. Construct cleanouts in the bottom course of masonry for each grout pour when the grout pour height exceeds 5 ft.
   1. Hollow-unit masonry: create cleanout by cutting off entire the face shell of the cmu. Replace face shell after inspection and before grouting.
   2. Solid-unit multiwythe masonry: create cleanout by leaving out every other unit. Install unit after inspection and before grouting.
   3. Brace cleanout closure to resist grout pressure.
   4. For solid grouted masonry, space cleanouts horizontally a maximum 32 in. on center.

E. All masonry shall be laid true, level, plumb, and in accordance with the drawings.

F. Ensure all vertical cells to be grouted are aligned and unobstructed openings for grout are provided in accordance with Project Drawings.

G. Exposed masonry shall be laid in stack bond unless otherwise indicated in Project Drawings.

H. Concealed masonry with shall be laid in stack bond unless otherwise indicated.

I. Brace masonry during construction to assure stability. Design, provide, and install bracing.

3.04 MORTAR BEDDING AND JOINTING

A. Place mortar in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.3 B.

B. Initial bed joint shall not be less than 1/4 inch nor more than 3/4 inch.

C. All head and bed joints, except as in 3.4 B., shall be a nominal 3/8 in. thick, unless otherwise required.

D. Thickness of bed joints shall not exceed 5/8 inch.

E. Lay hollow units with head and bed joints filled with mortar for the thickness of the face shell.

F. Lay solid units with full head and bed joints. Do not fill head joints by slushing with mortar. Bed joints shall not be furrowed deep enough to produce voids.

G. Remove mortar protrusions extending 1/2 in. or more into cells to be grouted.

H. Fully mortar webs in all courses of piers, columns and pilasters, in the starting course on foundations, and when necessary to confine grout.

I. All mortar joints on exposed walls shall be concave, unless otherwise indicated, and struck to produce a dense, slightly concave surface well bonded to the surface of the masonry unit.

J. Remove and re-lay in fresh mortar any unit that has been disturbed to the extent the initial bond is broken.

3.05 EMBEDDED ITEMS AND ACCESSORIES

A. Construct control joints as detailed in the drawings as masonry progresses.
   1. Install preformed control-joint gaskets designed to fit standard sash block.

B. Construct chases as masonry units are laid.

C. Install pipes and conduits passing horizontally through nonbearing masonry partitions as indicated.

D. Place pipes and conduits passing horizontally through masonry walls as indicated.

E. Place pipes and conduits in and parallel to plane of walls only where approved by SEOR except as noted on plans. Pipes and conduits are not allowed in cells with reinforcing steel.

F. Install and secure connectors, flashing, weep holes, weep vents, nailing blocks, and other accessories as required.

3.06 INSTALLATION OF REINFORCING STEEL, WALL TIES, AND ANCHORS

A. Install reinforcing steel, wall ties, and anchors in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.4.

B. Place reinforcement as detailed on the drawings.
   1. Support and fasten reinforcement to prevent displacement beyond specified tolerances during construction and grouting operations.
   2. Maintain clear distances between reinforcement and any face of masonry unit or formed surface, but not less than ¼ in. for fine grout, or ½ in. for coarse grout.
   3. Completely embed reinforcing bars in grout.
   4. Embed joint reinforcement with minimum 5/8 inch cover to faces exposed to weather or earth, and 1/2 inch elsewhere.

a. Provide minimum 6-in. lap splices and ensure that all ends of longitudinal wires are embedded in mortar at laps.

5. Tolerances for placement of reinforcing bars in walls and flexural elements shall be ± ½ in. when the distance from the centerline of reinforcing bars to the opposite face of masonry, *d*, is equal to 8 in. or less, ± 1 in. for *d* equal to 24 in. or less but greater than 8 in., and ± 1 ¼ in. for *d* greater than 24 in.
6. Foundation dowels that interfere with unit webs are permitted to be bent to a maximum of 1 in. horizontally for every 6 in. of vertical height.

C. Install wall ties as detailed on the drawings and in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.4 C.

D. Install anchor bolts ties as detailed on the drawings and in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.4 D.
1. Embed headed and bent-bar anchor bolts in grout. Anchor bolts of ¼ in. or less may be placed in mortar bed joints at least ½ in. in thickness.
2. Maintain clear distance between anchor bolts and any face of masonry unit or formed surface of at least ¼ in. when using fine grout, and of at least ½ in. when using coarse grout.
3. Maintain a clear distance between parallel anchor bolts not less the diameter of the anchor bolt, nor less than 1 in.

3.07 GROUTING

A. Comply with grout placement requirements in TMS 602/ACI 530.1/ASCE 6 Article 3.5.

B. Place grout within 1 ½ hr from introducing water in the mixture and prior to initial set.
1. Discard field-mixed grout that does not meet specified slump without adding water after initial mixing.
2. For transit-mixed grout:
   a. Addition of water is permitted at time of initial discharge to adjust consistency to a slump between 8 and 11 in.
   b. Discard transit-mixed grout that does not meet specified slump without adding water, other than as allowed in 3.7 B. 2.a above.
   c. Transit-mixed grout may be used beyond the time limit as long as it meets the specified slump.

C. Grout pour height: do not exceed maximum grout pour height as given in TMS 602/ACI 530.1/ASCE 6 Table 7, or as otherwise specified.

D. Grout lift height:
1. Conventional grout:
   a. Place grout in lifts not exceeding 5 ft.

E. Grout consolidation:
1. Conventional grout:
   a. Consolidate grout pours 12 in. or less by mechanical vibration or puddling.
   b. Consolidate grout pours exceeding 12 in. by mechanical vibration, and reconsolidate after initial water loss and settlement has occurred.

F. Grout keys are required between grout pours, or between lifts when the previous lift is permitted to set prior to placement of the subsequent lift.
1. Form grout key by terminating the grout a minimum of 1½ in. below a mortar joint.
2. Do not form grout keys within beams.
3. At beams or lintels laid with closed bottom units, terminate the grout pour at the bottom of the beam or lintel without forming a grout key.

3.08 FIELD QUALITY CONTROL

A. Inspection tasks and frequency shall be performed in accordance with the Statement of Special Inspections.

B. Tests
   1. Unless indicated otherwise, perform one set of tests for each 5000 sq. ft. of wall area or portion thereof.
   2. Concrete Masonry Units: test per ASTM C140.
   3. Grout: Test per ASTM C1019.
   4. Prism Test: For each type of construction indicated, construct and test three prisms per ASTM C1314.

3.09 POINTING, AND CLEANING

A. Point and tool holes in mortar joints to produce a uniform, tight joint.

B. During construction, minimize any mortar or grout stains on the wall. Immediately remove any staining or soiling that occurs.
   1. For precision or textured units, except as noted below, clean masonry by dry brushing before tooling joints.
   2. For burnished, glazed, or pre-finished concrete masonry units, immediately remove any green mortar smears or soiling with a damp sponge

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry surfaces of stains, efflorescence, mortar or grout droppings, and debris as follows:
   1. Clean exposed CMU walls with a light sandblast. All non-masonry work near the area to be sandblasted shall be covered or protected before the sandblasting starts. Care shall be taken to avoid contamination to areas that are not to be sandblasted.
      a. Burnished, glazed, or pre-finished concrete masonry units shall be protected from sandblast operations.

D. At completion of masonry work, remove all scaffolding and equipment used during construction, and remove all debris, refuse, and surplus masonry material from the site.
   1. Comply with Construction Waste Management plan.

3.10 WATER REPELLENT APPLICATION

A. Cleaning shall be complete and accepted by the Architect, and wall surfaces shall be thoroughly dry.

B. Apply water repellent in strict accordance with Section 07190 and the water repellent manufacturer's instructions.

END OF SECTION

SECTION 05300

METAL DECKING

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. Roof deck.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
   2. Division 9 Section "High-Performance Coatings" for repair of deck high-performance coatings.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
   1. Mechanical fasteners.

F. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to the Building Department.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Testing Agency Qualifications: An independent testing agency, acceptable to the Building Department, qualified according to ASTM E329 to conduct the testing indicated, as documented according to ASTM E548.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E119 by a testing and inspection agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
   2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

E. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Steel Deck:
      a. Verco Manufacturing Co.
      b. Nucor Corp.; Vulcraft Div.
      c. ASC Steel Deck Co.
      d. Or equal.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating.
   2. Deck Profile: Type WR, wide rib.
   3. Profile Depth: 1-1/2 inches
   4. Design Uncoated-Steel Thickness: See plan.
   5. Span Condition: As indicated.
   6. Side Laps: As indicated

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

C. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

D. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

E. End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

F. Galvanizing Repair Paint: ASTM A780, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.

B. Locate decking bundles to prevent overloading of supporting members.

C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by shot pins:
   1. Shot Pin Size: As indicated on plans.
   2. Spacing: Space as indicated on plans.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 24 inches, and as follows:
   1. See plan for attachment requirements.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:
   1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.

E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

3.4 FIELD QUALITY CONTROL

A. Testing: District will engage a qualified independent testing agency to perform field quality-control testing.

B. Field welds will be subject to inspection.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Completion.

END OF SECTION

SECTION 05400

COLD-FORMED METAL FRAMING

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. Exterior load-bearing wall framing.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.

1.3 DEFINITIONS

A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.

B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

D. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
   1. Expansion anchors.
   2. Mechanical fasteners.
   3. Miscellaneous structural clips and accessories.

E. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to the Building Department.

F. Certification by manufacturers that products supplied meet or exceed requirements of applicable referenced CBC Standards which may be different from the ASTM or other standard on which they are based.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 to conduct the testing indicated, as documented according to ASTM E548.

D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

E. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per UBC Standard 7-1 (based on ASTM E119-88) by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

F. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" or "Load and Resistance Factor Design Specification for Cold-Formed Steel Structural Members" and the following for calculating structural characteristics of cold-formed metal framing**:**
   1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
   1. Dietrich Industries, Inc.
   2. ClarkWestern Building System, Inc.
   3. CEMCO.
   4. Current members of Steel Stud Manufacturers Association (SSMA).
   5. Or equal

2.2 MATERIALS

A. Steel Sheet: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: As required by structural performance (Grade 33 for 18 gauge or lighter; Grade 50 for 16 gauge or heavier).
   2. Coating: G60.

2.3 LOAD-BEARING WALL FRAMING (EXTERIOR OR INTERIOR)

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C955, and as follows:
   1. Minimum Uncoated-Steel Thickness: As indicated on Drawings.
   2. Flange Width: As indicated on Drawings.
   3. Section Properties: As indicated on Drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C955, and as follows:
   1. Minimum Uncoated-Steel Thickness: As indicated on Drawings (min. 18 ga.).
   2. Flange Width: 1½ inch, unless noted otherwise.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi (50 ksi for 16 gauge or heavier).

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. End clips.
   5. Joist hangers and end closures.
   6. Hole reinforcing plates.
   7. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, as modified by UBC Standard 22-1, zinc coated by hot-dip process according to ASTM A123.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed, bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780.

B. Cement Grout: Portland cement, ASTM C150, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and 30-minute working time.

2.7 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   4. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
   5. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C1007, unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Field and shop welds will be subject to inspection and testing.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace Work that does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.

C. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.

D. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

E. Provide final protection and maintain conditions in a manner acceptable to Manufacturer and Installer that ensure cold-formed metal framing is without damage or deterioration at time of Completion.

END OF SECTION

SECTION 06152

FIBER REINFORCED HYBRID RAINSCREEN SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board and Panel Rainscreen Siding for walls and soffits with batten strips.

B. Trim, flashings, accessories, and fastenings.

1.02 RELATED REQUIREMENTS

A. Section 04200 - Unit Masonry: Siding substrate.

B. Section 05400 - Cold-Formed Metal Framing: Siding substrate.

C. Section 07600 - Sheet Metal Flashing and Trim: Product requirements for metal flashings and trim associated with wood siding for placement by this section.

D. Section 07920 - Joint Sealers: Sealant at perimeter.

F. Section 09900 - Painting and Coating: Prime and finish painting.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2010.

B. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 Degrees C With a Vitreous Silica Dilatometer ; 2008.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.

D. DIN EN 320 - Particleboards and fibreboards - Determination of resistance to axial withdrawal of screws; 2011.

E. DIN EN ISO 4892 - Plastics - Methods of exposure to laboratory light sources; 2009.

F. DIN V ENV 12038 - Durability of wood and wood-based products - Wood-based panels - Method of test for determining the resistance against wood-destroying basidiomycetes; 2002

G. DIN EN 12664 - Laboratory glassware; one-mark volumetric flasks, flasks with glass round thread; 1981.

H. DIN EN ISO 178 - Plastics - Determination of Flexural Properties; 2010.

I. DIN EN ISO 527 - Plastics - Determination of Tensile Properties; 2012.

J. DIN EN ISO 11925 Reaction to Fire Tests - Ignitability of products subjected to direct impingement of flame; 2010 (Cor 1:2011).

1.04 SUBMITTALS

A. See Section 01340 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating materials, component profiles, fastening methods, jointing details, finishes, and accessories.

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Samples: Submit two samples 12 x 12 inch (300 x 300 mm) in size illustrating surface texture.

D. Samples: Submit two samples 12 x 12 inch (300 x 300 mm) in size to applicator of finish paint for use in preparation of finish samples.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 MOCK-UP

A. Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and quality are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store in ventilated areas with constant minimum temperature of 60 degrees F (16 degrees C) and maximum relative humidity of 55 percent.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within one year period after Date of Substantial Completion.

C. Provide fifteen (15) year manufacturer warranty for materials.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire retardant requirements.

2.02 MANUFACTURERS

A. Fiber Reinforced Decking:

1. Resysta North America, Inc.: Product, Resysta Decking; www.resysta.us. (909) 465-1000 13771 Roswell Avenue, Suite H, Chino, California 91710

2. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MATERIAL

A. Fiber reinforced hybrid siding shall be an extruded composite consisting of a proprietary blend of approximately 60% rice husks, 22% common salt and 18% mineral oil.

B. Properties:

1. Surface Burning Characteristics:

   a. Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   b. Fire Rating (per EN ISO 11925-2): E (B2)

2. Bending Strength: 6,671 psi (46 N/sq.mm) per ISO 178.

3. Bending E-Modulus: 558,420 psi (3850 N/sq.mm per ISO 178).

4. Tensile Strength: 3,162 psi (21,8 N/sq.mm) per ISO 527.

5. Tensile E-Modulus: 339,440 psi (2340 N/sq.mm).

6. Screw Withdrawal: 1,299 lbf (5777 N).

   a. Screw extension stability according to EN 320.

      1) Axial extraction force: 609,456 psi (4202 N/sq.mm).
      2) Axial extraction resistance: 40,615 psi (280 N/sq.mm).

7. Thermal Conductivity (DIN EN 12664): 1.38 BTU-in/hr-sq.ft. (ca. 0.199 W/(mK)).

8. Coefficient of Linear Thermal Expansion (ASM 696): 0.0000656 ft./ft.F (3.6x10(-5) m/mC).

9. Density (Approximate): 75 lb./cu.ft. (1201 kg/cu.m).

10. Humidity - Water Absorption Behavior: Low to no absorption of water or dimensional change.

11. Fungal Resistance (DINV ENV 12038:2002): No attack by test fungi, highest durability class 1.)

12. Weathering (DIN EN ISO 4892-3: No cracks, blisters or other visible changes after 1500 hours.

13. Emissions:

    a. LGA Tested (Passed)
    b. Formaldehyde emission: <0.01 ppm
    c. PCP (pentachlorophenol): <8 x 10-6 oz. lb.
    d. TeCP (tetrachlorophenol): <8 x 10-6 oz. lb.
    e. DEHP (Diethylhexylphtalate): <0.05 %
    f. BBP (Benzylbutylphtalate): <0.05 %
    g. DBP (Di-n-butylphtalate): <0.05%
    h. PAH (Polycyclic aromatic hydrocarbons) skin contact under 30 sec. total: 10 mg/kg
    i. benzo(a)pyrene: 10 mg/kg
    j. Cadmium: 0.005%

C. Recycled content: 60 percent.

D. Fiber reinforced hybrid siding shall be workable, sandable and stainable similar to normal wood products.

2.04 SIDING

A. Wall Siding: RESP340612

1. Size: 3/4” inches (20 mm) thick, 5-1/2” inches (140 mm) high nominal board with 1/4 inch (6 mm) interlocking shiplap.

2. Maximum Span: 24 inches.

3. Profile: Hollow with four channels.

4. Surface Texture: Sanded.

5. Stain: Factory provided, field applied.

B. Wall Siding: RESP3423412.

1. Size: 3/4” inches (20 mm) thick, 2-3/4” inches (70 mm) high nominal board with 1/4 inch (6 mm) interlocking shiplap.

2. Maximum Span: 24 inches.

3. Profile: Hollow with two channels.

4. Surface Texture: Sanded.

5. Stain: Factory provided, field applied.

C. Batten (Furring) Strips: Same as siding.

D. Batten (Furring) Spacers:

1. Model RUS 3825; Size: 1 inch (25 mm) thick, 1-1/2 inches (38 mm) wide solid core board with internal ribs.

2. Model RUH 3825; Size: 1 inch (25 mm) thick, 1-1/2 inches (38 mm) wide hollow core board with internal ribs.

3. Texture: Smooth Matte.

4. Color: Black.

E. Corner Strip Closure (End Caps):

1. ANP 5050; L-Angle shaped; Size: 2 inches (50 mm) thick by 2 inches (50 mm) wide by length.

2. ANP 6060; L-Angle shaped; Size: 2-23/64 inches (60 mm) thick by 2-23/64 inches (60 mm) wide by length.

3. Install miscellaneous trims as shapes as required to provide a complete assembly

2.05 FINISH

A. Stains and Sealer: Select from manufacturer's standard glaze colors.

1. Manufacturer Provided Standard Stain Color:

a. Burma - FVG C 08.

2. Sealer: 2K Protection Varnish – matt.
(Note: This sealer product is recommended to protect the stain.)

B. Use of non-manufacturer water borne or oil-based stain is not recommended and may violate the product warranty.

2.06 ACCESSORIES

A. Nails and Screws: Corrosion resistant type; non-staining, of size and strength to securely and rigidly retain the work; prefinished to match siding finish.

B. Flashing: Galvanized steel as specified in Section 07 62 00.

C. Accessory Components: Fascias, Starter strips, and Trim of same material and finish as siding.

D. Prime Paint: Latex base primer enamel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate conditions before beginning installation; verify dimensions and acceptability of substrate.

B. Verify that weather barrier has been installed over substrate completely and correctly.

C. Confirm metal flashings are installed at sills, heads of wall openings, and horizontal joints of sheet materials.

D. Do not proceed with installation until unacceptable conditions have been corrected.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Prime paint surfaces in contact with cementitious materials.

3.03 INSTALLATION

A. Install siding in accordance with manufacturer's instructions.

1. Preplan cuts to allow for expansion gaps at inside and outside corners.

2. Provide joint gaps as indicated on Drawings. Typical joint width is approximately 3/8 inch.

B. Attach vertical support battens (furring) securely to framing, not sheathing, with horizontal components true to level and vertical components true to plumb, providing a weather resistant installation.

1. Place vertical support battens (furring) to allow screw attachment within two inches of the end of the horizontally placed siding panels.

2. Confirm battens provide minimum 3/4 inch airspace between siding and weather barrier.

C. Apply finish stain to individual planks, panels and trim prior to installation.

D. Fasten siding in place, level and plumb.

1. Arrange for orderly nailing pattern. Blind nail except on overlapping trim.

2. Install siding for natural shed of water.

3. Position cut ends over bearing surfaces. Sand cut edges smooth and clean.

E. Install corner strips.

F. Install joint sealers between siding/soffit/trim and adjacent construction, using procedures specified in Section 07 90 05.

G. Touch-up prefinished paint surfaces that are disfigured. Unsightly touch-up will require removal and replacement of affected siding.

H. Sand work smooth and set exposed nails and screws. Ease sharp edges with 80-100 grit sandpaper for color uniformity prior to staining.

I. Prepare for site finishing specified in Section 09900.

3.04 TOLERANCES

A. Maximum Variation from Plumb and Level: 1/4 inch per 10 feet (6 mm/3 m).

B. Maximum Offset from Joint Alignment: 1/16 inch (1.5 mm).

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07140

COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
Provide a complete polyurethane waterproofing membrane system including all applicable sealants and elastomeric flashings needed to prevent water penetration at locations indicated.

B. Related work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data:
1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop Drawings or catalog illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades;
4. Manufacturer's current recommended installation procedures which, when reviewed by Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
5. Written documentation of applicator's qualifications, including reference projects of similar scope and complexity, with current phone contacts of architects and owners for verification.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Applicator qualifications:
1. Applicator shall have at least three years experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.

C. Convene a pre-installation job-site conference three weeks prior to commencing work of this Section:
1. Secure attendance by Architect, Contractor, applicator, and authorized representatives of the membrane system manufacturer and interfacing trades.
2. Examine Drawings and Specifications affecting work of this Section, verify all conditions, review installation procedures, and coordinate scheduling with interfacing portions of the Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at time of use.

B. Maintain the products in accord with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.

C. Comply with pertinent provisions of Section 01620.

1.05 SUBSTRATE CONDITIONS

A. General:
   1. Provide applicator with surfaces that are broom clean, dry, sound and free of voids, bugholes, rockpockets, honeycombs, protrusions, excessive roughness, foreign matter, frost, ice and other contaminants which may inhibit application or performance of the waterproofing membrane system.
   2. Using suitable abrasive methods, remove residue of form release, curing compound, chemical retarders and other surface treatments, laitance, mortar smear, sawcutting residue, mill scale, rust, loose material and other contaminants from concrete, masonry and ferrous metal surfaces to receive the work of this Section.

B. Concrete: Where work of this Section will be applied to concrete, provide surfaces that are smooth with finish equal to one that is light steel troweled followed by a fine hair broom.

C. Plywood: Where work of this Section will be applied to plywood, provide exterior grade plywood, 5/8" thick minimum, with A-side up, fastened with ring-shank nails.

D. Decks:
   1. Slope deck surfaces to drains that have flanges at membrane level which are flush with deck surfaces.
   2. Rigidly install pipe, vents and other surface protrusions, properly flash them, and cover to prevent entry of membrane materials.

E. Metal flashings: Where metal flashings are substrate to waterproofing membrane, set the flashings in continuous bedding bead of urethane sealant; install sealant S-bead between metal laps and mechanically fasten to substrate along leading edges at every 4" on center, staggered linearly, to lay flat without fishmouths.

F. Joints: Configuration shall be consistent with this Section and with all other requirements of the Contract Documents.

1.06 WARRANTY

A. Deliver to the Architect signed copies of the following written warranties against defective materials and workmanship executed for the following periods following date of completion. Warrant that installed waterproofing membrane system shall be free of defects including adhesive failure, cohesive failure, and waterproofing failure resulting from substrate cracking up to 1/16 inch.
   1. Manufacturer's standard warranty covering materials for five year period;
   2. Applicator's standard warranty covering workmanship for two year period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide a complete fluid applied elastomeric waterproofing membrane system designed for concealed building components subject to hydrostatic head that is polyurethane, coal-tar free and complies with ASTM C 836:
   1. Acceptable product:
      a. TREMproof 250 GC; Tremco Inc.
      b. or prior approved equal

2.02 ACCESSORIES

A. Primer: As recommended by waterproofing membrane system manufacturer;

B. Joint backing: Closed-cell, polyethylene rod as recommended by membrane manufacturer;

C. Reinforcing fabric: Woven fiberglass scrim cloth;

D. Elastomeric sheet flashing: 1/16 inch thick by 12 inch wide uncured neoprene sheeting;

E. Elastomeric transition flashing to above-grade: polyurethane liquid-applied coating system with ultraviolet protective topcoat.
   1. Acceptable product:
      a. Vulkem 350/351; Tremco Inc.

F. Joint Treatment:
   1. Acceptable product:
      a. Dymeric 240FC; Tremco Inc.
      b. TREMproof 250GCT; Tremco Inc.
      c. or prior approved equal

G. Protection course: As recommended by waterproofing membrane manufacturer.
   1. Acceptable product for walls/slabs:
      a. Protection Mat; Tremco Inc.

H. Prefabricated Composite Drainage: Two-part prefabricated composite drainage material consisting of a formed polystyrene core covered on one side with filter fabric.
   1. For backfilled walls less than 20 feet in height, a composite drainage mat with non-woven polypropylene filter fabric, 9 gpm/ft flow capacity per unit width and 10,800 lbs/ft² compressive strength. Acceptable product:
      a. Tremdrain; Tremco Inc.

   2. For backfilled walls 20 feet or greater in height, a composite drainage mat with non-woven polypropylene filter fabric, 16 gpm/ft flow capacity per unit width and 15,000 lbs/ft² compressive strength. Acceptable product:
      a. Tremdrain 1000; Tremco Inc.

   3. For slabs receiving concrete topping and for planters, a composite drainage mat with woven monofilament filter fabric, 18 gpm/ft flow capacity per unit width and 21,000 lbs/ft² compressive strength. Acceptable products:
      a. Tremdrain 2000; Tremco Inc.

   4. For slabs receiving pavers, a composite drainage mat with non-woven polypropylene filter fabric, 9 gpm/ft flow capacity per unit width and 30,000 lbs/ft² compressive strength. Acceptable product:
      a. Tremdrain S; Tremco Inc.

5. For water collection and high profile section for water flow around the perimeter of the structure, a drainage composite with non-woven needle-punched polypropylene filter fabric, a transition section to couple with adjoining drainage mat, high profile flow capacity of 100 gpm and fitted with compatible factory-molded universal tees, universal outlets and 12” corner guards. Acceptable product:
   a. TREMDrain Total-Drain; Tremco Inc.

2.03 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the membrane system manufacturer as compatible, subject to review of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Applicator shall examine the areas and conditions under which work of this Section will be performed.
   1. Verify conformance with manufacturer's requirements;
   2. Report unsatisfactory conditions in writing to the Architect;
   3. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Surface preparation and detailing procedures to be in accord with waterproof membrane system manufacturer's instructions and recommendations except where more stringent requirements are indicated.

B. Clean all deck surfaces to receive membrane system in accord with manufacturer's instructions; vacuum clean or blow clean with oil-free compressed air all surfaces to receive sealants, detailing materials or membranes immediately prior to installation.

C. Rout, clean, prepare and detail surface cracks in accord with manufacturer's instructions; install backer rod where required.

D. Clean metal surfaces to bright metal by wire brushing or mechanical etching; scuff-sand lead flashing and plastic surfaces.

E. Prime surfaces in accord with manufacturer's instructions.

F. Install 1/4" diameter backer rod into corner of all horizontal-to-vertical junctures subject to movement and cover with 1" detail cant of approved sealant; install 1" detail cants at projections, curbs and other horizontal-to-vertical junctures.

G. Install detail coats, joint and crack treatments, elastomeric flashing and reinforcing fabric in accord with manufacturer's instructions.

H. Allow detail applications to cure in accordance with manufacturer's instructions prior to general application of membrane.

3.03 APPLICATION

A. General: Install waterproofing system in accord with manufacturer's recommendations and instructions as applies to the Work except where more stringent requirements are indicated.
   1. Grid deck surfaces to assure proper coverage rates and verify membrane wet-film mil thickness with gauges as work progresses.
   2. Retain empty product containers during course of work to aid in determining whether completed membrane complies with required average dry-film thickness.

B. Verify proper dry condition of substrate using method recommended by membrane system manufacturer; perform adhesion checks prior to general application of membrane system using field adhesion test method recommended by manufacturer.

C. Mask off adjoining surfaces not to receive membrane system.

D. Wipe clean all detail coats with white rags wetted with Xylene solvent; do not saturate detail coat.

E. Apply membrane uniformly and allow to cure in accordance with manufacturer's instructions.

F. Feather terminating edge when entire area cannot be completed in one day; clean area 6" wide along terminating edge of membrane with Xylene solvent on clean white rags prior to startup on next working day; use interlaminary primer per manufacturer's instructions as needed; overlap existing work by 6" with new work.

G. Flood test: Follow ASTM D 5957. Plug drains on deck surfaces and use sand bags or other means to restrict runoff. Flood deck with water to depth of 2" (50 mm) and allow to stand at least 48 hours.

H. Install protection course over cured membrane in accord with manufacturer's instructions.

I. Install drainage material in accord with manufacturer's instructions.

3.04 PROTECTION AND CLEAN-UP

A. Promptly remove primer or membrane system material from adjacent surfaces with MEK, Toluene or Xylene; leave work area in broom clean condition.

B. Prohibit traffic over completed work and protect against work overhead until protection course is installed; protect from damage until protected beneath overlaying work.

END OF SECTION

SECTION 07190

WATER REPELLENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Water-repellent coating to exterior concrete masonry units and brick veneer surfaces.

1.02 REFERENCES

A. AQMD – Local Air Quality Management District Regulations

1.03 SUBMITTALS

A. Product data including details of product description, tests performed, limitations to coating, cautionary procedures required during application and chemical properties, including percentage of solids.

B. Manufacturer's installation instructions.

C. Provide qualification data as required by paragraph under Quality Assurance.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of water-repellent coatings with 5 years minimum experience.

B. Applicator: 5 years experience in the application of the specified product and approved by the manufacturer.

C. Field sample:
1. Apply coating to maximum 4 square feet vertical or horizontal area of surface.
2. Do not proceed with full application until sample has been subjected to water application and approved by Architect.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not apply coating when surface temperature is lower than 50 degrees F or higher than 100 degrees F.

B. Comply with AQMD regulations.
1. Water repellents less than 400 grams per liter.

1.06 WARRANTY

A. General Warranty: Special warranty specified in the article shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

1. Special Warranty: Submit written warranty, executed by applicator and water repellent manufacturer, covering materials and labor, agreeing to repair or replace materials that fail to provide water repellency within specified warranty period. Warranty does not include deterioration or failure of coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new joints and cracks in excess of 1/16 inch wide, fire, vandalism, or abuse by maintenance equipment.

PART 2 - PRODUCTS

2.01 MATERIAL CHARACTERISTICS

A. Self-emulsifying water repellent concentrate for dilution with fresh water at jobsite. Solvent-free blend of silanes and oligomeric alkoxysiloxanes mixes easily with water, with following minimum characteristics:

1. Form: Liquid
2. Color: Clear
3. Specific Gravity: 0.96
4. Active Substance: Microemulsion concentrate of silanes and oligomeric alkyl alkoxysiloxanes.
5. Solids: 100% concentrate
6. VOC: Maximum VOC content 100 grams/liter.
7. Flash point 69°F (in concentrate) (140°F @ 1:9 dilution) (145°F @ 1:14 dilution) ASTM D 3278

B. Provide water repellent, recommended and / or approved by Masonry Unit Manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify joint sealants are installed and cured.

B. Verify cracks and mortar-joint holes, bee holes are mortared.

C. Verify surfaces to be coated are dry, clean, and free of efflorescense, oil, or other matter detrimental to application of coating.

D. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

A. Remove loose particles and foreign matter.

B. Remove oil or foreign substance with chemical solvent that will not affect coating.

C. Scrub and rinse surfaces with water and let dry completely.

D. Protect adjacent surfaces not scheduled to receive coating.

E. If applied on unscheduled surfaces, remove immediately by approved method.

F. Protect landscaping, property and vehicles.

3.03 APPLICATION

A. Delay work until masonry mortar substrate is cured minimum of 60 days, or as acceptable to coating manufacturer.

B. Concrete surfaces: Cured.

C. Apply coating in accordance with manufacturer's instructions by airless spray to provide continuous uniform coat.

D. Coatings:
   1. Apply multiple coatings recommended by manufacturer for specific porosity of surface material, minimum two coats. Apply prepared solution within 8 hours of preparation.

END OF SECTION

SECTION 07265

CONCRETE SLAB VAPOR EMISSIONS TREATMENT

PART 1 – GENERAL

1.01 SECTION INCLUDES:

A. Spray-applied concrete sealer system.

B. Install Vapor Emission Treatment Systems where tests reveal presence of more than acceptable moisture level in accordance with Test Method ASTM F1869 or ASTM F2170.

C. Related Sections:

1. Section 03300, Cast-in-Place Concrete

1.02 PERFORMANCE REQUIREMENTS

A. Vapor emissions floor treatment shall reduce vapor emissions from on-grade slabs to levels satisfactory to resilient flooring manufacturer's requirements and warranties.

B. Vapor emission floor treatment shall prevent negative side moisture migration through concrete floor and shall allow for all types of flooring surface treatment systems.

C. Vapor emission floor treatment shall be alkali-neutralizing and shall penetrate into concrete materials and chemically form protective crystalline barrier between surface. Inner barrier so formed shall not be affected by ultraviolet light, abrasion and chemicals and shall permanently seal and waterproof concrete against harmful effects of water intrusion, freeze-thaw cycle damage, de-icing salts and chloride migration.

1.03 SUBMITTALS

A. Product data describing physical and performance characteristics.

B. Manufacturer's written installation instructions.

C. Manufacturer's certificate indicating applicator is accepted installer.

D. Moisture vapor emission test results. Indicate environmental conditions, installation procedures used, deficiencies and corrective actions taken for filler, vapor emissions' coating and membrane.

1.04 SYSTEM DESCRIPTION

A. Sealer/Hardener/Vapor Barrier compound, with minimum of 5 years documented experience to control moisture vapor emission, having 34 percent solid content, compatible with all flooring material, adhesives, bond breakers and overlayments. Complying with ASTM C-309, ASTM C-1315. Surface treatment applied on cured existing slabs receiving resilient flooring, sheet vinyl and vinyl composition tile, rubber tile, wood flooring, carpet, epoxy flooring.

1.05 QUALITY ASSURANCE

A. Applicator: Company approved and certified by vapor emission floor treatment manufacturer.

B. Requirements of Regulatory Agencies: Materials used in formulation of product shall conform to all local, state, and federal air-quality and environmental control standards.

C. Pre-installation Conference:
   1. Pre-installation meeting: Schedule before installing concrete floor slabs.
   2. Required attendees: Contractor's representative, Architect's representative, Owner's representative, Manufacturer's representative, Subcontractor, Installer.
   3. Convene before installation of concrete.
   4. Advise Contractor of all Warranty requirements.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original sealed containers, clearly marked with manufacturer's name and brand name.

B. Store materials in accordance with manufacturer's recommendations.

1.07 WARRANTY

A. Submit under provisions of Division 01, General Requirements.

B. Provide 15-year full-system warranty issued to the Owner of the facility covering all labor and materials needed to replace all floor covering that fails due to concrete moisture vapor emission and moisture-borne contaminates such as alkalinity.
   1. Issue a certificate of insurance in amount of Two Million Dollars ($2,000,000.00)

C. Include all costs for replacement of failed flooring material installed over moisture seal membrane, cracks, joints and holes.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Vapor Emission Floor Treatment: Silicate-based or synthetic solution to penetrate on-grade concrete floor surfaces to form protective crystalline or polymer restrictive moisture barrier.

B. Accessory Materials: As recommended by manufacturer, or intended application.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Manufacturer's representative shall be onsite to document and oversee the entire installation process.

B. Verify surfaces are dry and free of dirt and contaminates.

C. Verify moisture tests have been conducted per ASTM F1869 or ASTM F2170.

D. Verify existing concrete conditions are suitable to receive the work of this Section.

E. Repair concrete where required according to manufacturer's recommendations.

F. Do not begin application until unsuitable conditions have been corrected, and control joints have been sawcut. Sawcut of control joints after installation of treatment will not be accepted. Tool joints where indicated prior to installation of treatment.

G. Beginning of installation means acceptance of existing substrate and site conditions.

3.02 PREPARATION

A. Prepare surface by removal of laitance, grease, adhesives, unapproved patching compounds and foreign matter. Use mechanical means (scarifying or bead blasting) where required for existing slabs.

B. Thoroughly clean all cracks. Apply to structurally sound concrete surfaces, free of voids and cracks. If needed, apply cementitious patch or approved epoxy filler to any voids or cracks. Groove out all cracks/control joints and fill with an approved patching compound.

C. Clean expansion joints and control joints as required.

D. Maintain building temperature above 65 degrees Fahrenheit for a period of 48 hours prior to start of installation of base coat.

3.03 APPLICATION

A. Apply the products according to the manufacturer's instructions.

B. Manufacturer technician will be onsite the day of the concrete pour at the beginning of the work to install or train in application, document and return on every application thereafter to verify that proper procedures are followed.

C. Apply Concrete Surface Treatment / Sealer / Hardener / Curing Compound after calcium chloride test and subsequent results have been performed [the day of the concrete pour or] and as soon as harsh weather permits, prior to any other chemical treatments for concrete slabs either on grade, below grade or above grade receiving resilient flooring such as sheet vinyl, vinyl composition tile, rubber, wood flooring, carpet, epoxy coatings and overlays.

D. Apply materials to the concrete slabs as soon as final finishing operations are complete, control joints are tooled and concrete has hardened sufficiently to sustain foot traffic without damage.

E. Spray-apply at the rate of 200 square feet per gallon. If puddling or bird-bathing occurs, lightly broom product evenly over the substrate until product has completely penetrated the surface.

F. If within 2 hours after initial application areas are subjected to heavy rainfall and puddling occurs, reapply product to these areas as soon as weather conditions permit.

3.04 TESTING

A. Prohibit traffic on finish floor surface prior to installation of finish floor covering.

END OF SECTION

SECTION 07540

PVC THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Install an adhered Sika Sarnafil roofing system including membrane, flashings and other components.
   1. Section Includes:
      a. S327-20FB Energysmart White Roof Membrane
      b. Fasteners for membrane attachment
      c. Fasteners and termination accessories
      d. Sarnaclad Edge Metal and fasteners
      e. G410-15 Roof Membrane Flashings
      f. Adhesive for Flashings
      g. Walkways
      h. Other Metal Flashings
      i. Sealants

B. Related Sections
      a. Section 01340: Submittals and Substitutions
      b. Section 07650: Sheet Metal Flashing and Trim

1.02 SUBMITTALS

A. At the time of award, the Applicator shall submit to the Owner (or Representative) 4 copies of the following:
   1. Copies of Specification.
   2. Copy of the ASTM Certification for the named product showing Type II Class I fiberglass reinforced roofing membranes.
   3. Samples of each primary component to be used in the roof system and the manufacturer's current literature for each component.
   4. Sample copy of Manufacturer's warranty.
   5. Evidence that the proposed roof system meets the requirements of the local building code and has been tested and approved or listed by the required test organizations.
   6. Full information for five projects within 100 miles of the subject project demonstrating a minimum twenty years service life of manufacturer’s specified roof membrane (membrane thickness may vary).
   7. Written confirmation from a corporate officer of the roofing system manufacturer that the membrane manufacturer has initiated a post consumer recycling program.
   8. Evidence of five projects where the existing roof has been removed and recycled by the proposed manufacturer into new roofing membrane or PVC components.
   9. Sample copy of Applicator's NDL warranty.
   10. Material Safety Data Sheets (MSDS)
   11. Letter from proposed Roofing Manufacturer indicating the actual polymer thickness of the product supplied for this project is 80 mils. With a polymer thickness variance shall not exceeding ± two (2) mils.
   12. Written confirmation from the proposed Roofing Manufacturer stating the number of years it has directly manufactured the roof system under the trade names and/or trademarks as proposed.

1.03 NOT USED.

1.04 QUALITY ASSURANCE

A. Track Record – Install only PVC Roofing systems from manufacturers able to demonstrate the product on 5 existing functional roofs. The age of the reference roofs must match or exceed the warranty term specified in this document.

B. Qualifications of Manufacturer:
   1. Roofing materials shall be the product of a manufacturer regularly engaged in manufacturer of this product for not less than the warranty term (30 years).

   2. Use only a Manufacturer who has initiated a post consumer recycling program and can demonstrate a minimum of five projects where the existing PVC roof has been removed and recycled into new roofing membrane or PVC components.

   3. Use only a Manufacturer certified ISO 14001: 2004 and RC 14001: 2008 responsible care.

C. Membrane thicknesses stated in this document are waterproofing membrane PVC polymer thicknesses. If a polyester felt/fleece backing is specified the thickness of the felt/fleece is always in addition to the required membrane thickness and is measured in a weight per square yard. Where required the stated 7 oz/sqft fleece weight is a non negotiable minimum requirement.

D. Unreinforced or polyester reinforced membrane flashings are prohibited.

E. No “Private Label” or third party membrane manufacturers will be approved as alternates or substitutions.

F. Qualifications of Roofer: The Roofing Contractor must be authorized by Manufacturer 5 years prior to bid.

G. No deviation from the Project Specification or the approved shop drawings is permitted without prior written approval by the Owner, the Owner's Representative and Manufacturer.

H. Only Applicator personnel trained and authorized by manufacturer are permitted to complete work pertaining to the installation of Sarnafil membrane and flashings.

I. Verify the roof deck and roof construction is structurally sound to provide support for the new roof system.

J. The Manufacturer must provide interim and final roof inspection from a directly employed dedicated team of experienced inspectors. Sales personnel may not be used for onsite inspection of installations.

1.05 REGULATORY REQUIREMENTS

A. These requirements are minimum standards and no roofing work shall commence without written documentation of the system's compliance, as required in the "Submittals" section of this specification.

B. California Title 24 Part 6: Roof membrane (not post installation applied finish) must comply with current minimum 3-year aged solar reflectance of 0.55 and a minimum thermal emittance of 0.75

C. Field membrane shall conform to ASTM D4434 (latest version), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type III.

D. Flashing membrane shall conform to ASTM D4434 (latest version), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II Grade I.

E. Factory Mutual Research Corporation (FM) - Norwood, MA

F. Class FMG 1-90

G. Underwriters Laboratories, Inc. - Northbrook, IL

H. Class A assembly

1.06 PRE-INSTALLATION MEETINGS

A. The Applicator, Owner's Representative/Designer and Manufacturer(s) shall attend a pre-construction conference.

B. The meeting shall discuss all aspects of the project including but not limited to:
   1. Safety
   2. Set up
   3. Construction schedule
   4. Contract conditions
   5. Coordination of the work

1.07 DELIVERY, STORAGE AND HANDLING

A. All products delivered to the job site shall be in the original unopened containers or wrappings bearing all seals and approvals.

B. Handle all materials to prevent damage. Place all materials on pallets and fully protect from moisture.

C. Membrane rolls shall be stored lying down on pallets and fully protected from the weather with clean canvas tarpaulins. Unvented polyethylene tarpaulins are not accepted due to the accumulation of moisture beneath the tarpaulin in certain weather conditions that may affect the ease of membrane weldability.

D. As a general rule all adhesives shall be stored at temperatures between 40º F and 80º F. Read instructions contained on adhesive canister for specific storage instructions.

E. All flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.

F. Materials, which are determined to be damaged by the Owner’s Representative or Sika Sarnafil, are to be removed from the job site and replaced.

1.08 PROJECT CONDITIONS

A. Schedule and execute all work without exposing the interior building areas to the effects of inclement weather.

B. Secure all new and temporary construction, including equipment and accessories, to preclude wind blow-off and roof or equipment damage.

C. Install uninterrupted waterstops at the end of each day's work. Completely remove before proceeding. Waterstops must not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses.

D. Remove all excessive moisture, dirt, debris and dust prior to and during application.

E. Immediately take all existing and new roofing, insulation, flashings and metal work removed during construction to a legal dumping area authorized to receive such materials.

F. Take precautions that storage and/or application of materials and/or equipment does not overload the roof deck or building structure.

G. Verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Report any such blockages in writing (letter copy to Sika Sarnafil) to the Contractor or Owner as appropriate for corrective action prior to the installation of the Sika Sarnafil roof system.

H. If any water is allowed to enter under the newly completed roofing, remove and replace the affected cover board and insulation with new dry materials.

I. Inspect the substrate for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect the quality of work. Stop work if any contamination or unusual or concealed condition is discovered and immediately notify the Contractor of such condition in writing for correction.

1.09 SEQUENCING

A. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. Provide a substantial protection layer consisting of plywood over Sarnafelt or plywood over insulation board for all roof areas that receive rooftop traffic during construction.

1.10 WARRANTY

A. Upon successful completion of work the following warranties must be provided:
   1. 30-Year Sika Sarnafil Warranty
   2. 2-Year Roofing Contractor Warranty

B. Warranties shall be No Dollar Limit, non-prorated and contain no exclusion for ponding or standing water with no time limits for same.

C. Sika Sarnafil System Warranty (only products purchased from Sika Sarnafil are covered under System Warranty)
   1. Upon successful completion of the work to Sika Sarnafil's satisfaction and receipt of final payment, the Sika Sarnafil System Warranty shall be issued.

D. Applicator/Roofing Contractor Warranty.

E. The Applicator shall supply the Owner with a separate workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within the Applicator warranty term, defective or otherwise not in accordance with the Contract Documents, the Applicator shall repair that defect at no cost to the Owner. The Applicator's warranty obligation shall run directly to the Owner, and a copy shall be sent to Sika Sarnafil.

F. Owner Responsibility
   1. Owner shall notify both Sika Sarnafil and the Applicator of any leaks as they occur during the time period when both warranties are in effect.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide PVC roofing system Sika-Sarnafil (310-528-3348), S327-20FB or an equal product meeting or exceeding all type and performance criteria by one of the following:
   1. Durolast Inc.
   2. Tremco Inc.

B. Components to be used that are other than those supplied or manufactured by Sika Sarnafil may be submitted for review and acceptance by Sika Sarnafil. Sika Sarnafil's acceptance of any other product is only for a determination of compatibility with Sika Sarnafil products and not for inclusion in the Sika Sarnafil warranty. The specifications, installation instructions, limitations, and/or restrictions of the respective manufacturers must be reviewed by the Owner's Representative for acceptability for the intended use with Sika Sarnafil products.

2.02 MATERIALS

A. Sarnafil S327-20FB Feltback fiberglass reinforced membrane with a lacquer coating.

B. Field Membrane shall conform to ASTM D4434 (latest version), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type III. Flashing Membrane shall conform to ASTM D4434 (latest version), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II Grade I.
   1. Install only Field Membranes conforming to ASTM D4434 (latest version), “Standard for Polyvinyl Chloride Sheet Roofing,” Classification: Type III.
   2. Install only Membrane Flashings conforming to ASTM D4434 (latest version), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II Grade I.
   3. Unreinforced or polyester reinforced membrane flashings are prohibited.
   4. Main Field Sheet – S327-20 PVC 80 mils thermoplastic membrane with polyester reinforcement. Minimum Weight 0.48 pounds per sqft. Minimum 7oz/sqyd factory applied non woven polyester fleece backing.
   5. Flashing Membranes G410-15 PVC 60 mils thickness with fiberglass reinforcement Minimum Weight 0.36 pounds per sqf.
   6. Main Field and Flashings EnergySmart (white), initial reflectivity of 0.83, initial emissivity 0.90, and a solar reflective index (SRI) of >104.

C. Certified Polymer Thickness
   1. Membrane manufacturer is to certify that the polymer thickness is within 3 mils of the polymer thickness specified. Certification is to be signed by the membrane manufacturer’s quality control manager. ASTM +/- 10% tolerance for membrane thickness is not sufficient or accepted.

D. Color of Membrane
   1. Main Field and Flashings EnergySmart (white), initial reflectivity of 0.83, initial emissivity 0.90, solar reflective index (SRI) of >104 and 3 Year Aged reflectivity => 0.55

2.03 FLASHING MATERIALS

A. Wall/Curb Flashing
   1. Sarnafil G410 Membrane:
      A fiberglass reinforced membrane adhered to approved substrate using Sarnacol adhesive. Consult Product Data Sheets for adhesive options and additional information.
   2. Sarnaclad:
      A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Sarnaclad is a 25 gauge, G90 galvanized metal sheet with a 20 mil (1 mm) unsupported Sarnafil membrane laminated on one side. The dimensions of Sarnaclad are 4 ft x 8 ft (1.2 m x 2.4 m) or 4 ft x 10 ft (1.2 m x 3.0m). Consult Product Data Sheet for additional information.

B. Perimeter Edge Flashing
   1. Edge Grip – A prefabricated perimeter edge system provided and included in the roof system warranty by the roofing system manufacturer. The system has concealed fasteners with no penetrations on the horizontal roof surface and includes fasteners and splice plates. Edge Grip is made from two distinct parts. A rigid retainer base plate and a decorative snap-on fascia cover.
      a. Provide 0.05 inch aluminum retainer base plate in 10-feet lengths.
      b. Provide 0.04 inch aluminum Kynar Finish Snap-on fascia cover in 10-feet lengths.
      c. Provide matching corners, end caps, fascia sumps, and spill-outs as required.
      d. Color: Custom color as selected by Architect.
      e. Fascia Depth: As indicated on drawings.

2.04 EQUIPMENT

A. Sarnamatic 641mc or 661 - 220 volt, self-propelled, hot air welding machine used to seal Sarnafil membrane seams.

2.05 COMPONENTS

A. Sarnaflash:
   1. A prefabricated expansion joint cover made from Sarnafil membrane. Sarnaflash is designed for securement to vertical or horizontal surfaces to span and accommodate the movement of new and existing expansion gaps from 1 inch to 41/2 inches (25 mm to 114 mm) across. Available in 40-foot rolls. Consult Product Data Sheet for additional information.

B. Sarnareglet:
   1. A heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs. Sarnareglet is produced from 6063-T5, 0.10 inch - 0.12 inch (2.5 mm - 3.0 mm) thick extruded aluminum. Sarnareglet has a 2¼ inch (57 mm) deep profile, and is provided in 10 foot (3 m) lengths. Use prefabricated Sarnareglet mitered inside and outside corners where walls intersect. Consult Product Data Sheet for additional information.

C. Sarnastack:
   1. A prefabricated vent pipe flashing made from 0.048 inch (48 mil/1.2 mm) thick Sarnafil G410 membrane. Available in five different sizes. Consult Product Data Sheet for sizes and additional information.

D. Sarnacorners – Universal:
   1. Prefabricated outside and inside flashing corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are heat-welded to membrane or Sarnaclad base flashings. Available in one size, which accommodates both inside and outside corners. Can be cut into one inside or one outside corner. Consult Product Data Sheet for additional information.

2.06 ATTACHMENT COMPONENTS

A. Membrane Fasteners
   1. Sarnafastener-XP: #15, heavy-duty, corrosion-resistant fastener used with Sarnaplate to attach insulation or Sarnastop and Sarnabar to attach Sarnafil G410 roof membrane to steel or wood roof decks. Sarnafastener-XP has a shank diameter of approximately 0.21 inch (5.3 mm) and the thread diameter is approximately 0.26 inch (6.6 mm). The driving head has a diameter of approximately 0.435 inch (11 mm) with a #3 Phillips recess for positive engagement. Consult Product Data Sheet for additional information.
   2. Sarnadisc-XPN: A high strength linear plate used with a Sarnafastener to attach Sarnafil S327 roof membrane to steel, wood or concrete roof decks. Sarnadisc-XPN is an 18 gauge (1.2 mm), 1½ inch by 3¾ inch (38 mm x 95 mm) corrosion resistant steel plate. Consult Product Data Sheet for additional information.
   3. Flashing Adhesive: Stabond U148A Adhesive

B. A low VOC reactivating-type adhesive used to attach membrane to flashing substrate. Consult Product Data Sheets for additional information.

2.07 WALKWAY PROTECTION

A. Crossgrip Walkway: A rolled-out walkway protection mat used to protect Sarnafil roofing membrane from mechanical abuse. Crossgrip Walkway is 9/16 inch (14 mm) thick flexible PVC with a heavily textured surface. Crossgrip Walkway is loose laid on top of completed Sarnafil roof assemblies. Where design windspeeds exceed 94 mph (150 km/h) the walkway must be secured with loops of Sarnafil membrane welded to the field sheet. Consult Product Data Sheet for additional information.

2.08 PVC PROTECTION LAYER

A. Install over the completed Sarnafil waterproofing membrane under ballasted photovoltaic panels. Layer is a 51 mil (1.3 mm) thick thermoplastic sheet material made with 1% Post-Consumer and 9% Pre-Consumer PVC content, with integral fiberglass reinforcement.

Parameters	**ASTM Test Method**	**Typical Physical Properties**
Reinforcing Material	--	Fiberglass
Overall Thickness, in. (mm)	D638	0.51 (1.3)
Weight, lb/ft^2 (kg/m^2)	--	0.31 (1.51)
Recycled Content	1% Post-Consumer, 9% Pre-Consumer	
VOC Content		0 g/L

2.09 ACCESSORIES

A. Aluminum Tape: A 2-inch (50 mm) wide pressure-sensitive aluminum tape used as a separation layer between small areas of asphalt contamination and the membrane and as a bond-breaker under the coverstrip at Sarnaclad joints.

B. Multi-Purpose Tape: A high performance sealant tape used with metal flashings as a preventive measure against air and wind blown moisture entry.

C. Sarnasolv: A high quality solvent cleaner used for the general cleaning of residual asphalt, scuff marks, etc., from the membrane surface. Sarnasolv is also used daily to clean seam areas prior to hot-air welding in tear off or dirty conditions or if the membrane is not welded the same day it is unrolled. Consult Product Data Sheet for additional information.

2.10 SEALANTS

A. Sarnafil Multi-Purpose Sealant (for termination details).

B. Sarnafiller (two-component urethane adhesive sealant).

C. Depending on substrates, the following sealants are options for temporary overnight tie-ins:
   1. Sarnafiller.
   2. Spray-applied, water-resistant urethane foam.
   3. Mechanical attachment with rigid bars and compressed sealant.

2.11 MISCELLANEOUS FASTENERS AND ANCHORS

A. All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1¼ inch (32 mm) and shall be approved for such use by the fastener manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch (25 mm) and shall be approved for such use by the fastener manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Applicator shall be responsible for acceptance or provision of proper substrate to receive new roofing materials.

B. Applicator shall verify that the work done under related sections meets the following conditions:
   1. Roof drains and/or scuppers have been installed properly.
   2. Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured and prepared to receive new roofing materials.
   3. All surfaces are smooth and free of dirt, debris and incompatible materials.
   4. All roof surfaces shall be free of water, ice and snow.

3.02 PREPARATION

A. The roof deck and existing roof construction must be structurally sound to provide support for the new roof system. The Applicator shall load materials on the rooftop in such a manner as to eliminate risk of deck overload due to concentrated weight. The Owner's Representative shall ensure that the roof deck is secured to the structural framing according to local building code and in such a manner as to resist all anticipated wind loads in that location.
   1. New Construction:
      a. Insulating Fill Substrate: The lightweight fill shall be installed by a trained lightweight fill Applicator in accordance with the lightweight fill manufacturer's requirements and industry practice. The surface shall be free from dust and loose fragments, be smooth, level, and free from moisture. Sharp ridges or other projections above the surface shall be removed before roofing. Proper venting as recommended by the roof deck manufacturer shall be provided.

3.03 INSTALLATION OF SARNAFIL MEMBRANE

A. General

B. Attach Sarnafil S327 membrane through the LWIC into the metal deck with Sarnafasteners and/or Sarnabar according to Sika Sarnafil and Factory Mutual's requirements. Fasteners must penetrate the deck by a minimum of 1 inch.

C. Install Sarnafasteners and Sarnadiscs along the edge of the membrane on the fastening line at a spacing determined by Sika Sarnafil. Clamp the S327 membrane tightly to the substrate.

D. **Tack welding of S327 full or half-width rolls for purposes of temporary restraint during installation is not permitted.**

E. Perimeter and Corner Areas
   1. Install S327 half-width rolls either parallel or perpendicular to the entire perimeter edge. The number of adjacent half-rolls will be determined by building height and width and other conditions according to FM guidelines and Sika Sarnafil Technical. In corner areas where perimeters half-rolls intersect, additional rows of Sarnafasteners and Sarnadiscs and a welded coverstrip are required.

F. Interior Area
   1. Install S327 full-width rolls perpendicular to the steel deck flutes.
   2. **Hot-air weld overlaps according to Sika Sarnafil's recommendations. Take seam test cuts at least 2 times per day.**

G. Securement Around Rooftop Penetrations
   1. Around all perimeters, at the base of walls, drains, curbs, vent pipes, or any other roof penetrations, install Sarnafasteners and Sarnadiscs according to perimeter rate of attachment.
   2. Overlap Sarnafil membrane flashings 2-1/2 inches past the Sarnadisc and Sarnadisc-XPN. Hot-air weld to the Sarnafil deck membrane.
   3. **Hot-air weld overlaps according to Sika Sarnafil's recommendations. Seam test cuts shall be taken at least 3 times per day.**

3.04 MEMBRANE FLASHINGS

A. Install flashings concurrently with the roof membrane as the job progresses. No temporary flashings are permitted without the prior written approval of the Owner's Representative and Sika Sarnafil. Approval if given is for specific locations on specific dates only.

B. Adhere flashing materials to compatible surfaces only. Use caution to ensure adhesive fumes are not drawn into the building.

C. Stabond Adhesive for Membrane Flashings - Apply Stabond adhesive in smooth, even coats with no gaps, globs or similar inconsistencies. Press the bonded sheet firmly in place with a hand roller. Do not apply adhesive in seam areas. Apply membrane panels uniformly.

D. The minimum flashing height is 8 inches above finished roofing level unless otherwise accepted in writing by the Owner's Representative and Sika Sarnafil Technical Department.

E. Mechanically fasten all flashing membranes along the counter-flashed top edge with Sarnastop/Sarnareglet or approved alternate at 6-8 inches on center.

F. Additionally secure all flashings that exceed 30 inches in height. Consult Sika Sarnafil Technical Department for securement methods.

3.05 METAL FLASHINGS

A. Metal details, fabrication practices and installation methods shall conform to the applicable requirements of the following:
   1. Factory Mutual Loss Prevention Data Sheet 1-49 (latest issue)
   2. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - latest issue.

B. Metal, other than that provided by Sika Sarnafil, is not covered under the Sika Sarnafil warranty.

C. Complete all metal work in conjunction with roofing and flashings so that a watertight condition exists daily.

D. Metal shall be installed to provide adequate resistance to bending to allow for normal thermal expansion and contraction.

E. Metal joints shall be watertight.

F. Metal flashings shall be securely fastened into solid wood blocking. Fasteners shall penetrate the wood nailer a minimum of 1 inch (25 mm).

G. Airtight and continuous metal hook strips are required behind metal fascias. Hook strips are to be fastened 12 inches (0.3 m) on center into the wood nailer or masonry wall.

H. Counter flashings shall overlap base flashings at least 4 inches (100 mm).

I. Hook strips shall extend past wood nailers over wall surfaces by 1-1/2 inch (38 mm) minimum and shall be securely sealed from air entry.

3.06 WALKWAY INSTALLATION

A. Cross-Grip Walkway:
   1. Crossgrip Walkway is installed loose laid on top of completed Sarnafil roof assemblies. Where design windspeeds exceed 94 mph the walkway must be secured with loops of Sarnafil membrane welded to the field sheet. Unroll and position Crossgrip Walkway within specified areas and cut to desired length. Do not install Crossgrip Walkway directly over Sarnabars. Connecting clips are available for butting two ends together. **Important:** Check all existing deck membrane seams that are to be covered and reweld any inconsistencies before installation.

3.07 COMPLETION

A. Correct all punch-list items to the satisfaction of the Owner's Representative and Sika Sarnafil prior to demobilization.

3.08 FIELD QUALITY CONTROL

A. Upon completion of the installation and the delivery to Sika Sarnafil by the Applicator of a certification that all work has been done in strict accordance with the contract specifications and Sika Sarnafil's requirements, an inspection shall be made by a Technical Representative of Sika Sarnafil to review the installed roof system.

3.09 DEMONSTRATION

A. Provide maintenance documents and personal instruction for the facilities staff and other interested parties at a single pre-determined mutually convenient time. The instruction shall include the following topics:

- Access restriction and precautions
- Avoiding Mechanical Damage
- Potential Contaminants and rectification
- Cleaning
- Emergency repairs
- Procedures for permanent repairs and alterations

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Provide flashing and sheet metal not specifically described in other Sections of these Specifications but required to prevent penetration of water through the exterior shell of the building.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.

1.02 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 45 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. In addition to complying with pertinent codes and regulations, comply with pertinent recommendations contained in current edition of "Architectural Sheet Metal Manual" published by the Sheet Metal and Air-conditioning Contractors National Association (SMACNA).

C. Standard commercial items may be used for flashing, trim, reglets, and similar purposes provided such items meet or exceed the quality standards specified.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 - PRODUCTS

2.01 MATERIALS AND GAGES

A. Where sheet metal is required, and no material or gage is indicated on the Drawings, provide the highest quality and gage commensurate with the referenced standards, but no less than 24 gage.

2.02 GALVANIZED IRON

A. Provide sheet metal or sheet iron of a standard brand of open-hearth copper-bearing steel, copper-molybdenum iron, or pure iron sheets.

B. Zinc coating:
   1. Where galvanizing is required, provide zinc coating by hot-dip galvanize to all surfaces.
   2. Weight:
      a. Provide not less than 1-1/4 oz per sq ft, nor more than 1-1/2 oz per sq ft, to surfaces required to be galvanized.
   3. Comply with ASTM A123-84.
   4. Separation of materials:
      a. Sheets or surfaces of different materials, subject to electrolysis shall be thoroughly insulated. Where not otherwise furnished or provided for, the work of this section includes furnishing and installing of a heavy bodied bituminous paint, or non-abrasive tape or gasket, as a separation against galvanic or corrosive action.
   5. Where galvanizing is cut or damaged, touch up with Galvaloy or equal.

2.03 NAILS, RIVETS, AND FASTENERS

A. Use only soft iron rivets having rust-resistive coating, galvanized nails, and cadmium plated screws and washers in connection with galvanized iron and steel.

2.04 FLUX

A. Where flux is required, use raw muriatic acid.

2.05 SOLDER

A. Where solder is required, comply with ASTM B32.

2.06 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

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

3.02 WORKMANSHIP

A. General:
   1. Form sheet metal accurately and to the dimensions and shapes required, finishing molded and broken surfaces with true, sharp, and straight lines and angles and, where intercepting other members, coping to an accurate fit and soldering securely.

   2. Unless otherwise specifically permitted by the Architect, turn exposed edges back 1/2".

B. Form, fabricate, and install sheet metal so as to adequately provide for expansion and contraction in the finished Work.

C. Weatherproofing:
   1. Finish watertight and weather-tight where so required.
   2. Make lock seam work flat and true to line, sweating full of solder.
   3. Make lock seams and lap seams, when soldered, at least 1/2" wide.
   4. Where lap seams are not soldered, lap according to pitch, but in no case less than 3".
   5. Make flat and lap seams in the direction of flow.

D. Joints:
   1. Join parts with rivets or sheet metal screws where necessary for strength and stiffness.
   2. Provide suitable watertight expansion joints for runs of more than 40'-0", except where closer spacing is indicated on the Drawings or required for proper installation.

E. Nailing:
   1. Whenever possible, secure metal by means of clips or cleats, without nailing through the exterior metal.
   2. In general, space nails, rivets, and screws not more than 8" apart and, where exposed to the weather, use lead washers.
   3. For nailing into wood, use barbed roofing nails 1-1/4" long by 11 gage.
   4. For nailing into concrete, use drilled plugholes and plugs.

3.03 EMBEDMENT

A. Embed metal in connection with roofs in a solid bed of sealant, using materials and methods described in Section 07920 of these Specifications or other materials and methods approved in advance by the Architect.

3.04 SOLDERING

A. General:
   1. Thoroughly clean and tin the joint materials prior to soldering.
   2. Perform soldering slowly, with a well heated copper, in order to heat the seams thoroughly and to completely fill them with solder.
   3. Perform soldering with a heavy soldering copper of blunt design, properly tinned for use.
   4. Make exposed soldering on finished surfaces neat, full flowing, and smooth.

B. After soldering, thoroughly wash acid flux with a soda solution.

3.05 TESTS

A. Upon request of the Architect, demonstrate by hose or standing water that the flashing and sheet metal are completely watertight.

END OF SECTION

SECTION 07920

SEALANT AND CAULKING

PART 1 - GENERAL

1.01 SCOPE

A. Furnish all labor, materials, services, equipment and appliances required to perform all sealants and caulking, backing materials and supplementary work to complete the Contract including, but are not limited to, these major items:
   1. At all doors, windows, etc.
   2. At perimeter of all change in finish materials, i.e. between EIFS and metal flashings and/or concrete.
   3. Roof penetrations not specified under Mechanical or Electrical Sections.
   4. All concrete construction and separation joints in concrete building slab and site concrete.
   5. Sealant between storm drainage downspouts and wall outlets.
   6. Fire retardant sealants for type of rated penetration, as required.
   7. All other Sealants and Caulking as indicated on Drawings.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 07600: Sheet Metal Work

B. Section 08100: Hollow Metal Doors and Frames

C. C.Section 08410: Aluminum Window Wall and Storefront

D. Section 08800: Glass & Glazing

1.03 REFERENCE STANDARDS

A. ASTM C 920 Specification for Elastomeric Joint Sealants.A sealant qualifying under this specification shall be classified as to type, grade, class, and use as follows:
   1. Type S - Single component sealant
   2. Type M - Multi component sealant
   3. Grade P - Pourable or self-leveling
   4. Grade NS - Nonsag or gunable
   5. Class 25 - Adhesion and cohesion under movement shall withstand an increase or decrease of at least 25% of the joint width.
   6. Use T - Pedestrian and vehicular traffic areas. Sealant shall have a hardness reading, after being properly cured, of not less than 25 or more than 50 when tested in accordance with Test Method C 661.
   7. Use NT - Nontraffic applications
   8. Use M - Mortar/Masonry
   9. Use G - Glass
   10. Use A - Aluminum
   11. Use O - Other than the Standard Substrates meeting this specification.

   ASTM C962 Standard Guide Use of Elastomeric Joint Sealants
   ASTM C1193 Standard Guide for Use of Joint Sealants.
   ASTM C1184 Standard Guide for Use of Structural Sealants.
   ASTM D1565 Standard Specification for Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell form)
   ASTM D1667 Standard Specification for Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam)

B. Federal Specification:
FS TT-S-00227E, "Sealing Compound, Rubber Base, Two-Component."
FS TT-S-00230, "Sealing Compounds, Synthetic Rubber Base, Single Component, Chemically Curing.

C. Sealant, Waterproofing and Restoration Institute (SWRI) - Sealant and Caulking Guide Specifications.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01340.

B. Product Data: Submit manufacturer's technical data, mixing instructions, application recommendations and installation instructions, including cleaning and priming instructions and sealant limitations for each type of material required. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material selected complies or is suitable for the temperatures, movements and weather conditions that will be encountered during the sealants service life.

C. Samples: Submit manufacturer's standard bead samples consisting of strips of actual products to be exposed to view showing full range of cured colors available.

D. Contractor's and manufacturers' guarantees and warranties respectively.

E. Sealant Schedule: Indicate each sealant type and backer rod type proposed for each appropriate location and for each appropriate substrate.

F. Certificates: Furnish manufacturers certification that sealant systems comply with local regulations controlling use of volatile organic compounds. Manufacturer shall certify that sealant systems are compatible with adjacent substrate and related finish materials.

G. Product Testing: Include manufacturer or independent laboratory test results demonstrating hardness, stain resistance, adhesion and cohesion under cyclic movement per ASTM C719, low temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging and effects of accelerated weathering.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an installer who has successfully completed within the last three (3) years at least three (3) joint sealer applications similar to type and size to that of this project.

B. Single Source for Materials: Obtain joint sealer materials from a single manufacturer for each different product required, for each different application.

C. Manufacturer's representative to provide inspection of conditions prior to start of the work and initial supervision at the start of each application, to insure that any physical conditions which would result in defective work are properly corrected before materials are applied, and that proper procedures are being followed. Provide such inspection and supervision by qualified personnel. Report all unsatisfactory conditions existing at the time of inspection in writing to the Architect for correction before proceeding with the work.

D. Notify the manufacturer's representative at least 72 hours prior to the time inspection is required.

E. Failure or refusal of the manufacturer or manufacturer's representative to provide the inspection and supervision as required hereunder constitutes grounds for non-acceptability of materials manufactured, even though such materials have been specified or approved.

1.06 REQUIREMENTS

A. Sealant system shall include joint preparation, joint back-up or bondbreaker, priming, sealant and caulkings required to seal exterior and interior joints throughout the project, including those not specifically indicated in the Contract Documents, but necessary to completely eliminate active, direct and indirect moisture and weather elements of water, air or dust, from entering through, around, over and under joints of building components, to provide a watertight, moisturetight and weathertight building envelope and seal joints between adjacent materials.

B. Sealants are not to harden or soften more than 10 Shore A durometer points as measured 21 days after original installation.

C. Verify compatibility of sealants with various other sealants or joint systems at any point of interface or possible contact.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in original unopened containers or bundles with labels, indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multicomponent materials.

B. Store at 80°F or less in a cool, dry area. Handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.

C. Use sealant within the time recommended by the manufacturer.

1.08 PROJECT/SITE CONDITIONS

A. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions, or when ambient and substrate temperatures are below or above manufacturer's recommended limitations for installation or below 40°F. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.

B. Surface Conditions: Provide proper primers suited to conditions. Primers may be omitted upon certification by sealant manufacturer that they are not required. Where any doubt exists, prepare sample joints on actual materials as furnished for the job to determine the matter.

1.09 WARRANTY

Contractor shall submit manufacturer's written five (5) year warranty agreeing to replace joint sealers which fail or deteriorate including color resistance compromising system life.

1.10 GUARANTEE

Provide joint installer/manufacturer guarantee of work against inherent or developed defects in material or installation, agreeing to repair or replace joint sealers which fail, leak, crumble, harden, shrink, bleed, sag, stain or loose adhesion. Guarantee installed work to remain watertight for a period of two (2) years.

PART 2 - PRODUCTS

2.01 MATERIALS

Use sealants of the following types and manufacturers. Use manufacturer's standard or custom colored materials to match color of adjacent surfaces. Where adjacent materials on each side of the joint are different colors, the Architect will select sealant colors. If the desired color is not available from one manufacturer, select the proper color from another manufacturer.

2.02 MANUFACTURERS

A. Provide one of the following for each different product required:
   1. Momentive Performance Material
   2. Mameco/International, Inc.
   3. Pacific Polymers
   4. Pecora
   5. Sika
   6. Equivalent products meeting performance criteria specified will be acceptable.

2.03 MATERIAL TYPES

A. POLYURETHANE SEALANTS

1. One part, non sag, non staining, gun grade sealants ASTM C920, Type S, Grade NS, Class 25, uses NT, M, G, A & O, TT-S-00230C, Type II, Class A.

   a. Location/Use: Exterior/Interior, Horizontal/Vertical joints in concrete, masonry, steel, aluminum and glass
   b. Mameco International 'Vulkem 116 or 921'
      Pacific Polymers 'Elasto-thane 230-Type II', Elasto-seal 230
      Pecora 'Dynatrol 1'
      Sika - Sikaflex - 1a or 15LM
      Sonneborn 'Sonolastic NP-1/Ultra/Sonolastic 150

2. Two part, non sag, non staining, gun grade sealant, Type M, Grade NS, Class 25, uses NT, M, A & O, TT-S-00227E, Type II, Class A.

   a. Location/Use: Exterior/Interior, Horizontal/Vertical joints in concrete, masonry, steel, aluminum.
   b. Mameco International 'Vulkem 227 or 922'
      Pacific Polymers 'Elasto-seal 227 or Elasto-thane 920 Type II'
      Pecora 'Dynatrol II'
      Sika - Sikaflex - 2c NS/SL
      Sonneborn 'Sonolastic NP-2'

3. One part, self leveling, pourable sealant, ASTM C920, Type S, Grade P, Class 25, Uses T, M, A & 0, TT-S-00230C, Type 1

   a. Location/Use: Exterior/Interior, Horizontal expansion and control joints; light traffic.
   b. Mameco International 'Vulkem 45'
      Pecora 'Urexpan NR-201'
      Sika - Sikaflex - 1 CSL
      Sonneborn 'Sonolastic SL1'

4. Two part, self leveling, pourable sealant, ASTM C920, Type M, Grade P, Class 25, uses T, M, A & O, TT-S-00227E, Type I.

   a. Location/Use: Exterior/Interior, Horizontal expansion and control joints; medium to heavy traffic.
   b. Mameco International 'Vulkem 245-255'
      Pacific Polymers 'Elasto-thane 227 High Shore'
      Pecora 'Urexpan NR-200'or 'Dynatred'
      Permapol 'RC-2SL'
      Sika - Sikaflex 2CSL
      Sonneborn 'Sonolastic SL2'

B. Silicone Sealants

1. Silicone based, single components, non sag, conforming to Federal Spec. TT-5-0030C (2) & TT-S-001543A.
   a. Joints in glass and metal surfaces of walls and other vertical and sloping surfaces of window surrounds.
      General Electric - GE1200
      Dow Corning - 790
      Pecora 864 or 890
      Sonneborn - Sonolastic 150/Omniseal
   b. Joints in concrete and masonry in vertical and sloping surfaces.
      General Electric - Silpruf
      Dow Corning - 795
      Pecora 895
      Sonneborn - Sonolastic 150/Omniseal

C. Joint Backing: Closed cell materials, neoprene, polypropylene, or polyethylene, ASTM D1565 or D1667 conforming to manufacturers written recommendations. Material is to be non-staining, free of asphalt, oils or creosote. Sized and shaped to control depth of sealant and to provide 25 - 50 percent compression upon insertion. Open cell polyurethane foam backer rod is not allowed.

D. Primers: As recommended in writing by sealant manufacturer. Verify that recommended primer has been tested not to stain the substrate. Refer to 3.01D.

E. Bond Breaker: Pressure sensitive adhesive polyethylene tape, or other type recommended by sealant manufacturer.

F. Fire Retardant Sealant: Products as tested and listed by approved system design as indicated in the U.L.Inc Volume 2, directory. System is to be recognized by UL and ASTM E119 procedures, (and ICBO by report NER #243), for fire rating of penetration to be sealed. Products as distributed by Kirwan Corporation (714) 939-6887.

   1. Pecora Ultra-Block fire safing joint system used in conjunction with acrylic latex sealants (AC-20 FTR), polyurethanes or silicones, as approved by the manufacturer, based on hardness or flexibility of the joint required. Alternate mineral wool safings must comply to approved system designs.

   2. 3M - "Fire Barrier Caulk CP25 and Putty 303", or Dow Corning - "Firestop Sealant".

G. Fire Retardant Foam: UL tested and listed, conforming to ASTM E119 for rating of penetration to be sealed. 3M 2001 RTV "Firestop Foam" or equal.

H. Structural Glazing Adhesives/Sealants
One-component, high-modulus, high-strength, neutral-cure, 100 percent silicone polymer sealant.
   1. Acceptable Product: Momentive, GE SSG4000 UltraGlaze Silicone Structural Glazing Adhesive/Sealant as manufactured by Momentive Performance Materials

a) Compliance:
   (1) ASTM C 1184, Type S, Use G and O.
   (2) ASTM C 920, Type S, Grade NS, Class 25, Use NT, A, G, O.
   (3) Federal Specification TT-S-001 543A.
   (4) Federal Specification TT-S-00230C.
b) Dynamic Movement Capability, ASTM C 719: +/- 25 percent.
c) Color: Black.
d) Color: Grey.

2.04 INCIDENTAL REQUIREMENTS AND MATERIALS

A. Staining Characteristics: All joint fillers, primers, or other materials used in conjunction with sealants shall be of such composition as to not cause staining of the sealant or the materials to which they are applied.

B. Compressible Joint Filler: As recommended by the sealant manufacturer for use in conjunction with the sealant. Size closed cell joint backing for joint width plus 25 percent.

C. Primers: As recommended by the sealant manufacturer for use in conjunction with the sealant for application onto the various types of materials to which the sealer is applied.

D. Cleaners, where required in lieu of primers, as recommended by the sealant manufacturer, which will not stain or damage building materials.

PART 3- EXECUTION

3.01 EXAMINATION

Examine substrate surfaces to receive sealant system and associated work and conditions under which work will be installed. Do not proceed with sealants until unsatisfactory conditions have been corrected in a manner acceptable to installer. Starting work within a particular area will be construed as applicators acceptance of surface conditions.

3.02 PREPARATION

A. Comply with manufacturers latest written requirements, recommendations and specifications for cleaning, surface preparation and priming. Remove loose foreign materials which could impair adhesion or proper performance of sealants.

B. Prime joint substrates where recommended by joint sealant manufacturer or where required by preconstruction joint sealant substrate tests. Confine primers to areas of joint sealant bond. Do not allow spillage or migration onto adjoining surfaces.

C. Apply epoxy primers to all concrete surfaces to which joints are to be sealed prior to sealant application to increase adhesion, decreasing failure due to temperature exposure, thermal and structural movement.

D. Prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears.

3.03 APPLICATION

A. Install back-up and sealants in accordance with ASTM C1193 and manufacturers written recommendations as recommended for each use type and substrate, or as directed by manufacturer's technical field representative to ensure proper preparation and application.

B. Accurately install/position joint back-up to provide support of sealants during application and at position required to control/produce the uniform cross sectional shape and depth of installed sealants relative to designated joint thickness/widths to achieve required width to depth ratios, that allow optimum sealant movement capability.

   1. Do not leave gaps between ends of back-up rod.
   2. Do not stretch, twist, puncture or tear back-up rod.
   3. Install bond breaker tape where backer rods cannot be used do to shallow joint depth, to avoid three side adhesions.

C. Install/apply sealants by proven techniques using caulking guns with proper nozzles using sufficient pressure that results in sealants directly contacting and fully wetting joint substrates. Completely fill recesses provided for each joint configuration, providing uniform, cross sectional shapes and depths relative to joint widths, and to assure/obtain uniform adhesion free of air pockets, voids, embedded matter, ridges and sags. During application keep tip of nozzle at bottom of joint, forcing sealant to fill from bottom to top. Finish joints smooth, uniform and free of ridges, wrinkles, sags, air pockets, and embedded impurities.

D. Tool sealants to form smooth, uniform beads of concave configuration finished below the surface. Use tooling agents that are approved by sealant manufacturer. Remove excess sealants from surface adjacent to joint.

E. Fire Retardant Foam and Sealant: Conform to manufacturer's printed directions for preparation and application of materials per applicable details for fire-rated penetrations. Seal all gaps, cracks, and holes around the perimeter of materials penetrating the fire rated floors and walls.

F. Fire Retardant Putty: Apply to thicknesses required for rating and type of construction, in accordance with manufacturer's directions.

3.04 PROTECTION

A. Protect joint sealants from contact with contaminating substances or from damage resulting from construction operations or other causes.

B. Cut out and remove damaged or deteriorated joint sealants and repair so that areas are indistinguishable from original work.

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated steel doors and frames.

B. Steel frames for wood doors.

C. Fire-rated steel doors and frames.

D. Thermally insulated steel doors.

E. Sound-rated steel doors and frames.

F. Steel glazing frames.

G. Accessories, including glazing, louvers, and matching panels.

1.02 RELATED SECTIONS

A. Section 08710 - Door Hardware.

B. Section 08800 - Glazing: Glass for doors and borrowed lites.

C. Section 09900 - Paints and Coatings: Field painting.

1.03 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

B. ANSI A250.3 - Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames; 1999.

C. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

D. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).

E. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2005a.

F. ASTM C 236 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box; 1989 (Reapproved 1993).

G. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2005.

H. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2004.

I. ASTM E 413 - Classification for Rating Sound Insulation; 2004.

J. ASTM E 1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).

K. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; 2000 (ANSI/DHI A115 Series).

L. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

M. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 1999.

N. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 1992.

O. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2000.

P. NAAMM HMMA 862 - Guide Specifications for Commercial Security Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2003.

Q. NAAMM HMMA 863 - Guide Specifications for Detention Security Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2004.

R. NAAMM HMMA 865 - Guide Specifications for Swinging Sound Control Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2003.

S. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association; 2007.

T. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association; 2003.

U. UBC Std 7-2, Part II - Test Standard for Smoke- and Draft-control Assemblies; International Conference of Building Officials; 1997.

V. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

W. UL 10B - Standard for Fire Tests of Door Assemblies; 1997.

X. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; 1998.

Y. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; 2001.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Samples: Submit two samples of metal, 2 x 2 inches (50 x 50 mm) in size showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

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

B. Maintain at the project site a copy of all reference standards dealing with installation.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:
   1. Steelcraft; www.steelcraft.com.
   2. Assa Abloy Ceco,: www.assaabloydss.com.
   3. Windsor Republic Doors; www.republicdoor.com.
   4. Substitutions: See Section 01600 - Product Requirements.

2.02 DOORS AND FRAMES

A. Requirements for All Doors and Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Door Top Closures: Flush with top of faces and edges.
   3. Door Edge Profile: Beveled on both edges.
   4. Door Texture: Smooth faces.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   6. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   7. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
   8. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 STEEL DOORS

A. Exterior Doors Type L-Series:
   1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
   2. Grade: NAAMM HMMA 861, physical performance Level A.
   3. Core: Honeycomb core system.
   4. Top Closures for Outswinging Doors:
      a. Flush with top of faces and edges.
      b. Not less than 16 ga. Flush or inverted.
      c. Welded to the face sheet.
   5. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
   6. Texture: Smooth faces.
   7. Astragals: Flat security type.
   8. Weatherstripping: Separate, see Section 08710.
   9. Finish: Factory primed , field painted.

2.04 STEEL FRAMES

A. General:
   1. Comply with the requirements of grade specified for corresponding door, except:
      a. ANSI A250.8 Level 1 Doors: 16 gage frames.
   2. Finish: Same as for door.
   3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
   4. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches (100 mm) high to fill opening without cutting masonry units.
   5. Frames wider than 48 Inches (1200 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

   6. Frames Installed Back-to-Back: Reinforce with steel channels anchored to floor and

overhead structure.

7. Frame Anchors
   a. Existing Masonry or Concrete
      1. 3/8 inch countersunk flat head bolt and expansion shields.
      2. Locate 6 inches from top and bottom and maximum 24 inches on center.
      3. Weld pipe spacers or other type of spacers, per manufacturers standard design, in back of frame soffit.
   b. Attachment to Drywall Construction:
      1. Steel or Wood Stud type to accommodate frame jamb depth and face dimension on welded type frame.
   c. Provide one anchor for every 30 inches of jamb or fraction thereof.
   d. Floor Anchor: angle clip type.
      1. 16 Gauge.
      2. Two fasteners per jamb.
      3. Weld to bottom of each jamb.
8. Preparation for Hardware
   a. Reinforce per SDI 107.
   b. Lock and Closer reinforcement: box type.
   c. Door Hinge reinforcement: 7 gauge or equivalent, manufacturer's standard.
   d. Punch strike jambs to receive three silencers; double leaf frames to receive manufacturer's standard preparation.
   e. Hardware locations per "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames".
   f. Provide welded in place guards for all hardware cutouts in frame.
   g. Electrical preps: provide welded-in-place boxes, special designed anchors, raceways and access panels as required.

B. Exterior Door Frames: Face welded, F16 Series, sanded and grinded smooth, seamless with joints filled.
   1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
   2. Finish: Factory primed , field painted.
   3. Weatherstripping: Separate, see Section 08710.

C. Mullions for Pairs of Doors: Fixed, of profile similar to jambs.

D. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.

E. Transom Bars: Fixed, of profile same as jamb and head.

2.05 ACCESSORY MATERIALS

A. Glazing: As specified in Section 08800, factory installed.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Astragals for Double Doors: Specified in Section 08710.
   1. Exterior Doors: Steel, Z-shaped.
   2. Fire-Rated Doors: Steel, shape as required to accomplish fire rating.

D. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

E. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.06 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

C. Finish. Color to be selected.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

B. Coat inside of other frames with bituminous coating to a thickness of 1/16 inch (1.5 mm).

3.03 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Coordinate installation of hardware.

F. Coordinate installation of glazing.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.

3.04 ERECTION TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI A250.8.

B. Maximum Diagonal Distortion: 1/16 in (1.5 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

C. Test sound control doors for force to close, latch, and unlatch in accordance with ASTM E 1408; adjust as required to comply.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule appended to this section.

END OF SECTION

SECTION 08310

ACCESS DOORS AND PANELS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:
   1. Flush access doors and panels.
   2. Related hardware and attachments.

1.02 RELATED SECTION

A. Section 09900 – Paints and Coatings.

B. Division 15 - Mechanical.

C. Division 16 – Electrical.

1.03 SYSTEM DESCRIPTION

A. Milcor M and MS Access Doors provide critical service access in drywall, masonry or tile walls and offer superior resistance to corrosion.

1.04 SUBMITTALS

A. Comply with Sections 01310 & 01340.

B. Shop Drawings:
   1. Door and panel units: Show types, elevations, thickness of metals, full size profiles of door members.
   2. Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.

C. General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of door and panel units.

D. Product Data: Manufacturer's technical data for each type of access door and panel assembly, including setting drawings, templates, fire-resistive characteristics, finish requirements, and details of anchorage devices.

E. Include complete schedule, types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.

F. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

1.05 QUALITY ASSURANCE

A. Comply with Section 01400 and 01410.

B. Single Source Responsibility: Obtain access door and panel units, and frames for entire Project from 1 source and 1 single manufacturer.

C. Fire-Resistance Ratings:
   1. Where a fire-resistance classification is indicated, provide access door and panel assemblies with panel door, frame, hinge, and latch from manufacturer listed in Underwriter's

Laboratories (UL), “Building Materials Directory” for rating shown.
2. Provide 90 minutes UL label at 20 hour rated partitions. Provide 3 hour label at horizontal applications, up to 24 inch wide x 36 inch high.
3. Provide 2 hour label at horizontal applications greater than 24 inch wide x 36 inch high.

D. Size Variations: Obtain Architect’s acceptance and approval of manufacturer’s standard size units that may vary slightly from sizes indicated on Drawings.

E. Coordination: Provide inserts and anchoring devices that will be built into other Work for installation of access door assemblies. Coordinate delivery with other Work to avoid delay.

1.06 DELIVERY, STORAGE AND HANDLING

A. Comply with Section 01620
1. Package and ship per manufacturer’s recommendations. One per carton.
2. Store per manufacturer’s instructions.
3. Store in dry area out of direct sunlight.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Equal to Milcor, Telephone:800.624.8642
1. Style M and MS Doors
2. Finish: Style M Factory Primed field painted
Style MS stainless steel
3. Location: Use MS Style at wet areas

2.02 MATERIALS

A. Style M, Prime Painted: 14-gauge steel frame and door panel. Style MS.

B. Stainless Steel: 16-gauge stainless steel frame and door panel.

2.03. ACCESS PANELS

A. Finishes: Milcor access doors are offered in corrosion-resistant, prime-painted and stainless steel surfaces. The prime-painted surface is factory-painted through an electro-static binding process with an ionized power paint and then thermo set in a curing cycle to eliminate runs and bubble. This paint able surface can be used as is, or painted to suit specific décor. Stainless steel models in a satin finish are available for added corrosion resistance

B. Hinge: Concealed spring hinges open to 175 degrees. Extracting pin from hinge leaf attached to panel permits panel removal. Number of hinges varies with size of door: check with your Milcor representative for details.

C. Flush: Screwdriver-operated with steel cam. Available with Allen head or spanner head cam on special order. Cylinder lock with two keys furnished to replace one cam lock, if required, at slight extra charge.

D. Anchor: Milcor M & MS door frames are furnished with masonry anchors, if specified, at slight extra charge. Number of anchors varies per door size requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Comply with Section 01700

B. Verify that rough openings for door and frame are correctly sized and located.

C. Verify mechanical and electrical requirements for ceiling or wall access panels.

3.02 PREPARATION

A. Advise installers of work relating to access panel installation including rough opening dimensions, locations of supports, and anchoring methods. Coordinate delivery with other work to avoid delay.

3.03 INSTALLATION

A. Install access door and frame units per manufacturer's written instructions.

B. Install frames plumb and level in opening. Secure rigidly in place.

C. Position units to provide convenient access to concealed Work requiring access.

3.04 ADJUST AND CLEAN

A. Adjust panel after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed, or damaged.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:
   1. Mechanical and electrified door hardware for the following:
      a. Swinging doors.
      b. Sliding doors.
      c. Folding doors

   2. Electronic access control system components, including the following:
      a. Electronic access control locksets and exit device trim.

   3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

   4. Lead-lining door hardware items required for radiation protection at door openings.

B. Exclusions: Hardware for the following is not provided under the scope of this section, unless specifically listed in the hardware sets:

   1. Windows
   2. Cabinets (casework), including locks in cabinets
   3. Signage
   4. Toilet accessories
   5. Overhead doors

C. Related Sections:

   1. Division 01 Section “Alternates” for alternates affecting the work of this section.
   2. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation under the work of this section.
   3. Division 09 Sections for touchup finishing or refinishing of existing openings modified by the work of this section.
   4. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.

1.3 REFERENCES

A. Applicable state and local building codes and standards.

B. Fire/Life Safety
   1. NFPA - National Fire Protection Association
      a. NFPA 70 – National Electric Code
      b. NFPA 80 - Standard for Fire Doors and Fire Windows
      c. NFPA 101 - Life Safety Code
      d. NFPA 105 - Smoke and Draft Control Door Assemblies
   2. State Fire Safety Code [and Amendments to CT Supplement].

C. UL - Underwriters Laboratories
   1. UL 10B - Fire Test of Door Assemblies
   2. UL 10C - Positive Pressure Test of Fire Door Assemblies
   3. UL 1784 - Air Leakage Tests of Door Assemblies
   4. UL 305 - Panic Hardware

D. Accessibility
   1. California Building Code, 2010 edition.

E. DHI - Door and Hardware Institute
   1. Sequence and Format for the Hardware Schedule
   2. Recommended Locations for Builders Hardware

F. ANSI - American National Standards Institute
   1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.4 SUBMITTALS

A. General:

   1. Submit the following in accordance with Conditions of Contract and Division 01 requirements.
   2. Advise Architect within the submittal package of incompatibility or issues which may detrimentally affect the work of this section.

B. Action Submittals:

   1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

   2. Riser and Wiring Diagrams: After final approval of the hardware schedule, submit details of electrified door hardware, indicating the following:

      a. Wiring Diagrams: For power, signal, and control wiring and including the following:
         1) Details of interface of electrified door hardware and building safety and security systems.
         2) Schematic diagram of systems that interface with electrified door hardware.
         3) Point-to-point wiring.
         4) Risers.

   3. Samples for Verification: If requested by the Architect, submit production sample or sample installations as requested of each type of exposed hardware unit in the finish indicated, and tagged with a full description for coordination with the schedule.

      a. Samples will be returned to the supplier in like-new condition. Units that are acceptable to the Architect may, after final check of operations, be incorporated into the Work, within limitations of key coordination requirements.

   4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, Include the following information:
      a. Door Index; include door number, heading number, and Architects hardware set number.

b. Opening Lock Function Spreadsheet; list locking device and function for each opening.
c. Type, style, function, size, and finish of each hardware item.
d. Name and manufacturer of each item.
e. Fastenings and other pertinent information.
f. Location of each hardware set cross-referenced to indications on Drawings.
g. Explanation of all abbreviations, symbols, and codes contained in schedule.
h. Mounting locations for hardware.
i. Door and frame sizes and materials.
j. Name and phone number for the local manufacturer's representative for each product.
k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and/or access control components). Operational description should include how the door will operate on egress, ingress, and fire/smoke alarm connection.
    1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.

5. Keying:

    a. Furnish temporary construction cores for construction period. Brass cores at exteriors and sensitive interiors, plastic insert type elsewhere.
    b. Furnish uncombinated brass cores directly from factory to Owner for each locking device, city's lock shop will combinate as needed.
    c. Furnish key blanks directly from factory to Owner, city's lock shop will cut and stamp as needed.
        1) Furnish cores and blanks using secured delivery, signature required.
        2) Obtain necessary authorization forms from Owner.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.

2. Product Certificates for electrified door hardware, signed by the manufacturer:
    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:
    a. Upon request of Architect or Authority Having Jurisdiction certificates of compliance for fire-rated hardware and installation instructions shall be made available.
    b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
    c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.

4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

5. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data : Provide in accordance with Division 01 and include the following:

   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Name, address, and phone number of local representative for each manufacturer.
   d. Parts list for each product.
   e. Copy of final approved hardware schedule, edited to reflect conditions as-installed.
   f. Copy of final keying schedule.
   g. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
   h. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.

1.5 QUALITY ASSURANCE

A. Product Substitutions: For the purpose of performing the work of this section, comply with product requirements stated in Division 01 and as specified herein.

1. Where a specific manufacturer's product is named and accompanied by the words "No Substitute," including make or model number or other designation, provide the product exactly as specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
   a. Where no additional products or manufacturers are listed in a product category, requirements for "No Substitute" govern product selection.

2. Where products indicate "acceptable substitute" or "acceptable manufacturer", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.

B. Supplier Qualifications and Responsibilities: A recognized architectural hardware supplier that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides a certified Architectural Hardware Consultant (AHC) available to the Owner, Architect, and Contractor, at reasonable times during the course of the Work for consultation.

1. Warehousing Facilities: In Southern California or Clark County, NV.

2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

4. Coordination Responsibility: Coordinate installation of the electronic security hardware with the Architect and electrical engineers and provide installation and technical data to the Architect and other related subcontractors.
   a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

C. Installer Qualifications: Qualified tradesmen, skilled in the application of commercial grade hardware that has a record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

D. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who can meet the following qualification requirements:

1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
2. Can provide installation and technical data to the Architect and other related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.
4. Capable of producing wiring diagrams.
5. Capable of coordinating installation of the electrified hardware with the Architect and electrical engineers.

E. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

F. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.

G. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

H. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

I. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).

2. Comply with the following maximum opening-force requirements:
   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
   b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
   c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high [and] [3/4 inch (19 mm) high for exterior sliding doors].

4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

J. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

K. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold a meeting for the purpose of reviewing any questions or concerns related to the proper installation and adjustment of door hardware.
   a. Attendees: doors hardware supplier, door hardware installer, Contractor.
   b. After the meeting, provide letter of compliance to the Architect, indicating when the meeting was held and who was in attendance.

2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold a meeting for the purpose of coordinating door hardware with security, electrical, doors and frames, and other related suppliers.
   a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, [Owner's security consultant,] Architect and Contractor.
   b. After meeting, provide letter of compliance to the Architect, indicating when the coordination conference was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
   1. Each article of hardware shall be individually packaged in manufacturer's original packaging.

C. Project Conditions:
   1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
   2. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:
   1. Promptly replace products damaged during shipping with exactly the same products.
   2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during the course of the Work.
   3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
F. Deliver keys [and permanent cores] to Owner by registered mail or overnight package service.

1.7 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

F. Direct shipments not permitted, unless approved by the Contractor.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.
   a. Closers:
      1) Mechanical: 10 years.
      2) Electrified: 2 years.
   b. Exit Devices:
      1) Mechanical: 3 years.
      2) Electrified: 1 year.
   c. Locksets:
      1) Mechanical: 3 years.
      2) Electrified: 1 year.
   d. Continuous Hinges: Lifetime warranty.
   e. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.9 MAINTENANCE

A. Maintenance Materials:
   1. Furnish per ‘MAINTENACE MATERIALS’ set appended to the hardware schedule. Furnish directly to Owner, and in manufacturer’s original packaging.

B. Maintenance Tools:
   1. Furnish One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Awarding Authority has determined that certain products will be selected for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”
   1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers other than those listed shall be in accordance with QUALITY ASSURANCE article, herein.

C. Approval of products from manufacturers indicated as “Acceptable Manufacturer” in the following table is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

Item	Scheduled Manufacturer	Acceptable Substitute
Hinges	Ives (IVE)	Hager, McKinney, Stanley
Continuous Hinges	Ives (IVE)	Markar, Stanley, Select
Electric Power Transfer	Von Duprin (VON)	ABH, Falcon
Flush Bolts & Coordinators	Ives (IVE)	Burns, DCI
Locksets & Deadlocks	Best (BES)	No Substitute
Aluminum Door Locks – Narrow Style	Adams Rite (ADA)	As pre-approved
Sliding Door Locks	Trimco (TRI)	As pre-approved
Exit Devices & Mullions	Von Duprin (VON)	No Substitute
Electronic Access Control – Standalone	Schlage – electronic (SCE)	No Substitute
Power Supplies	Von Duprin (VON)	No Substitute
Roller Latches	Ives (IVE)	Burns, Rockwood
Door Closers	LCN (LCN)	Norton, Sargent, Falcon,
Electro-Mechanical Automatic Operators	LCN (LCN)	Besam, Horton
Door Trim	Ives (IVE)	Burns, Rockwood, Elmes
Protection Plates	Ives (IVE)	Burns, Rockwood, Trimco
Overhead Stops	Glynn-Johnson (GLY)	ABH
Stops & Holders	Ives (IVE)	Burns, Rockwood, Trimco
Thresholds & Weatherstrip	National Guard Products (NGP)	DHSI, Zero, Pemko
Silencers	Ives (IVE)	Burns, Rockwood
Door Position Switches	Schlage Electronics (SCE)	GE, Sargent
Latch Protector	Ives (IVE)	Burns, Rockwood
Sliding and Folding Door Hardware	K. N. Crowder (KNC)	Hafele, Henderson
Robe Hooks	Ives (IVE)	Burns, Rockwood

D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

E. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval.

2.2 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.

2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Review door specification and advise Architect if thru-bolts are required.

4. Hardware shall be installed with the fasteners provided by the hardware manufacturer.

2.3 HINGES

A. Provide three-knuckle, concealed bearing hinges of type, material, and height as outlined in the hardware sets:

2.4 CONTINUOUS HINGES

A. Aluminum Geared

1. Requirements:
   a. Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 2.
   b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with .25 inch diameter Teflon coated stainless steel hinge pin.
   c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
   d. Hinges shall be capable of supporting door weights up to 450 pounds, and shall be successfully tested for 1,500,000 cycles.
   e. Install hinges with fasteners supplied by manufacturer. Hole pattern shall be symmetrically patterned.

2.5 ELECTRIC POWER TRANSFER

A. Provide power transfer with ten wires to accommodate electric function of specified hardware.

B. Electric power transfer is to be located per manufacturer’s template and UL requirements, unless interference with operation of door or other hardware items.

2.6 FLUSH BOLTS

A. Requirements:

1. Provide automatic and manual flush bolts with forged bronze face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. Top rods at manual flush bolts for doors over 90 inches in height shall be increased by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.

2.7 MORTISE LOCKS

A. Requirements:

1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handing without opening the case. Cylinders: Refer to "KEYING" article, herein.

2. Provide standard curved-lip ASA strikes, use extended curved-lip strikes are necessary to protect trim.

3. Lever trim shall be solid stainless steel, cast or forged in the specified lever design, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle.

2.8 CYLINDRICAL LOCKS – GRADE 1

A. Requirements:

1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1.
2. Provide locks with a standard 2-3/4 inches backset, unless noted otherwise, with a 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
3. Provide locksets with a separate anti-rotation through-bolts, and shall have no exposed screws. Levers shall operate independently, and shall have two external return spring cassettes mounted under roses to prevent lever sag.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Curved lip type throughout.
5. Lever trim: solid cast levers without plastic inserts, and wrought roses on both sides. Locksets shall be thru-bolted to assure proper alignment.
   a. Lever design shall be Schlage Tubular (TLR), configured to accept Owner's Best brand seven pin interchangeable core (SFIC).

2.9 EXIT DEVICES

A. Manufacturers:
   1. Scheduled Manufacturer: Von Duprin 98/35 series, No Substitute

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit and/or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.

2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.

3. Exit devices shall incorporate a fluid damper or other device that eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one half of the door width, but not the full length of the exit device rail. End-cap will have two-point attachment to door. Touch-pad shall match exit device finish, and shall be stainless steel for US26D and US32D finishes; for all other finishes, the touch-pad finish shall be of compatible finish to exit device. Only compression springs will be used in devices, latches, and outside trims or controls.

4. Exit devices to incorporate a deadlatching feature for security and/or for future addition of alarm kits and/or other electrical requirements.

5. Concealed vertical exit devices shall be a cable-actuated concealed vertical latch system available in two-point and less bottom latch (LBL) configurations. Vertical rods are not acceptable.

    a. Cable shall include color-coded stainless steel with polytetrafluoroethylene (Teflon®) liner and stainless steel core wire. Latches and center slides are color coded to aid in installation. Conduit and core wire ends snap into latch and center slides without the use of tools. Latchbolts and blocking cams shall be manufactured from sintered metal low carbon copper- infiltrated steel, with a molybdenum disulfide coating for low friction and consistent performance.
    b. Top latchbolt shall have a minimum 0.382 inch and greater than 90 degree engagement with strike to prevent door and frame separation under high static load. Bottom latchbolt, when used, shall have a minimum of 0.44 inch engagement with strike.
    c. Product cycle life shall exceed 1,000,000 cycles.
    d. Latch release does not require separate trigger mechanism.
    e. Top and bottom latch must operate independently of each other. Top latch will fully engage top strike even when bottom latch is compromised.
    f. Cable and latching system shall have the ability to:
        1) Be assembled as a complete assembly and function prior to being installed in the door.
        2) Install into the door as a one-piece single assembly
        3) Be installed independently of device installation and function on door even prior to device and trim installation.
        4) Connect to the exit device at a single attachment point.
        5) Adjust bottom latch height from a single point, after the system is installed and connected to exit device, while the door is hanging
        6) Alter latch position up and down within two-inches without additional adjustment.
        7) Ability to remove the system while door is hanging.
        8) Configure latchbolt mounting: double or single tab mount for steel doors, and wood doors, face mount for aluminum doors, eliminating requirement of tabs.
        9) Provide adjustable exit device to latch center line adjustment. Ensures double tab mounting option for top latch, regardless of exit device centerline.

6. Provide exit devices with manufacturer's approved strikes.

7. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Architect.

8. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.

9. Non-fire-rated exit devices shall have cylinder dogging.

10. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
    a. Lever style: match the lever style of the locksets.

11. Provide electrical options as scheduled.

2.10 ELECTRONIC ACCESS CONTROL LOCKSETS – OFFLINE BORED-TYPE

A. Manufacturer: “AD-200-CY” series, as manufactured by Schlage, an Ingersoll Rand Company, at designated interior openings.

B. Requirements: Offline electronic locksets shall comply with the following requirements.
   1. Type: Heavy-duty, bored cylindrical, non-handed, field-reversible.
   2. Backset: as needed.
   3. Latchbolt Throw: 1/2-inch (13 mm).
   4. Chassis: Shall accommodate standard 161 cylindrical lock prep for 1-3/4-inch (44 mm) doors standard, or 1-3/8-inch (35 mm) to 2-3/4-inch (70 mm) thick doors in 1/8-inch (3 mm) increments.
   5. Applicable Standards:
      a. Listed, UL 294 - The Standard of Safety for Access Control System Units.
      b. Compliant with ANSI Standard A156.25 and A156.2 Series 4000, Grade 1 strength and operational requirements.
      c. Compliant with ANSI/BHMA A156.25 Grade 1 Operation and Security Requirement.
      d. Certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203.
      e. Compliant with ASTM E330 for door assemblies.
      f. Compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada IC.
   6. Lockset Functions: Provide locks with following functions, as scheduled, that are field configurable without taking the lock off the door:
      a. Classroom / Storeroom 70.
      b. Apartment 60.
      c. Office 50.
      d. Privacy 40.
   7. Emergency Override: Lockset shall have the ability to utilize emergency mechanical key override with the following manufacturer’s key systems in the lever:
      a. Small Format Interchangeable core up to 7 pin by Best.
   8. Levers:
      a. Vandal Resistance: Exterior (secure side) lever designed with ability to rotate freely while door remains securely locked, preventing damage to internal lock components from vandalism by excessive force.
      b. Lever trim to be non-handed, and to operate independently of non-locking levers for extended life cycles.
      c. Style: Tubular
   9. Power Supply:
      a. Lockset powered by four AA batteries with options for eight AA batteries or a 12V or 24V DC power supply.
      b. Lockset shall have ability to communicate battery status.

10. Features: Locksets shall incorporate the following features.
    a. Visual tri-colored LED indicators that indicate activation, additional PIN code credential required, operational systems status, system error conditions and low power conditions.
    b. Visual bi-colored LED indicator on interior that is capable of indicating secured/unsecured status of device to occupants on interior.
    c. Audible feedback that can be enabled or disabled.
    d. Onboard processor with memory capacity of 5,000 users, 5,000 event audit history, up to 16 time zones and up to 32 calendar events.
    e. Tamper-Resistant Screws: Tamper torx screws on inside escutcheon for increased security.
11. Adaptability:
    a. Networking Capabilities: Network adaptable without removing device from door. Lockset to have the ability to be upgraded in the field from a standalone battery powered configuration to a wireless networked configuration without being removed from the door.
    b. Field changeable Reader Modules: Lockset to have the ability to change credential reader technologies without being removed from door.
12. Switches: Provide locksets with the following switches, standard:
    a. Door Position Switch
    b. Interior Cover Tamper Guard
    c. Mechanical Key Override
    d. Request to Exit
    e. Request to Enter
    f. Lock/Unlock Status (Clutch Position).
13. Credential Reader: Provide credential reader modules in the following configurations, as indicated in door hardware sets. Multi-tech contactless reader shall be NFC-Compatible and read access control data from both 125 kHz and 13.56 MHz contactless smart cards. The multi-tech contactless reader shall be optimally designed for use in access control applications that require reading both 125 kHz proximity and 13.56 MHz contactless smart cards.
    a. Credential Reader Configuration: Provide credential reader modules in the following configurations, as indicated in door hardware sets.
        1) Proximity, Smartcard via Multi-Technology.
    b. Credential reader capabilities for Partner integrated software to include, but may not be limited to:
        1) 13.56 MHz Smart card credentials:
            a) Secure section (Multi-Technology and Smartcard): Schlage, XceedID ISO-X, MIFARE, ISO-X Lite, my-d, DESFire 8-EV1.
            b) 13.56 MHz Serial number only (Multi-Technology and Smartcard): MIFARE, DESfire, iClass, Inside Pictotag, ST Micro, TI Tagit.
            c) 125 kHz Proximity card credentials: Schlage, XceedID, HID, GE/CASI ProxLite and AWID.
        2) Multi-Technology readers that read both 13.56 MHz Smart Cards and 125 kHz Prox cards.
        3) Dual credential reading capabilities credential card or fob and PIN.
        4) 12 button keypad with backlit buttons.
14. Operation:
    a. Lockset shall have ability to be configured at door by handheld programming device the length of time device is unlocked upon access grant.
    b. Lockset shall have the ability to communicate identifying information such as firmware versions, hardware versions, serial numbers, and manufacturing dates by handheld programming device.

2.11 ELECTRONIC ACCESS CONTROL LOCKSETS – OFFLINE MORTISE-TYPE

A. Manufacturer: “AD-200-MD” series, as manufactured by Schlage, an Ingersoll Rand Company, at designated exterior doors.

B. Requirements: Offline electronic locksets to comply with the following requirements.

1. Type: Mortise, field-reversible handing.
2. Backset: 2-3/4-inch (70 mm), nominal.
3. Latchbolt: 3-piece, beveled, stainless steel with 3/4-inch (19 mm) throw and anti-friction latch.
4. Chassis: Shall accommodate ANSI standard mortise lock prep for 1-3/4-inch (44 mm) doors standard, or 1-3/8-inch (35 mm) to 2-3/4-inch (70 mm) thick doors in 1/8-inch (3 mm) increments.
5. Applicable Standards:
   a. Listed, UL 294 - The Standard of Safety for Access Control System Units.
   b. Compliant with A156.25 and A156.13 Series 1000, Grade 1 Operational and Security.
   c. Certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203.
   d. Compliant with ASTM E330 for door assemblies.
   e. Compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada IC.
6. Lockset Functions: Provide locks with following functions, as scheduled, that are field configurable without taking the lock off the door:
   a. Apartment 60.
7. Deadbolt Option: Provide lockset incorporating deadbolt complying with the following.
   a. Characteristics: Stainless steel, 1-inch throw, 1-5/8-inch (41 mm) high and 5/8-inch (16 mm) thick.
   b. Operation:
      1) Deadbolt can be thrown from interior when door is in closed position to prevent unauthorized entry.
      2) Deadbolt can be retracted from both interior and exterior.
      3) Deadbolt interconnected with latch.
8. Emergency Override: Lockset shall have the ability to utilize emergency mechanical key override with the following manufacturer’s key systems in the lever:
   a. Small Format Interchangeable core up to 7 pin by Best.
9. Levers:
   a. Vandal Resistance: Exterior (secure side) lever designed with ability to rotate freely while door remains securely locked, preventing damage to internal lock components from vandalism by excessive force.
   b. Operation: Outside and inside levers operate independently of each other.
   c. Style: Tubular (03)
10. Power Supply:
    a. Lockset powered by four AA batteries with options for eight AA batteries or a 12V or 24V DC power supply.
    b. Lockset shall have ability to communicate battery status.
11. Features: Locksets shall incorporate the following features.
    a. Visual tri-colored LED indicators that indicate activation, additional PIN code credential required, operational systems status, system error conditions and low power conditions.
    b. Visual bi-colored LED indicator on interior that is capable of indicating secured/unsecured status of device to occupants on interior.
    c. Audible feedback that can be enabled or disabled.
    d. Onboard processor with memory capacity of 5,000 users, 5,000 event audit history, up to 16 time zones and up to 32 calendar events.

e. Tamper-Resistant Screws: Tamper torx screws on inside escutcheon for increased security.

12. Adaptability:
    a. Networking Capabilities: Network adaptable without removing device from door. Lockset to have the ability to be upgraded in the field from a standalone battery powered configuration to a wireless networked configuration without being removed from the door.
    b. Field changeable Reader Modules: Lockset to have the ability to change credential reader technologies without being removed from door.
13. Switches: Provide locksets with the following switches, standard:
    a. Door Position Switch
    b. Interior Cover Tamper Guard
    c. Mechanical Key Override
    d. Request to Exit
    e. Request to Enter
    f. Lock/Unlock Status (Clutch Position).
14. Credential Reader:
    a. Credential Reader Configuration: Provide credential reader modules in the following configurations, as indicated in door hardware sets. Multi-tech contactless reader shall be NFC-Compatible and read access control data from both 125 kHz and 13.56 MHz contactless smart cards. The multi-tech contactless reader shall be optimally designed for use in access control applications that require reading both 125 kHz proximity and 13.56 MHz contactless smart cards.
        1) Proximity, Smartcard via Multi-Technology.
    b. Credential reader capabilities for Partner integrated software to include, but may not be limited to:
        1) 13.56 MHz Smart card credentials:
            a) Secure section (Multi-Technology and Smartcard): Schlage, XceedID ISO-X, MIFARE, ISO-X Lite, my-d, DESFire 8-EV1.
            b) 13.56 MHz Serial number only (Multi-Technology and Smartcard): MIFARE, DESfire, iClass, Inside Pictotag, ST Micro, TI Tagit.
            c) 125 kHz Proximity card credentials: Schlage, XceedID, HID, GE/CASI ProxLite and AWID.
        2) Multi-Technology readers that read both 13.56 MHz Smart Cards and 125 kHz Prox cards.
15. Operation:
    a. Lockset shall have ability to be configured at door by handheld programming device the length of time device is unlocked upon access grant.
    b. Lockset shall have the ability to communicate identifying information such as firmware versions, hardware versions, serial numbers, and manufacturing dates by handheld programming device.

2.12 COMPONENTS

A. Handheld Programming Device for Electronic Access Control Locksets [and Exit Device Trim]
    1. Manufacturer: “HHD” series with “Schlage Utility Software,” as manufactured by Schlage, an Ingersoll Rand Company. No Substitute.
    2. Requirements: Handheld programming device shall comply with the following requirements.
        a. Capable of initializing lock and accessories using preloaded Schlage Utility Software.
        b. Used to field configure electronic access control devices for the following attributes:
            1) Credential reader formats
            2) Lock function

3) Unlock period
4) Power failure mode
5) Audible alarm ON/OFF
6) Battery status
7) Validate hardware and software revision
8) Troubleshooting status signals
9) Special access delay (ADA)
10) Delayed egress (release delay)
11) Door propped open delay
12) Lockdown cancel delay time out between credential and PIN
13) Number of key presses without valid PIN before lockout
14) Current date/time
15) Enable/disable manual programming

c. Utilized to download firmware updates and door files to device.
d. Utilized to download audit files from device.
e. Features/Components:
1) 3.5-inch (89 mm) LCD display minimum
2) Touch Screen/Keypad Backlit
3) 32-bit processor minimum
4) Memory: 128MB RAM/256 MB ROM
5) Battery: Rechargeable Li-ion

2.13 ACCESS CONTROL READER

A. Manufacturer:
1. Scheduled Manufacturer: Ingersoll Rand Security Technologies aptiQ MT11

B. Requirements: Read Only Multi-technology Contactless reader

1. Access control card readers shall be as manufactured by a global company who is a recognized leader in the production of access control devices. Card reader manufactured for non-access control applications shall not be acceptable
2. Multi-technology contactless reader shall read access control data from both 125 kHz and 13.56 MHz contactless smart cards and NFC-compatible. The multi-technology contactless reader shall be optimally designed for use in access control applications that require reading both 125 kHz Proximity and 13.56 MHz contactless smart cards by providing:
a. Configuration allows reader to be enabled to read smart, proximity or both technologies at the same time.
b. A migration platform to upgrade from the most popular 125 kHz proximity technologies to MIFARE or MIFARE DESFire EV1 by reading both 125 kHz proximity technology and 13.56 MHz contactless smart card technology.
c. Guaranteed compatibility to read all standard data formats ensuring card-to-reader interoperability in multi-location installations and multi-card/reader populations when used with Ingersoll Rand products.
d. Secure access control data exchange between the smart card and the reader utilizing diversified keys and mutual authentication sequences.
e. Universal compatibility with most access control systems.
f. Ease of installation through industry standard wiring methods.
g. Compatibility with legacy 125 KHz proximity access control formats (all standard formats up to 37 bits, including HID Corporate 1000 formats).
h. Optimal read range and read speed for increased access control throughput.
i. Global availability.
j. Product construction suitable for both indoor and outdoor applications.
k. Customizable behavior for indicator lights and beeper.

3. Multi-technology contactless reader shall comply with the following 13.56MHz-related standards to ensure product compatibility and predictability of performance:
   a. ISO 14443
4. Multi-technology contactless reader shall be configurable to read 13.56 MHz data simultaneously from the following cards (multiple credential support based on reader configuration):
   a. Secure support - Mifare DESFire EV1with PACSA, Mifare Classic, FIPS 201 PIV Credential.
   b. UID/CSN Support – DESFire Classic V0.06, HID iClass, ISOX (my-d).
   c. Proximity – Schlage Proximity, XID Proximity, HID Prox, AWID, GE/CASI, Lenel Prox, Inside Pictotag, TI Tagit, ST Micro.
5. Multi-technology contactless reader shall be configurable to read data from any compatible 125 kHz technology simultaneously with 13.56 MHz data. Compatible 125 kHz technologies include:
   a. XCEEDID/Schlage/HID Prox (format in the card – formats up to 37-bits supported).
   b. AWID PROX (SAME AS LENEL PROX - format in the card – formats up to 42-bits).
   c. GE PROX - two possible format options.
6. Multi-technology contactless reader shall provide the ability to read card access data stored in the secure access control sector/application area of the ISO 14443 XceedID MIFARE or MIFARE DESFire EV1 card.
7. The Multi-technology contactless reader shall be configurable to provide multiple hierarchical degrees of key compatibility for accessing the smart card access control data. Compatibility shall be provided for the following key structure options:
   a. Compatibility with the default Ingersoll Rand key structure to ensure convenient off the shelf compatibility with Ingersoll Rand cards and readers.
   b. Compatibility with custom keys managed by Ingersoll Rand which provide a site-specific, unique, protected key structure.
   c. Compatibility with high security customer managed custom keys.
8. The Multi-technology contactless reader shall be configurable to provide compatibility with all standard Prox formats up to 37 bits (including Corporate 1000®).
9. Multi-technology contactless reader shall allow the reader firmware to be upgraded in the field without the need to remove the reader from the wall through the use of factory-provided device.
10. Multi-technology contactless reader shall be suitable for global deployment by meeting worldwide radio and safety regulatory compliance including:
    a. FCC Certification (US)
    b. CE (EU)
    c. C-tick (Australia, New Zealand)
    d. R&TTE Directive (15EU)
    e. UL294 (US)
    f. ULC-S319
    g. IC (Canada)
    h. FIPS201 / PIV I
    i. IP65
11. Multi-technology contactless reader shall be fully compliant with Restriction of Hazardous Substances directive (RoHS) restricting the use of specific hazardous materials found in electrical and electronic products.
12. Multi-technology contactless reader shall provide universal compatibility with most access control systems by outputting card data in compliance with the SIA AC-01 Wiegand standard.
13. Multi-technology contactless reader shall allow for secure installation practices through mounting methods utilizing tamper resistant screws.

14. Multi-technology contactless reader shall provide the ability to transmit an alarm signal via and integrated optical tamper switch if an attempt is made to remove the reader from the wall. The tamper switch shall be programmable to provide a selectable action to provide a selectable action compatible with various tamper communication schemes provided by access control panel manufacturers. The selectable action shall include one of the following:
    a. The reader open collector line changes from a high state (5V) to a low state (Ground).
    b. If utilizing OSDP Protocol reader shall report a tamper condition via RS485.
15. Multi-technology contactless reader shall provide the ability for mounting to standard electrical boxes through the use of universal international mounting holes.
16. Multi-technology contactless reader shall be provided with a full potted assembly.
17. Multi-technology contactless reader shall be provided with a quick connect wire harness.
18. The Multi-technology contactless reader shall provide customizable reader behavior options either from the factory, or defined in the field through the use of pre-configured command cards. Reader behavior programming options shall include:
    a. LED & Audio configurations.
    b. Ability to disable reading of specific card technologies or frequencies.
    c. ISO 14443/15693 CSN output configuration.
    d. Wiegand output spacing and timing.
19. Multi-technology contactless reader shall provide the following programmable audio/visual indication:
    a. An audio beeper shall provide tone sequence to signify: access granted, access denied, power up, and diagnostics.
    b. A light bar shall provide clear visual status (red/green/amber).
20. Multi-technology contactless reader shall be designed for low current operation to enable migration from most legacy proximity applications without the need to replace existing access control panels and/or power supplies. Contactless smart card power requirements shall be:
    a. Operating voltage: 5 – 16 VDC, reverse voltage protected. Linear power supply recommended.
    b. Current requirements: 125 mA DC, 140 mA PEAK @ 12 VDC
21. Multi-technology contactless reader shall meet the following physical specifications:
    a. Dimensions: 5.91” x 1.72” x 0.84” (15 cm x 4.4 cm x 2.1cm)
    b. Weight: 9.6 oz. (272.15 g)
    c. Material: UL94 Polycarbonate
    d. Plastics: Consist of three-piece design with mounting plate, potted case and aesthetic cover.
    e. Color: Black, Gray, Brown or Cream as approved by the project architect.
22. Multi-technology contactless reader shall meet the following environmental specifications:
    a. Operating temperature: -31 to 151 degrees F (-35 to 67 degrees C)
    b. Operating humidity: 5% to 95% relative humidity non-condensing
    c. Weatherized design suitable to withstand harsh environments
        1) Certified rating of IP65
23. Multi-technology contactless reader cabling requirements shall be:
    a. Cable distance: (Wiegand): 500 feet (150m)
    b. Cable type: 5-conductor #22 AWG
    c. Standard reader termination: 18” (0.5m) wire harness

2.14 OFFLINE CONTROLLER

A. Manufacturers:
    1. Scheduled Manufacturer: BEST Access System , No Substitute

B. Requirements:
   1. Provide an offline single opening controller UL 294 listed and designed for offline electronic access control that supports up to two separate Wiegand reader inputs, three form C relay outputs, for strike, auxiliary and alarm, and three inputs that include door position, request-to-exit, and remote release.
   2. Offline controller shall support up to 5000 users and 5000 audits, have the ability to be programmed locally via keypad or via the Handheld Programming Device, includes 15 foot USB remote cable connector and decorative wall plate with USB input and supports, and has a LED visual indicators (including low battery and state of the relay).
   3. Provide an offline controller that supports a variety of card functions including: normal, toggle, freeze, pass through, construction, lockdown and Card + PIN applications and is compatible with credential technologies including.
      a. Magnetic Stripe (tracks 1, 2, and 3)
      b. 125 kHz Proximity, and 13.56 MHz Smart cards
   4. Provide an offline controller that can be upgraded to have networked functionality. With the addition of a networked communication board and upgraded firmware, the controller becomes a wireless reader interface that can communicate via 900MHz wireless signals to a Schlage AD-Series PIM400 which connects to the networked access control system. The wireless reader interface eliminates the need to run additional wires to the door.

2.15 POWER SUPPLIES

A. Manufacturers:
   1. Scheduled Manufacturer: Von Duprin PS900 series

B. Requirements:

   1. Provide power supplies, recommended and approved by the manufacturer of the electrified locking component, for the operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.

   2. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking component and/or components as recommended by the manufacturer of the electrified locking components with consideration for each electrified component utilizing the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Architect.

   3. Provide a power supply that is regulated and filtered 24 VDC, or as required, and UL class 2 listed.

   4. Options: Provide the following options.
      a. Provide a power supply, where specified, with the internal capability of charging optional sealed backup batteries 24 VDC, or as required, in addition to operating the DC load.
      b. Provide sealed batteries for battery back-up at each power supply where specified.
      c. Provide keyed power supply cabinet.

   5. Provide a power supply complete requiring only 120VAC to the fused input and shall be supplied in an enclosure.

   6. Provide a power supply with emergency release terminals, where required, that allow the release of all devices upon activation of the fire alarm system complete with fire alarm input for initiating “no delay” exiting mode.

2.16 ROLLER LATCHES

A. Requirements:

1. Provide roller latches with a 4-7/8 inches strike at single doors to fit ANSI frame prep. If dummy levers are used in conjunction with roller latch mount the roller latch at a height as to not interfere with the proper mounting and height of the dummy lever.
2. Provide roller latches 2-1/4 inches full lip strike at pair doors. Mount roller in the top rail of each leaf per manufacturer's template.

2.17 KEYING

A. Keying System: City's existing Best seven-pin SFIC.

2.18 DOOR CLOSERS

A. Manufacturers:
1. Scheduled Manufacturer: LCN 4010/4110/4041 series. No Substitute

B. Requirements:
1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.
2. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder, and shall utilize full complement bearings at shaft. Cylinder body shall be 1-1/2 inch diameter, and double heat-treated pinion journal shall be 11/16 inch diameter.
3. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degreesF. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
4. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
5. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within a 6-inch top rail without the use of a mounting plate so that closer shall not be visible through vision panel from pull side.
6. Closers shall not incorporate Pressure Relief Valve (PRV) technology.
7. Closer cylinders, arms, adapter plates, and metal covers shall have a high-metallic content powder coating finish (MTLPC) which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or shall have special rust inhibitor (SRI). In lieu of MTLPC finish, furnish satin-chrome plated components.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.19 ELECTRO-MECHANICAL AUTOMATIC OPERATORS

A. Manufacturers:
1. Scheduled Manufacturer: LCN Senior Swing.
2. Acceptable Substitution: Besam Swingmaster MP, Horton 4000LE series.

B. Requirements:

1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI A156.19 where automatic operators are specified.
2. The operator shall be powered with a DC motor working through reduction gears. Closing shall be spring force. No manual, hydraulic, or chain drive closer will be acceptable. The motor is to be off when the door is in closing mode. The door can be manually operated with the power on or off without damage to the operator. The operator shall include variable adjustments, including opening and closing speed adjustment. Operator shall be mounted in an aluminum cover.
3. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.
4. Provide drop plates, brackets, or adapters for arms as required to suit details.
5. Provide hard-wired vertical bar type actuator switches for operation as specified. Actuators shall be weather-resistant type at exterior applications.
6. Where automatic operators are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by the manufacturer of the automatic operator for each individual leaf. Actuators shall control both doors simultaneously at pairs. Exterior and vestibule doors with automatic operators shall be sequenced to allow ingress or egress through both sets of openings as directed by the Architect. Locate the actuators, key switches, and other controls as directed by the Architect.

2.20 DOOR TRIM

A. Manufacturers:
1. Scheduled Manufacturer: Ives.
2. Acceptable Substitution: Burns, Rockwood, Elmes, Trimco.

B. Requirements:
1. Provide push plates 4 inches wide x 16 inches high x 0.050 inch thick and beveled 4 edges. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Push bars shall be of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as specified. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches wide x 16 inches high x 0.050 inch thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.

2.21 PROTECTION PLATES

A. Manufacturers:
1. Scheduled Manufacturer: Ives.
2. Acceptable Substitute: Burns, Rockwood.

B. Requirements:
   1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch thick as scheduled, beveled four edges (B4E). Furnish with sheet metal screws, finished to match plates.

2.22 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturers: Glynn-Johnson
   2. Acceptable Substitutes: ABH

B. Requirements:
   1. Provide heavy duty concealed mounted overhead stop or overhead stop/holder as specified for exterior and interior vestibule single acting doors.
   2. Provide heavy duty concealed mounted overhead stop or overhead stop/holder as specified for double acting doors.
   3. Provide heavy or medium duty and concealed or surface mounted overhead stop or overhead stop/holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking a wall, open against equipment, casework, sidelights, and/or where conditions do not allow a wall stop or a floor stop presents a tripping hazard.
   4. Where overhead holders are specified provide friction type at doors without a closer and positive type at doors with a closer.

2.23 DOOR STOPS AND HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.
   2. Acceptable Substitution: Burns, Rockwood, Trimco.

B. Provide door stops for all doors in accordance with the following requirements:
   1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
   2. Where wall stops cannot be used, provide dome type floor stops of the proper height.
   3. At any opening where a wall or floor stop cannot be used, a medium duty surface mounted overhead stop shall be used.

2.24 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, GASKETING

A. Requirements:
   1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items as closely as possible.
   2. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
   3. Adhesive type seals: four-fingered type with inelastic rigid backing, not subject to stretching. Adhesive warranted for life-of-building. Self-compensating for warp, thermal bow, door settling, and out-of-plumb.

2.25 DOOR POSITION SWITCHES

A. Manufacturers:
   1. Scheduled Manufacturer: Schlage Electronics.
   2. Acceptable Substitutions: GE-Interlogix, Sargent.

B. Requirements:
   1. Provide recessed or surface mounted type door position switches as specified.

2. Switches shall be installed as recommended by manufacturers installation instructions and coordinated with other hardware being installed on the opening. Coordinate door and frame preparations with door and frame suppliers. If separate switches are being used with a magnetic locking device provide a minimum of 4 inches between the switch and the magnetic locking device.

2.26 SLIDING DOOR HARDWARE

A. Manufacturers:
   1. Scheduled Manufacturer: K. N. Crowder.
   2. Acceptable Substitutions: Hafele, Henderson.

B. Requirements:
   1. Provide complete sets of sliding door hardware as recommended by the manufacturer for the door type and weight.
      a. Include track, channels, brackets, hangers, fasteners, guides, pulls, and all hardware required for a complete installation.

2.27 BI-FOLD DOOR HARDWARE

A. Manufacturers:
   1. Scheduled Manufacturer: K. N. Crowder.
   2. Acceptable Substitutions: Hafele, Henderson.

B. Requirements:
   1. Provide complete sets of bi-fold door hardware as recommended by the manufacturer for the door type and weight.
      a. Include track, hangers, fasteners, guides, and all hardware required for a complete installation.

2.28 POCKET DOOR HARDWARE

A. Manufacturers:
   1. Scheduled Manufacturer: K. N. Crowder.
   2. Acceptable Substitutions: Hafele, Henderson.

B. Requirements:
   1. Provide complete sets of pocket door hardware as recommended by the manufacturer for the door type and weight.
      a. Include track, hangers, fasteners, guides, and all hardware required for a complete installation.

2.29 FINSHES

A. BHMA 630 with the exceptions as follows:
   1. Continuous Hinges: BHMA 628.
   2. Door Closers: high-metallic powder coat (MTLPC), or BHMA 652.
   3. Floor and Wall Stops: BHMA 626.
   4. Thresholds: Mill Finish Aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Where on-site modification of doors and frames is required, prepare hardware locations in accordance with the following:

1. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
2. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
3. Where doors are in rated assemblies, comply with NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.

C. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
   1. Furnish permanent cores to Owner for combining and installation.

I. Wire (including low voltage): Coordinate with the following work, provided under the scope of Division 26, ELECTRICAL.

   1. Conduit, junction boxes and wire pulls.
   2. Connections to and from power supplies to electrified hardware.
   3. Connections to fire/smoke alarm system and smoke evacuation system.
   4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
   5. Testing and labeling wires with the Architect's opening number.

J. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.

K. Power Supplies: Locate as directed by Architect.
   1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

L. Thresholds: Set thresholds scheduled herein, in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

M. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present a tripping hazard.

N. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

O. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

P. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant: Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
   1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

   1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
   2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
   3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three [six] <Insert number> months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Provide training for the Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

A. Provide hardware for each door to comply with requirements of this section and the below-listed scheduled sets.

B. It is intended that the following schedule includes complete items of door hardware necessary to complete the work. If a discrepancy is found in the scheduled hardware sets, such as a missing item, improper hardware for a frame, door or fire codes, provisions of the above-specifications shall govern.

C. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

Hardware Sets:
Refer to drawings.

END OF SECTION

SECTION 09900

PAINTING & COATING

PARTS 1 – GENERAL

1.01 SUMMARY:

A. Section Includes: Painting and finishing of all interior and exterior items and surfaces, unless otherwise indicated or listed under exclusions below:
   1. Paint all exposed surfaces, except as otherwise indicated, whether or not colors are designated. Include field painting of exposed exterior and interior plumbing, mechanical and electrical work, except as indicated below. .

B. Work Included:
   1. The intent and requirements of this Section is that all work, items and surfaces which are normally painted and finished in a building of this type and quality, shall be so included in this contract, whether or not said work, item or surface is specifically called out and included in the schedules and notes on the drawings, or is, or is not, specifically mentioned in these specifications.

C. The following general categories of work and items that are included under other sections shall not be a part of this section:
   1. Shop prime painting of structural and miscellaneous iron or steel.
   2. Shop prime painting of hollow metal work.
   3. Shop finished items.

D. The Room Finish Schedules indicated on the drawings indicates the location of interior room surfaces to be painted or finished. The schedule indications are general and do not necessarily define the detail requirements. Include all detailed refinements and further instructions as may be given for the required complete finishing of all spaces and rooms.

1.02 SUBMITTALS:

A. Product Data: Submit complete manufacturer's descriptive literature and specifications in accordance with the provisions of Section 01 30 00.
   1. Materials List: Submit complete lists of materials proposed for use, giving the manufacturer's name, catalog number, and catalog cut for each item when applicable. When required, provide a list of paint and coating materials proposed for use, which equates such materials with the design-basis products specified.

B. Samples: In accordance with provisions of Section 01300, submit, on 8-1/2 inch by 11 inch hardboard, samples of each color, gloss, texture and material selected by the Architect from standard colors available for the coatings required.
   1. For natural and stained finishes, provide sample on each type and quality of wood used on the project.

C. Manufacturer's Instructions: Submit the manufacturer's current recommended methods of installation, including relevant limitations, safety and environmental cautions, application rates, and composition analysis

1.03 QUALITY ASSURANCE:

A. Regulatory Requirements: Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this Specification, comply

with the more stringent provisions. Regulatory changes may affect the formulation, availability, or use of specified coatings. Confirm availability of coatings to be used prior to job going out to bid and before start of painting project.

a. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).
b. Comply with South Coast Air Quality Management District (SCAQMD) Rule 1113. A copy of this regulation can be obtained from http://www.aqmd.gov/rules/reg/reg11/r1113.pdf.

B. Field Sample: When and as directed by the Architect, apply one complete coating system for each color, gloss and texture required. When approved, the sample panel areas will be deemed incorporated into the Work and will serve as the standards by which the subsequent Work of this Section will be judged.

1.04 DELIVERY, STORAGE, AND HANDLING:

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

B. Deliver materials to job site in new, original, and unopened containers bearing manufacturer's name and trade name. Store where directed in accordance with manufacturer's instructions.

1.05 PROJECT CONDITIONS:

A. Do not apply exterior materials during fog, rain or mist, or when inclement weather is expected within the dry time specified by the manufacturer. No exterior or interior painting shall be done until the surfaces are thoroughly dry and cured. Do not apply paint when temperature is below 50° F. Avoid painting surfaces when exposed to direct sunlight.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Manufacturer's catalog names and number of paint types in this Section herein are based on products manufactured or distributed by the Dunn-Edwards Corporation www.dunnedwards.com and are the basis of design against which the Architect will judge equivalency. The quantity of titanium dioxide, the use of clays, aluminum silicate, talc and the purity of acrylic materials are a few of the criteria which will be used by the Architect in determining equivalency of materials.

B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 Product Requirements. When submitting request for substitution, provide complete product data specified above under Submittals, for each substitute product.

C. Acceptable Manufacturers
1. Carboline www.carboline.com
2. Deft www.deftfinishes.com
3. Dumond Chemicals www.dumondchemicals.com
4. Okon www.okoninc.com
5. Rustoleum www.rustoleumibg.com
6. Valspar www.valsparwood.com

2.02 MATERIALS:

A. Paints: Provide ready-mixed, except field catalyzed coatings. Pigments shall be fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed

to complete homogeneous mixture. Paints shall have good flowing and brushing properties and be capable of drying or curing free of streaks and sags.

B. Accessory Materials: Linseed oil, shellac, solvents, and other materials not specified but required to achieve required finishes shall be of high quality and approved by manufacturer.

C. Colors shall be selected from color chip samples provided by manufacturer of paint system approved for use. Match approved samples for color, texture and coverage.

D. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

E. Restricted Components: Paints and coatings shall not contain any of the following.

1. Acrolein.
2. Acrylonitrile.
3. Antimony.
4. Benzene.
5. Butyl benzyl phthalate.
6. Cadmium.
7. Di (2-ethylhexyl) phthalate.
8. Di-n-butyl phthalate.
9. Di-n-octyl phthalate.
10. 1,2-dichlorobenzene.
11. Diethyl phthalate.
12. Dimethyl phthalate.
13. Ethylbenzene.
14. Ethylene Glycol.
15. Formaldehyde.
16. Hexavalent chromium.
17. Isophorone.
18. Lead.
19. Mercury.
20. Methyl ethyl ketone.
21. Methyl isobutyl ketone.
22. Methylene chloride.
23. Naphthalene.
24. Toluene (methylbenzene).
25. 1,1,1-trichloroethane.
26. Vinyl chloride.

2.04 MIXES:

A. Mix, prepare, and store painting and finishing materials in accordance with manufacturer's directions.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine surfaces to be painted before beginning painting work. Work of other trades that has been left or installed in a condition not suitable to receive paint, stain other specified finish shall be repaired or corrected by the applicable trade before painting. Painting of defective or unsuitable surface implies acceptance of the surfaces.

B. Beware of a condition known as critical lighting. This condition causes shadows that accentuate even the slightest surface variations. A pigmented sealer will provide tooth for succeeding decorative coating, but "does not" equalize smoothness or surface texture. Any corrective action to drywall must be done by the drywall contractor prior to decorating.

3.02 PROTECTION:

A. Protect previously installed work and materials, which may be affected by Work of this Section.
   1. Protect prefinished surfaces, lawns, shrubbery and adjacent surfaces against paint and damage.
   2. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or splatter from fouling surfaces not being painted.
   3. Protect surfaces, equipment, and fixtures from damage resulting from use of fixed, movable and hanging scaffolding, planking, and staging.

B. Provide wet paint signs, barricades, and other devices required to protect newly finished surfaces. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.03 PREPARATION:

A. Perform preparation and cleaning procedures in strict accordance with coating manufacturer's instructions for each substrate condition.

B. Concrete and Masonry: Surfaces shall be dry, clean, and free of dirt, efflorescence, encrustation, and other foreign matter. Glazed surfaces on concrete shall be roughened or etched to uniform texture.

C. Ferrous Metal: Clean oil, grease, and foreign matter with solvent. Surface shall be primed within 3 hours after preparation.

D. Sand and scrape metal to remove loose primer and rust.

E. Non-Ferrous Metal: Chemically or solvent clean and then treat with an etching-type solution if recommended by the finish manufacturer. Cleaned and retreated Non-Ferrous Metal shall be primed the same day that cleaning has been performed.

F. Wood Surfaces: Remove dust, grit and foreign matter. Sand surfaces and dust clean. Spot coat knots, pitch streaks, and sappy section with pigmented stain sealer when surfaces are to be painted. Fill nail holes, cracks and other defects after priming and spot prime repairs when fully cured.

G. Remove hardware and accessories, machined surfaces, plates, lighting fixtures and similar items in place and not-to-be-finish painted, or provide surface-applied protection. Reinstall removed items upon completion of work in each area.

H. Existing surfaces to be recoated shall be thoroughly cleaned and deglossed by sanding or other means prior to painting. Patched and bare areas shall be spot primed with same primer as specified for new work.

I. Thoroughly backpaint all surfaces of exterior and interior finish lumber and millwork, including doors and window frames, trim, cabinetwork, etc., which will be concealed after installation. Backpaint items to be painted or enameled with the priming coat. Use a clear sealer for backpriming where transparent finish is required.

3.03 PREPARATION:

J. Bare and covered pipes, ducts, hangers, exposed steel and ironwork, and primed metal surfaces of equipment installed under mechanical and electrical work shall be cleaned prior to priming.

K. Preparation of other surfaces shall be performed following specific recommendations of the coatings manufacturer.

L. Bond breakers and curing agents shall be removed and the surface cleaned before primers, sealers or finish paints can be applied.

M. All drywall surfaces shall be completely dry and dust free before painting. Skim coated drywall shall be sealed with a sealer recommended by the paint manufacturer for this surface. Use the appropriate light or medium tack masking tape.

3.04 APPLICATION:

A. Apply painting and finishing materials in accordance with the manufacturer's recommendations.
   1. The number of coats specified is the minimum that shall be applied. Apply additional coats when undercoats, stains or other conditions show through final paint coat, until paint film is of uniform finish, color and appearance.

B. Apply each material at not less than the manufacturer's recommended spreading rate:

C. Apply prime coat to surface which is required to be painted or finished.

D. Finish exterior doors on tops, bottoms, and edges same as exterior faces, after fitting.

E. Sand lightly and dust clean between succeeding coats.

3.05 CLEANING, TOUCH-UP AND REFINISHING:

A. Carefully remove all spattering, spots and blemishes caused by work under this section from surfaces throughout the project.

B. Upon completion of painting work remove all rubbish, paint cans, and accumulated materials resulting from work in each space or room. All areas shall be left in a clean, orderly condition.

C. Runs, sags, misses, holidays, stains and other defects in the painted surfaces, including inadequate coverage and mil thickness shall be satisfactorily touched up, or refinished, or repainted as necessary.

3.06 FINISH SCHEDULE

A. Apply the following finishes to the surfaces specified on the finish schedule or on the drawings. Apply all materials in accordance with manufacturer’s instructions on properly prepared surfaces and foundation coats. All intermediate undercoats must be tinted to approximate the final color.
   1. Architect will issue a color schedule prior to start of painting to designate the various colors and locations required for the work.

   1. Masonry and Stucco

      a. Flat – Modified Copolymer / 100% Acrylic

         First Coat FLEX-PRIME Select, Flexible Crack-Resistant Primer (FPSL00)
         Second Coat SPARTASHIELD Exterior Flat Paint (SSHL10)

Third Coat	SPARTASHIELD Exterior Flat Paint (SSHL10)

b. Velvet Sheen - Modified Copolymer / 100% Acrylic

First Coat	FLEX-PRIME Select, Flexible Crack-Resistant Primer (FPSL00)
Second Coat	SPARTASHIELD Exterior Velvet Paint (SSHL20)
Third Coat	SPARTASHIELD Exterior Velvet Paint (SSHL20)

c. Eggshell - Modified Copolymer / 100% Acrylic

First Coat	FLEX-PRIME Select, Flexible Crack-Resistant Primer (FPSL00)
Second Coat	SPARTASHIELD, Exterior Eggshell Paint (SSHL30)
Third Coat	SPARTASHIELD, Exterior Eggshell Paint (SSHL30)

d. Low Sheen – Modified Copolymer / 100% Acrylic

One Coat	DUMOND CHEMICAL, WATCH DOG CPU-747, Polyurethane

2**. Concrete Block – CMU**

a. Flat –Acrylic Copolymer / 100% Acrylic

First Coat	**SMOOTH BLOCFIL SELECT CONCRETE BLOCK FILLER (SBPR00)**
Second Coat	**SPARTASHIELD Exterior Flat Paint (SSHL10)**
Third Coat	**SPARTASHIELD Exterior Flat Paint (SSHL10)**

3. Ferrous Metal

a. Flat – Alkyd Emulsion / 100% Acrylic

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SPARTASHIELD Exterior Flat Paint (SSHL10)
Third Coat	SPARTASHIELD Exterior Flat Paint (SSHL10)

b. Velvet – Alkyd Emulsion / 100% Acrylic

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SPARTASHIELD Exterior Velvet Paint (SSHL20)
Third Coat	SPARTASHIELD Exterior Velvet Paint (SSHL20)

c. Eggshell – Alkyd Emulsion / 100% Acrylic

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SPARTASHIELD, Exterior Eggshell Paint (SSHL30)
Third Coat	SPARTASHIELD, Exterior Eggshell Paint (SSHL30)

d. Low Sheen - Alkyd Emulsion / 100% Acrylic

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SPARTASHIELD, Exterior Low Sheen Paint (SSHL40)
Third Coat	SPARTASHIELD, Exterior Low Sheen Paint (SSHL40)

e. Semi-Gloss – Alkyd Emulsion / 100% Acrylic

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SYN-LUSTRO, Rust Preventive 100% Acrylic Semi-Gloss Paint (W-9)
Third Coat	SYN-LUSTRO, Rust Preventive 100% Acrylic Semi-Gloss Paint (W-9)

B. Exterior Systems: (Continued)

4. Ferrous Metal

a. Flat – Alkyd Emulsion / Acrylic Copolymer

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SPARTAWALL, Interior Flat Paint (SWLL10)
Third Coat	SPARTAWALL, Interior Flat Paint (SWLL10)

b. Velvet Sheen – Alkyd Emulsion / Acrylic Copolymer

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SPARTAWALL, Interior Velvet Sheen Paint (SWLL20)
Third Coat	SPARTAWALL, Interior Velvet Sheen Paint (SWLL20)

c. Eggshell Sheen - Alkyd Emulsion / Acrylic

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SPARTAWALL, Interior Eggshell Sheen Paint (SWLL30)
Third Coat	SPARTAWALL, Interior Eggshell Sheen Paint (SWLL30)

d. Low Sheen– Alkyd Emulsion / Acrylic

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SPARTAWALL, Interior Low Sheen Paint (SWLL40)
Third Coat	SPARTAWALL, Interior Low Sheen Paint (SWLL40)

e. Semi-Gloss or Gloss – Alkyd Emulsion / Acrylic

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SPARTAWALL, Interior Semi-Gloss or Gloss Paint (SWLL50 or SSHL60)
Third Coat	SPARTAWALL, Interior Semi-Gloss or Gloss Paint (SWLL50 or SSHL60)

f. Semi-Gloss – Alkyd Emulsion / 100% Acrylic

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SYN-LUSTRO, Rust Preventive 100% Acrylic Semi-Gloss Paint (W-9)

Third Coat SYN-LUSTRO, Rust Preventive 100% Acrylic Semi-Gloss Paint (W-9)

g. Gloss – Alkyd Emulsion / 100% Acrylic

First Coat	BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-1 series)
Second Coat	SYN-LUSTRO, Rust Preventive 100% Acrylic Gloss Paint (W-10)
Third Coat	SYN-LUSTRO, Rust Preventive 100% Acrylic Semi-Gloss Paint (W-10)

h. Flat – Zero VOC / Acrylic Urethane / Modified Copolymer

First Coat	RUSTOLEUM, METALMAX, DTM Acrylic Urethane Enamel S37
Second Coat	ECOSHIELD, Low-Order/Zero VOC Interior Latex Flat (W 601)
Third Coat	ECOSHIELD, Low-Order/Zero VOC Interior Latex Flat (W 601)

h. Low Sheen – Zero VOC / Acrylic Urethane / Modified Copolymer

First Coat	RUSTOLEUM, METALMAX, DTM Acrylic Urethane Enamel S37
Second Coat	ECOSHIELD, Low-Odor/Zero VOC Interior Latex Low Sheen Paint (W 602)
Third Coat	ECOSHIELD, Low-Odor/Zero VOC Interior Latex Low Sheen Paint (W 602)

i. Semi-Gloss – Zero VOC /Acrylic Urethane /100% Acrylic

First Coat	RUSTOLEUM, METALMAX, DTM Acrylic Urethane Enamel S37
Second Coat	ECOSHIELD, Low-Odor/Zero VOC Interior Latex Semi-Gloss Paint (W 603)
Third Coat	ECOSHIELD, Low-Odor/Zero VOC Interior Latex Semi-Gloss Paint (W 603)

I. Low sheen Interior (metal deck9s0, Exposed ducts, exposed beams and columns)

First Coat:	Ultrashield DTM Gray primer
Second Coat	DE ULMS00
Third Coat	DE Ultrashield ULSH40

5. Non Ferrous Metal

a. Flat – 100% Acrylic / Acrylic Copolymer

Pretreatment	SUPREME CHEMICAL, METAL CLEAN AND ETCH (ME 01)
Second Coat	SPARTAWALL, Interior Flat Paint (SWLL10)
Third Coat	SPARTAWALL, Interior Flat Paint (SWLL10)

b. Velvet Sheen – 100% Acrylic / Acrylic

Pretreatment	SUPREME CHEMICAL, METAL CLEAN AND ETCH (ME 01)
First Coat	ULTRA-GRIP Premium, Multi Purpose Primer (UGPR00-1)
Second Coat	SPARTAWALL, Interior Velvet Sheen Paint (SWLL20)
Third Coat	SPARTAWALL, Interior Velvet Sheen Paint (SWLL20)

c. Eggshell – 100% Acrylic / Acrylic

Pretreatment	SUPREME CHEMICAL, METAL CLEAN AND ETCH (ME 01)
First Coat	ULTRA-GRIP Premium, Multi Purpose Primer (UGPR00-1)
Second Coat	SPARTAWALL, Interior Eggshell Sheen Paint (SWLL30)

Third Coat	SPARTAWALL, Interior Eggshell Sheen Paint (SWLL30)

d. Low Sheen – 100% Acrylic

Pretreatment	SUPREME CHEMICAL, METAL CLEAN AND ETCH (ME 01)
First Coat	ULTRA-GRIP Premium, Multi Purpose Primer (UGPR00-1)
Second Coat	SYN-LUSTRO, Rust Preventive 100% Acrylic Semi-Gloss Paint (W-9)
Third Coat	SYN-LUSTRO, Rust Preventive 100% Acrylic Semi-Gloss Paint (W-9)

e. Semi-Gloss or Gloss – 100% Acrylic

Pretreatment	SUPREME CHEMICAL, METAL CLEAN AND ETCH (ME 01)
First Coat	ULTRA-GRIP Premium, Multi Purpose Primer (UGPR00-1)
Second Coat	SYN-LUSTRO, Rust Preventive 100% Acrylic Gloss Paint (W-10)
Third Coat	SYN-LUSTRO, Rust Preventive 100% Acrylic Semi-Gloss Paint (W-10)

f. Flat - Zero VOC / Acrylic Urethane / Modified Copolymer

Pretreatment	SUPREME CHEMICAL, METAL CLEAN AND ETCH (ME 01)
First Coat	RUSTOLUEM, METALMAX, DTM Acrylic Urethane Enamel S37
Second Coat	ECOSHIELD, Low-Order/Zero VOC Interior Latex Flat (W 601)
Third Coat	ECOSHIELD, Low-Order/Zero VOC Interior Latex Flat (W 601)

g. Low Sheen - Zero VOC / Acrylic Urethane /Modified Copolymer

Pretreatment	SUPREME CHEMICAL, METAL CLEAN AND ETCH (ME 01)
First Coat	RUSTOLUEM, METALMAX, DTM Acrylic Urethane Enamel S37
Second Coat	ECOSHIELD, Low-Odor/Zero VOC Interior Latex Low Sheen Paint (W 602)
Third Coat	ECOSHIELD, Low-Odor/Zero VOC Interior Latex Low Sheen Paint (W 602)

h. Semi-Gloss - Zero VOC / Acrylic Urethane /100% Acrylic

Pretreatment	SUPREME CHEMICAL, METAL CLEAN AND ETCH (ME 01)
First Coat	RUSTOLUEM, METALMAX, DTM Acrylic Urethane Enamel S37
Second Coat	ECOSHIELD, Low-Odor/Zero VOC Interior Latex Semi-Gloss Paint (W 603)
Third Coat	ECOSHIELD, Low-Odor/Zero VOC Interior Latex Semi-Gloss Paint (W 603)

C. Elastomeric Coating:

a. Primer:

1. Prime walls using specified primer, applied at a rate of 300 to 400 square feet per gallon – Elast-o-kote 1200 Primer
   For CMU – Use SBPR00 Smooth Block Filler (New Construction)

2. Ferrous Metal: Ferrous metal should be clean and rust free. Prime using specified primer per manufacturer's specifications.

3. Non-ferrous or Galvanized Metal: Non-ferrous or galvanized metal should be solvent-wiped and primed with specified primer per manufacturer's specifications.

b. Elastomeric Coating Material: Apply elastomeric coating material in a minimum of a two-coat application. **A minimum dry film thickness of 10 mils for each coat shall be obtained or apply additional coats so that a** minimum total system of 15-18 dry mils occurs. Coverage rate will be 50 to 100 square feet per gallon per coat depending on texture and porosity of the substrate. – **DE 7100 Elast-o-kote**

1. Apply each coat perpendicular to the direction of the preceding coat of elastomeric wall coating.

NOTICE

Availability of products listed in this specification may be affected by local, state, or federal regulatory requirements for architectural coatings. Consult your Dunn-Edwards representative for information on current product availability. Submittals prepared by Dunn-Edwards in accordance with this specification may include product codes that are modified with a letter suffix (e.g., W 901V or W 901E) to indicate the specific product formulation currently available to meet applicable requirements.

END OF SECTION

SECTION 10170

TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Solid Color Reinforced Composite (SCRC) Substrate: (Bobrick SierraSeries®)
   1. Toilet Partitions:
      a. Configuration: Floor-Anchored, Overhead-Braced.
   2. Urinal Privacy Screens:
      a. Configuration: Post-to-Ceiling.
      b. Configuration: Wall-Hung.
   3. Dressing Compartments: Floor-Anchored, Overhead-Braced.
   4. Shower Dividers: Floor-Anchored, Overhead-Braced.

1.2 RELATED REQUIREMENTS

A. Section 05500 - Metal Fabrications, coordination with overhead supports; steel beams above finished ceiling to secure Ceiling-Hung and floor-to-ceiling stiles.

B. Section 10800 - Washroom Accessories, for accessories.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets for each product specified.

B. Shop Drawings: Submit manufacturer’s shop drawings for each product specified, including the following:
   1. Plans, elevations, details of construction and attachment to adjacent construction.
   2. Show anchorage locations and accessory items.
   3. Verify dimensions with field measurements prior to final production of toilet compartments.

C. USGBC LEED Submittals:
   1. For Bobrick SierraSeries: Indoor Environmental Quality Credit IEQ 4 - No Added Urea Formaldehyde; submit manufacturer’s certification that composite and agrifiber products contain no added urea-formaldehyde resins and that laminating used to fabricate on-site and shop-applied composite wood and agrifiber contain no added urea-formaldehyde resins.

D. USA Certificate of Origin: Manufacturer must supply with first submittal, an example of their Certificate of Origin declaring toilet compartments are wholly manufactured and assembled specifically in the United States, including city and state locations. A notarized Certificate of Origin must be provided with closeout documents.

1.4 QUALITY ASSURANCE

A. Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.

B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.6 WARRANTY

A. Manufacturer’s Warranty (SierraSeries): Manufacturer’s standard 10 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer’s standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc.. www.bobrick.com. Location of manufacturing shall be the United States.

B. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.

2.2 SOLID COLOR REINFORCED COMPOSITE (SCRC) SUBSTRATE (SierraSeries)

A. Solid Color Reinforced Composite (SCRC) Partitions: Bobrick SierraSeries.
   1. Color: As selected by Architect from manufacturer’s standard SierraSeries range.
   2. Color: SC01 Golden Khaki.
   3. Color: SC02 Desert Beige.
   4. Color: SC03 Terra Cotta.
   5. Color: SC04 Forest Green.

B. Toilet Partitions:
   1. Configuration: Overhead-Braced partitions; with satin finish, extruded anodized aluminum headrails, 0.065 inch (1.65 mm) thick with anti-grip profile.

      a. Basis-of-Design: Bobrick 1092G.67 SierraSeries Toilet Partitions, vandal resistant, gap-free.
         1) Design: Gap-free interlocking design.
         2) Hardware: Vandal resistant full-height stainless steel hardware.

b. Basis-of-Design: Bobrick 2092G.67 SierraSeries Toilet Partitions, maximum height, vandal resistant, gap-free.
   1) Design: Gap-free interlocking design.
   2) Hardware: Vandal resistant full-height stainless steel hardware.

2. Fire Resistance:
   a. Flame Spread Index (ASTM E 84): 45 for panels, doors and stiles.
   b. Smoke Developed Index (ASTM E 84): 120 for panels, 95 for doors and stiles.
   c. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B.
   d. Uniform Building Code: Class II.

C. Urinal Privacy Screens:
1. Basis-of-Design: Bobrick 1095 SierraSeries Wall-Hung Urinal Privacy Screens.
   a. Brackets: 11 gauge (3 mm), double thickness.
2. Hardware: To match partition hardware.
3. Fire Resistance:
   a. Flame Spread Index (ASTM E 84): 45 for panels and stiles.
   b. Smoke Developed Index (ASTM E 84): 120 for panels, 95 for stiles.
   c. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B.
   d. Uniform Building Code: Class II.

D. Materials: Solid color reinforced composite (SCRC) material for stiles, panels, doors, and screens with Bobrick GraffitiOff® coating, thermoset and integrally fused into homogenous piece; high density polyethylene (HDPE), high density polypropylene not acceptable.
1. Composition: Dyes, organic fibrous material, and polycarbonate/phenolic resins.
2. Surface Treatment: Non-ghosting, graffiti resistant surface integrally bonded to core through a series of manufacturing steps requiring thermal and mechanical pressure.
3. Edges: Same color as the surface.
4. Acceptable SCRC Products: Or manufacturer approved equal.
   a. Ultimate Corian System by Shower Shapes.
   b. WilsonArt Gibraltar Material.
   c. WilsonArt EarthStone Material.

E. Performance Requirements:
1. Graffiti Resistance (ASTM D 6578): Passed cleanability test; 5 staining agents.
2. Scratch Resistance (ASTM D 2197): Maximum load value exceeds 10 kilograms.
3. Impact Resistance (ASTM D 2794): Maximum impact force exceeds 30 inch-pounds.
4. Smoke Developed Index (ASTM E 84): Less than 450.
5. Flame Spread Index (ASTM E 84): Less than 75.

F. Finished Thickness:
1. Stiles and Doors: 3/4 inch (19 mm)
   a. Finished thickness of doors and stiles to ensure flush front.
2. Panels and Screens: 1/2 inch (13 mm).

G. Stiles: Floor-Anchored stiles furnished with expansion shields and threaded rods.
1. Leveling Devices: 7 gauge, 3/16 inches (5 mm) thick, corrosion-resistant, chromate-treated, double zinc-plated steel angle leveling bar bolted to stile; furnished with 3/8 inch (10 mm) diameter threaded rods, hex nuts, lock washers, flat washers, spacer sleeves, expansion anchors, and shoe retainers.
2. Stile Shoes: One-piece, 22 gauge (0.8 mm), 18-8, Type 304 stainless steel, 4 inch (102 mm) height; tops with 90 degree return to stile. One-piece shoe capable of

adapting to 3/4 inch (19 mm) or 1 inch (25 mm) stile thickness and capable of being fastened (by clip) to stiles starting at wall line.

H. Wall Posts: Pre-drilled for door hardware, 18-8, Type 304, 16 gauge (1.6 mm) stainless steel with satin finish; 1 inch (25 mm) x 1-1/2 inches (38 mm) x 58 inches high (1473 mm).

I. Anchors: Expansion shields and threaded rods at floor connections as applicable. Threaded rods secured to supports above ceiling as applicable. Supports above ceiling furnished and installed as Work of Section 055000.

J. Hardware:
   1. Compliance: Operable with one hand, without tight grasping, pinching, or twisting of the wrist, and force to operate does not exceed five pounds.
   2. Emergency Access: Hinges, latch allow door to be lifted over keeper from outside compartment on inswing doors.
   3. Materials: 18-8, Type 304, heavy-gauge stainless steel with satin finish. Chrome-plated “Zamak”, aluminum, or extruded plastic hardware not acceptable.
   4. Fastening: Hardware secured to door and stile by through-bolted, theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts. Fasteners secured directly into core not acceptable.
      a. Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 1500 lb (680 kg) per insert.
   5. Clothes Hooks: Projecting no more than 1-1/8 inch (29 mm) from face of door.
   6. Hardware Type: Institutional Hardware (.67p).
      a. Latching: 14 gauge (2 mm) sliding door latch, 11 gauge (3.2 mm) keeper; latch slides on a shock-resistant nylon track. Twist-style door latch operation not acceptable.
      b. Hinges: 16 gauge (1.6 mm) stainless steel, self-closing, 3 section hinges.
      c. Mounting Brackets: 18 gauge (1.2 mm) stainless steel and extend full height of panel.
         1) U-Channels: Secure panels to stiles.
         2) Angle Brackets: Secure stiles-to-walls and panels-to-walls.

PART 3 EXECUTION

3.1 PREPARATION

A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.
   1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
   2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.

B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer’s recommended installation tolerances and conditions.

C. Do not proceed with installation until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from manufacturer’s recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.2 INSTALLATION

A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
   1. Verify blocking and supports in walls and ceilings have been installed properly at points of attachment.
   2. Verify location does not interfere with door swings or use of fixtures.
   3. Use fasteners and anchors suitable for substrate and project conditions
   4. Install units rigid, straight, plumb, and level.
   5. Conceal evidence of drilling, cutting, and fitting to room finish.
   6. Test for proper operation.

3.3 ADJUSTING, CLEANING AND PROTECTION

A. Adjust hardware for proper operation after installation. Set hinge cam on in-swinging doors to hold doors open when unlatched. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.

B. Touch-up, repair or replace damaged products.

C. Clean exposed surfaces of compartments, hardware, and fittings.

END OF SECTION

SECTION 10800

TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide toilet room accessories where indicated on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Provide the following products of American Specialties, Inc, or equal product(s) by Bradley Corporation: www.bradleycorp.com approved in advance by the Architect

B. Technical Concepts (Soap Dispensers)

C. Bobrick (Electric Hand Dryer & Baby Changing Station)

2.02 MATERIALS

A. Electric Hand Dryer:
   a. Bobrick – B-470 Eclipse , surface mounted automatic hand dryer

B. Soap dispenser:
   Product: Technical Concept, Model#750127

C. Toilet tissue dispensers:
   Product: Surface mount, manufactured by ASI.
   Model # ASI 0040

D. Toilet Seat Cover Dispenser:
   Product: Surface mount, Model # 20477-SM

E. Sanitary Napkin Dispenser:
Product: Surface mount, Model # 20852

F. Grab bars:
Product: Type -01
Size: Refer to interior elevations and standard ADA / Tile 24 Sheet.

G. Baby Changing Station:
Product: Bobrick, Model #KB110

2.03 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder: 0.05 inch (1.3mm) thick stainless steel, Type 304 with stainless steel shelf.
Product: ASI, Model #1308

2.04 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

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

3.02 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install each item in its proper location, firmly anchored into position, level and plumb, and in accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 15400

PLUMBING

PART 1 - GENERAL

1.01 REFERENCE

A. Requirements in Addenda, Alternates, Conditions, and Divisions 1 collectively apply to this work.

1. Examination Of Site Prior To Bidding: Supplementary Conditions, Section 00800, Article 1.04.

1.02 DESCRIPTION

A. Principal Work Items Are:

1. Complete sanitary soil, waste system.
2. Complete cold water system, including connection to water meter main in street.
3. Roof drainage system.
4. Plumbing fixtures, fittings, and trim.
5. Plumbing equipment and accessories.
6. Underground pipe protection.
7. Water system sterilization; Laboratory analysis of water purity.
8. Rough - in for and make final connections to certain equipment furnished by other Spec. sections.
9. Make application to Utility Companies for services; and verify availability dates.

    a. Water company: Make application for service including plan check fees, permit and inspection fees.
    b. Sewer Company: Make application for service including plan check fees, permit and inspection fees.

B. Related Work Specified Elsewhere:

1. Demolition.
2. Earthquake.
3. Site Drainage.
4. Landscape Sprinkler System.
5. Concrete.
6. Built-Up Bituminous Roofing.
7. Painting, except equipment finish.
8. Toilet & Bath Accessories.
9. Framing openings.

C. Description Of Plumbing System:

1. Piping is shown in diagrammatic form to indicate work to be done, rather than show exact routing and locations. Make use of all data in Contract Documents, verify against developed field conditions, install work in an orderly arrangement in a manner to overcome structural interference.
2. Fixture and equipment are laid out per requirements of one manufacturer. Modify work and arrangements to suit actual equipment installed.

3. Architectural and structural drawings take precedence over plumbing drawings in representation of general construction work; drawing of various trades take precedence in representation of work of these trades. Refer to all drawings for conditions relevant to this work.

1.03 SUBSTITUTIONS

A. Only written approval of Architect will permit substitutions for materials specified; see Section 00800, Supplementary Conditions for procedures.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications:

1. Cutting and patching finish work shall be performed by workmen of respective trades.
2. Water Systems Sterilization: Approved applicators with qualified personnel having chemical and laboratory experience.

B. Testing Agency; For Water Purity; District Approved Testing Laboratory. C.

Requirements Of Regulatory Agencies:

1. Codes & Ordinances: Conform to all applicable requirements, whichever is most stringent.

   a. Title 19, 21 & 24 of California Code of Regulations. b. Division of the State Architect.
   c. State and Local Fire Marshal.
   d. Serving Utility Companies.
   e. California Plumbing and Mechanical Codes.
   f. Nothing in Contract Documents shall be construed as authority to permit work not conforming to Codes, ordinances, or regulations.
   g. Conflicts with applicable regulations shall be resolved at Contractor's expense before installation. Prepare and secure approval of any clarifying details required by inspection authorities.

2. Earthquake Provisions: All equipment shall be braced and/or anchored to resist horizontal forces per Titles 24 Table 16A-O.
3. Permits, Licenses & Inspections:

   a. Except where specifically noted otherwise, obtain and pay for all permits and licenses require for execution of work.

      of work required by Code, and pay all associated costs.
   c. Obtain all certificates of inspection and approval from authorities having jurisdiction.
   d. All permits inspection & plan check meter & meter box fees shall be paid by construct or/and bill back to the owner at direct cost and no mark-up.

4. Serving Utilities: Comply with requirements for rendering service.
5. Off- Site Work: Conform to Governing Agencies requirements.

D. Source Quality Control: Equipment to have label, listing, or approval of stated agency. E.

Reference Standards:

1. Standards: Comply with standards of each industry involved.
2. Abbreviations:

ASA	American Standards Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
CS	Commercial Specifications
CP	Chromium Plated
FS	Federal Specifications
NP	Nickel Plated
UPC	Uniform Plumbing Code

Other abbreviations used are in accordance with current trade practice.

1.05 SUBMITTALS:

A. Shop Drawings & Product Data: Follow General Conditions procedure, except where modified below.

1. Shop Drawings: Submit for items listed.

   a. When requested by Architect where arrangement is different than indicated or when substitution is proposed.
   b. Control diagrams.

2. Products Data: submit for listed items; 5 copies bound into brochures with covers, and indexed.

   a. Materials: Complete list.
   b. Fixtures & Equipment: Complete list; manufactures' printed data illustrating items, full descriptive data; referenced to Architect's identification numbers and/or details.

B. Record Drawing: see spec. Section 01700, Contract Close-Out, "Project Record Documents", for data required and recording method.

C. Test Reports:

1. Water Purity Test: See Article titled "Field Quality Control". a.

   3 copies.
   b. Submit within 10 days of test date, but no later than 5 days before scheduled final inspection.

D. Certificates: (See Section 01700, Contract Close-Out).

1. Pipe Coating : Manufacturer's certification that coating materials, application, and testing conform to Contract Documents. Deliver with the piping.
2. Off-Site Work : Acceptance by Local Governing Agency. E.

Operation & Maintenance Data:

1. General: See Spec. Section 01700. Contract Close-Out.

2. Maintenance manuals: Catalog data and/or service manuals for all equipment and motors.
3. Operating Instructions:

    a. Printed instruction for oiling, servicing, and operating equipment; as-built control diagrams.
    b. After engineer approval, mount in frame under glass in approved conspicuous location near equipment.

4. Valve Charts:

    a. Separate charts for site and each building showing location and use of all valves and cocks required to have tags.
    b. After Engineer approval, mount in frame under glass in approved locations. F.

Maintenance Materials:

1. General: Deliver to Inspector at Projects site, for transmission to District.
2. Wrenches: One 36' long "T" handle wrench for:

    a. Each size water shutoff valve.
    b. Each sewer cleanout plug.

3. Handle And/Or Keys:

    a. One for each 5, or fraction thereof, loose key valves, stops, or hose bibbs. b. One galv. steel cover key for each 3 yard boxes.

1.06 PRODUCT DELIVERY, STORAGE, & HANDLING.

A. Delivery equipment in mfr.'s. original, unopened protective packaging.

B. Store to keep all product clean and free from damage due to water or other deteriorating elements. Do not store on ground.

C. Handle so as to prevent damage during storage and installation . Follow manufacturers recommendations for coated pipe.

1.07 JOB CONDITIONS

A. Sequencing, scheduling:

1. Schedule work to coordinate with related work of other Sections.

    a. Storm drain lines to have precedence over all other underground line elevations. Cooperate with Site Drainage Contract so gravity flow lines will pass storm drain lines.

2. Provide necessary information for proper sizing of required openings in building elements to accommodate this work.
3. Verify exact locations of fixtures and equipment.
4. Verify exact service requirements with actual fixtures and equipment items.

1.08 GUARANTEE

A. See Spec. Section 01700, Contract Close-Out, "Guarantees".

B. Submit manufacturers standard guarantees for all applicable equipment and fixtures.

C. Repair or replace defective work at no cost District during guarantee period.

D. Repair or replace any parts of the work damage by leaks or breaks in pipes, fixtures or equipment, with qualified workmen, at no cost to District during guarantee period.

PART 2 - PRODUCTS

2.01 PRODUCTS; GENERAL

A. General : All materials and products to be new and in perfect condition, and Manufacturer's latest type and model . One manufacturer only for each material or product type.

B. Trade Name: A standard of quality. See Supplementary Conditions, Section 00800, for substitutions.

C. Finishes: Factory finish on all equipment.

D. Identification: Provide easily visible and readable plates or labels giving equipment characteristics on all equipment, pumps and motors. Locate for visibility in installed position.

2.02 MATERIALS; STANDARDS

A. Standard Specifications: Comply with latest editions of the following, unless indicated otherwise.

1. Brass Pipe: Red brass, 85% copper; ASTM B-43
2. Brass Pipe Fittings: Threaded, banded, C. 1. pattern for 125 lbs.
3. CI Drainage Fittings: WWP - 491a.
4. CI Fittings: 125 lb. banded, WWP-50 lb.
5. CI Soil Pipe Fittings: Same make and weight as pipe.
6. CI Soil, Waste, Vent Lines: No-Hub, CS-188-59, F. S. WWP-401.
7. Cooper Tubing & Wrought Copper Fittings: F.S. WW-T-99a; ASTM B-88
8. Malleable Iron Fittings: 150 lb. banded, A277-447.
9. PVC Pipe & Fittings: C. S. 272.65; F. S. L-P-320a, ASTM D-2665.
10. Steel Pipe: ASTM A-120, Standard weight.
11. Solder: ASTM B-32.
12. Unions: Brass 125 lbs., ATSM B-62
13. Unions: Malleable iron;, ground joint, brass to iron seat, 150 lbs., ASTM A-197.

B. Zinc Coating/Galvanizing: An even coating of zinc applied by the hot-dip process to clean pickled surfaces, to specified weights/sf. when tested by ASTM A-90. Finished surfaces to be free from imperfectly coated spots, large spangles, scratches or flaking.

2.03 MATERIALS; PIPING SYSTEMS

A. Roof Drain Downspouts:

1. Inside Building, Above Grade: Service weight cast iron soil pipe and fitting; or No-Hub cast iron pie and fittings; or schedule 40 galvanized steel screw pipe with cast iron

drainage fittings.

2. Piping Below Grade: Service weight cast iron pipe and fittings; or No-Hub cast iron pipe and fittings.
3. Underside walk and curb penetration: Alhambra Foundry or approved equivalent rectangular pipe for all sizes 4” diameter and larger (do not penetrate curb with 4” or larger diameter pipe).

B. Sewer, Soil & Waste Piping:

1. Inside Buildings Above Ground: Service weight cast iron soil pipe and fittings; No-Hub. CISPI-301.
2. Inside buildings Underground, Outside Buildings underground: Service weight hubless cast iron with stainless steel couplings to 5’ - 0" beyond building wall. pipe beyond 5’-0" to be standard weight cast iron hub & spigot soil pipe and fitting of A. B. S. solvent weld if approved by local Code.

C. Vents:

1. Inside Building, Above Ground: Vents not in finished rooms, and vents up to 6" above top of fixtures, shall be cast iron pipe fittings, No-Hub.
2. Inside Buildings, Underground: Service weight hubless cast iron with stainless steel couplings.
3. Exposed Above Roof: Standard galvanized mild steel screw pipe and fitting.

4. All Other Locations: Standard galvanized mild steel screw pipe with standard 125 pounds banded cast iron screwed fittings.

D. Water Lines; <u>All Copper Systems:</u>

1. Inside Buildings:

   a. Above Ground: Type "L" hard-drawn tubing with wrought fittings, ASTM B88.
   b. Exposed Piping In Finished Area At Fixtures: Chrome plated IPS brass pipe and fittings.
   c. Underground: Type "K" hard-drawn tubing with wrought fittings.

2. Outside Building : PVC-C900 high pressure water pipe. Class 200, Dr14, AWWA-C900-81 gasketed Joint Assembly ASTM-D3139, 200 PSI rated.

2.04 MATERIAL; FITTINGS

A. Cleanouts; Sanitary Sewer Systems:

1. Manufacturers: Smith, Josam, Zurn, Wade, or approved equivalent; types as noted.
2. Metal Cleanouts: Bronze countersunk rectangular slotted plugs, lubricated with non-hardening thread lubricant. Flush -with -floor cleanout tops shall have non-skid covers. Flashing flange with ring required on membrane floors.

3. Unfinished Room Floors: Smith 4223, Josam Y-600-Qr with screwed down cover, or Zurn 1326-10; non-skid cast iron top.

4. Finished Room Walls: All doors removable, with concealed hinges.

   a. Toilet Rooms Or Tile Walls: Josam Y150, counter-sunk slotted plug, Y2100

stainless steel access box; Zurn 2-1315-1, 2-1376 stainless steel face: or Smith 4762 Stainless steel face, #4 finish.

b. Other Walls: Smith 4760, prime coated steel cover, Allen locking device; Josam Y150, U2100 prime coated; or Zurn Z-1315, 2-1376 Permacoated steel.

5. Under Sink Cabinets: Brass nipple extending through cabinets; brass cap and escutcheon, both C. P.
6. Exterior Concrete Surface, Subject To Auto Traffic: Smith 4253, Josam Y-2171-FQ2, or Zurn ZP-9991; extra heavy cast iron , non-skid cover.
7. Exterior Asphalt Concrete Surface, Or Non-Surfaced Areas; Subject to Auto Traffic: Smith 4253 Josam Y-2172FQ2, or Zurn ZP-9990; extra heavy cast iron, non-skid cover.
8. Cast Iron Lines Above Ground: Smith 4470, Zurn 1329-2, Josam Y-30-A.
9. IPS Lines Above Ground: Smith 4470, Zurn 1329-21, Josam Y20.
10. VCP Lines: Neoprene stopper type, with handle for insertion into a bell, Wedge Lock or Speed

Seal pipe. B.

Finished

Brass:

1. General:

a. All finished brass of a similar type shall be same mfr.
b. All finished and exposed brass items shall be heavily chromium plated (CP) and polished.

2. Faucet Handles: Solid brass; vandal-proof, secured to stems by Allen head stainless steel set screws through side of handle (extending into stem), or approved equivalent vandal-proof methods.
3. Fixtures Supplies; Exposed: Seamless 85% red brass pipe, IPS, standard weight screwed fittings. Lav Supplies, from wall to fixture: 3/8'' size, cast brass flange with set screw.
4. Floor Drains: Nickel bronze.
5. Trap & tail Piece Assemblies: 17 ga. brass tail piece, Los Angeles Pattern cast brass "P" trap, cast brass wall flanges with set screws, brass casing.

C. Unions:

1. 2" & Smaller: Ground joint pattern.
2. Larger Than 2". Flanged , 1/16" thick asbestos fiber gaskets. Garlock or approved equivalent.

D. Valves, Stops, Cocks, Hose Bibbs:

1. General:

A. Gate, Globe, Angle & Check Valves: 150 lb. steam, 300 lbs. cold water, non- shock working pressure; union bonnet; designed for the type of service for which it is installed.
B. Items Exposed To View: Conform to Article "B. Finished

Brass" E. Couplings; No-Hub Pipe:

1. Type; Stainless Steel Band: For above-ground use only.

a. Clamp Band: #24 ga., Type 304 stainless steel; housing band and 2 tightening bands with adjustment screw capable of producing 100 to 125 inch-pounds of torque.
b. Gasket: Neoprene (R) sleeve, formed to interlock with clamp band. c. Acceptable Manufacturers/Products:

(1) "Clamp-All Coupling" by Clamp-All Corp., Billerica, Maine; represented locally by Scallion Sales Co., Garden Grove, CA., TELEPHONE (714) 539-3309; as a standard of quality.

2. Type; Cast-Iron Coupling: For use below-ground or above-ground.

a. Coupling: Two mated cast-iron hosing clamps, ASTM A-48; #18-8 stainless steel nuts and bolts.
b. Gasket: Circular neoprene with diametrically opposed ears, formed to interlock with coupling, ASTM C-564.
c. Acceptable Manufacturers/Products:

(1) "MG" coupling by MG Coupling Co.; represented locally by Benisek-Delaney & Assoc., Los Angeles, CA., telephone (213)726-0591; as a standard of quality.

3. Other Manufacturers: See Article 1.03A. Substitutions.

2.05 MATERIALS; PIPING SYSTEMS ACCESSORIES

A. Air Chambers: J. R. Smith "Hydrotrol", Zurn Shoktrol, PPP Arrestor, or Josam 1485 shock absorbers; size according to Standard P.D.I.-WH201.

B. Backflow Preventer:

1. Type: Watts, Febco. Wilkins; types, sizes as required.
2. Approved by local Health

Department. C. Flashings:

1. Pipes Through Roof: Stoneman Stormite Series 1100; 4 pounds seamless lead, 8" skirt, steel reinforced boot, cast iron counter flashing sleeve, perma-seal waterproofing compound.
2. Vents Through Roof: Stoneman or approved equal; counterflashing sleeve with low vandal- proof hood; threaded at steel vents; caulk type at cast iron vents.

D. Pipe Hanger & Supports:

1. General: Solid rod hangers with isolator units; 3/8" dia. rods for pipes 2" and smaller ; 1/2" dia. rods for 2-1/2" to 31/2" pipes; 5/8" rods for 4" to 6" pipes.
2. Acceptable Mfr's./Products:

a. Michigan Hanger; as a standard of quality.
b. Other Mfr's.: Super Strut, Unistrut, Globe Pipe Hanger, Pipe Shields, Calif. Dynamics.

3. Types:

a. Horizontal Suspended copper Pipes:

(1) For Cold water: for 3" and smaller pipes, Michigan #1031; for 3-1/2" and larger pipes Michigan #4031.

(2) Horizontal Suspended Steel & Cast Iron Pipes: For 8" and smaller pipes, Michigan #1000.

(3) Vertical Supports: Rigid type Clamps, Michigan #510 or #511; or U-bolt type, Michigan #150. Pipes subject to expansion, Michigan #S-402.

E. Pressure Gauges: Marsh, 3-1/2" dia. With white backgrounds, black lines and figures, 0 to 200 lbs. range, 280 degrees dial arc, 1% accuracy; recalibrator.

F. Sleeves:

1. Below Finished Grade: Transite pipe or Sperzel "crate-sleeves".
2. Above Grade: #26 ga. galvanized steel.

G. Sleeves and Firestopping Pipe Penetrator:

1. Provide ProSet System U. L. fire rated sleeve/ coupling penetration for each pipe penetration or fixture opening passing through floors, walls, partition or floor ceiling assemblies. All Penetrators shall comply with ASTM E-814 or U. L. 1479 fire test standards.
2. Sleeves Penetrators couplings shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit Cored hole Penetrator for cored holes.
3. Copper and Steel piping shall have ProSeal on both sides of the penetrator to reduce noise and waterproof.

   a. Copper and Steel insulated pipe - Use System "A".
   b. Cast Iron pipe - Use System "B".
   c. PVC waste & vent piping - Use System "C".

4. All above System to be installed in strict accordance with manufactures instructions.
5. Alternate Firestopping Systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

H. Thermometer: Trerice, Philadelphia, Weksler, or Weiss; flat-back type with black iron case, min. 6" scale, calibrated from 30 to 260 degrees F., straight or angle form as required to install scale vertical and facing location from which thermometer will normally be read.

I. Valve Tags:

1. Approved type, 2" diameter heavy brass disc.

2. Stamp discs with 1/4" min. height characters; a number, corresponding to location on

valve chart; and a service designation as follows:

Domestic Cold Water Lines "CW" J. Yard Boxes & Cover:

1. Box: Concrete, sized as required (minimum size 12" W x 18" L x 12" D outside dimensions) to provide 1-1/2" clearance all sides of equipment installed therein.
2. Frame & Cover : Brooks 36-HFL; cast iron, lockable with cover key, cover marked "Gas Shut-off", "Clean-Out" or "Water", as

required. K. Joint Materials:

1. General: Code approved types to suit piping systems.
2. Solvent-Cement For Plastic Piping: As recommended by pipe manufacturer.
3. Solder For Copper Tubing: 95-5; 95% tin, 5% antimony.
4. Joint Compound For Threaded Pipe: Oil Base.
5. Joint Tape For Threaded Pipe: Teflon.

2.06 MATERIALS; PROTECTIVE COATINGS FOR UNDERGROUND STEEL PIPE (Galvanized or Ungalvanized)

A. Pipe Coatings: Contractors' option of one of the following "Methods."

1. Factory Applied Process Coating Method: Plexco "X-Tru-

Coat." a. Modified rubber blend adhesive, 10 mils thick

minimum.

b. Polyethylene copolymer coating, 23-40 mils thick as recommended by manufacturer for size pipe used.

2. Tape-Wrap Method:

a. Tape: Pressure-sensitive polyethylene or polyvinyl-chloride (PVC), 20 mil thickness. b. Primer; As recommended by tape mfr.

B. Materials For Covering Field Assembled Joints: Contractors' option of one of the following "Method."

1. Tape - Wrap Methods: Butyl molding tape; 10 mil polyethylene pressure sensitive tape.
2. Heat-Shrinkable Sleeve Method: Raychem, TPS polyethylene.

2.07 MATERIALS; INSULATION FOR PIPE.

A. Water Lines; Above Ground:

1. Fire Hazard Classification rating: Flame Spread = 25 max.; Fuel Contributed = 50 max.; Smoke Developed = 50 max.
2. Concealed Line: Johns-Manville or equivalent by Owens-Corning: "Flame-Safe", "Snap- On", 3/4" fiber glass, "GVB" vapor barrier jacket.
3. Exposes Lines: Johns-Manville or equivalent by Owens-Corning: "Flame-Safe", "Snap-On",

3/4" fiber glass, "GVB" vapor barrier.

4. Saddles: 20 ga. galvanized steel; formed to contour of the insulation; 6" long for pipe under 2" diameter; 8" long pipe 2".

B. Water Lines; Under Ground: Protexulate or approved equal.

1. Manufacturer: Protexulate represented locally by Steve Welch Associates, Maywood, CA., phone (213) 581-7177.

2.08 FIXTURES & EQUIPMENT

A. General:

1. All fixtures shall be American Standard; Crane or Kohler as specified on Drawing Equipment Schedule. B.

Drain:

1. <u>Floor Drain:</u>

a. All drain to be J.R. Smith; Zurn or Josam as Specified on Drawings.

C. <u>Roof Drain Assembly & Overflow Assembly; Typical:</u>

1. All Drain to be J.R. Smith; Zurn or Josam as specified on Drawings.

D. <u>Drinking Fountain:</u>

1. All drinking fountains to be haws, Sunroc or equal as specified on drawings.

E. <u>Water Pressure Reducing Valve:</u>

1. Equipment:

a. Type: Pressure reducing valve shall control downstream pressure and maintain a constant set pressure regardless of varying upstream pressure. Valve shall be hydraulically operated, single seated, diaphragm actuated, globe pattern, cast iron valve body, fused epoxy coating, pilot control system, adjustment ranges for 50 psi to 150 psi. Provide by-pass as required.

b. Acceptable Mfr's/ Products: Cla-Val model 90g-01ABSKC, Watts model 115-2, or Wilkins 500 FYS, epoxy coated.

F. <u>Backflow Preventer:</u>

1. Equipment:

a. Backflow Preventer: Reduced Pressure, all bronze body with internal parts made

of corrosion resistant materials, rated at 150 psi working pressure; Wilkins #975 or equal by Neptune, Beeco.

2. Provide strainer at upstream side of valve.

2.9 MATERIALS; MISCELLANEOUS

A. Dielectric Couplings: Maloney insulated pipe couplings, for isolating dissimilar

metals. B. Location Markers; Engraved: Marmiore type #DM1-20.

C. Sealant, For Use At Fixtures: Sanitary white silicone; G. E. #1700, as a standard of

quality. D. Fixture Backing Plates: 1/4" T x 8" H x Length as required, steel.

E. Concrete: Conform to Spec. Section 03300.

F. P-Trap & Pipe Insulation For Handicapped - Accessible fixtures: 1/2" thick, snap-on, closed cell, foam tubing insulation; Rubatex Model #R-180-RS as a standard of quality. Close with Manufacturer's recommended adhesive or tape.

2.10 FABRICATION; COATED STEEL PIPE FOR UNDERGROUND INSTALLATION

A. Scope: Coat all steel pipe, both galvanized and ungalvanized, which is to be placed underground. See Article 2.06, Materials For Protective Coating For Underground Steel Pipe. Contractors' option of one of the following "Methods."

1. Factory Applied Process Coating Method: Plexco "X-Tru-

Coat." a. Cleaning: Clean piping per coating mfr' s

recommendations.

b. Coating Application: Factory apply coating to clean pipe per coating manufacturer's

recommendations. Coating to provide positive adherence to pipe to prevent under-film moisture migration.

c. Testing: Test coating integrity at 6,000 volts for

"Holidays." d. Repair: Inspect and repair any damage.

e. Certificates: Provide per Article 1.05D1

2. Tape-Wrap Method:

a. Cleaning Pipe: Solvent clean pipe thoroughly of rust, oil, grease, dirt, dust, and other substances which will inhibit primer and/or tape bounding.

b. Primer: Apply to cleaned pipe per tape mfr's recommendations, by brush or other approved method, at the rate of 300 ± sq. ft./gal. Primed surface to be smooth, even, and suitable for tape application.

c. Tape Widths:

Pipe Diameter	Tape Width
1/2"	1" or 2"
3/4" thru 3"	2" or 4"
3-1/2" thru 12"	6" or 8" d.

Tape Wrapping:

(1) Number Of Layers: Apply 2 layers of 20 mil tape, half-lapped, to provide 40 mil min. thickness of tape covering at every point.
(2) Apply by rotating pipe and moving tape roll along pipe as it unwinds. (3) Apply first and last turns perpendicular to pipe, without tension.
(4) Apply intermediate turns spirally lapping previous turns, with slight tension to cause tape to unwind from roll; and/or welding without damaging tape.
(5) Terminate tape wrap 6" from pipe end to permit threading and/or welding without damaging tape.

e. Testing: Test wrapping integrity for "Holidays" at 6,000 volts, inspect for damage.
f. Repair: At "Holidays" or damaged areas, completely cover with 2 layers of tape per Article 5; lap 1" min. onto adjacent undamaged coating. g. Certificates: Provide per Article 1.05d1.

PART 3 - EXECUTION

3.01 PREPARATION

A. Layout: Accurately layout work to properly position piping runs, rough-ins, equipment, fixtures, and all work.

B. Openings & Sleeves:

1. General: Verify exact locations to coordinate with structural building elements.
2. Sleeves: Provide for all pipes passing through building construction.

a. Sizes: To provide 1" clear all around between pipe and sleeve. b. Set and anchor sleeves in forms prior to concrete pours.

3. Cutting: Do not cut concrete, masonry, or structural members except where approved by Architect and/or Structural Engineer. Inspector to observe all cutting.

3.02 INSTALLATION; GENERAL

A. Workmanship: See Supplementary Conditions, Architect is sole judge to whether execution is in workmanlike manner.

B. General: Follow mfr's printed recommendations where applicable.

3.03 INSTALLATION; PIPING SYSTEMS,

GENERAL

A. General Arrangement:

1. Concealment: Wherever possible, conceal pipe in walls , partitions, furred spaces, under floors, above ceilings, or bury in ground . Do not install pipe in concrete floors or concrete or masonry walls unless specifically indicated.

2. Arrangement: Group similar runs together; arrange symmetrically; maintain spacings and clearances. Install vertical piping plumb; horizontal piping parallel to main building walls and structural members, and level or at uniform slope where pitch is required.
3. Offsets: Make with fittings; do not bend pipe.
4. Pipe Runs: Use full-length pipe sections, cut to fit; use coupling only where runs require more than one pipe length. Locate short lengths at ends of runs.
5. Vents: Collect vent lines together to minimize roof penetrations. Offset vents away from roof edges, air-intakes. exterior wall openings, Offset to avoid penetrations through tile roofs. Where visible, vent projection above roof to be the minimum Code permitted distance above the roof plane or overflow line, whichever is higher.

B. Trenching & Backfill:

1. General: Conform to Spec. Section 02200, Earthwork.
2. Trenching: Dig all trenches for this work; to proper depth and a straight gradient; to provide support for pipe.
3. Backfill:

a. Do not backfill under pipes.
b. Do not backfill until piping has been inspected, tested, and its location recorded. c. Do not disturb pipe placement or injure protective coatings.

d. Backfill by hand around pipe and to a 12" depth above pipe; use earth with no stones larger than 1".
e. VCP & Coated Pipe: Backfill by hand around pipe and to a 6" depth above pipe with sand.
f. Compaction: Place fill in 6" layers; compact each layer with suitable rammer. Reconsolidate to same density as adjacent earth prior to excavation; or, where backfill occurs in an area of controlled compaction, reconsolidate per Spec. Section 02200, EARTHWORK.

C. Horizontal Piping, Underground:

1. Burial; Minimum Coverage Over Top Of Piping:

a. Plastic Lines: 24" minimum.
b. All Metal Lines: 18" minimum.

2. Laying: Lay pipe on firm bed for entire length of trench. Adjust grade and line by scraping earth away or filling locally under pipe body with sand.
3. Bracing: Firmly brace piping against displacement during backfilling, or encasement.

D. Horizontal Piping, Suspended:

1. General: Support at sufficiently close intervals to maintain alignment and prevent sagging.

a. Install hangers and supports 18" maximum from each joint, regardless of pipe length.
b. Install hangers at ends of all runs or branches, and each change of slope or direction.

2. Maximum Spacing Of Hangers Center-To-Center:

a. Cast Iron Pipe: 5' for five-foot pipe section; 10' for ten-foot pipe sections. b. Steel Pipe: 10'.
c. Copper Pipe: 1-1/4" and smaller, 6' intervals; 1-1/2" and larger, 10’ intervals.

E. Vertical Piping:

1. General: Secure at sufficiently close intervals to keep pipe in alignment, and support weight of pipe and contents.
2. Maximum Spacing Of Support Center-To-Center:

   a. At each floor line, or 15' intervals. b. At 8' from end of riser.

3. Construction Bracing: Where no structural building elements is available for support during construction, secure in position with temporary bracing.

F. Piping Movement Provisions:

1. Required Locations:

   a. Piping subject to stresses from expansion and contraction.

   b. Piping crossing building seismic expansion joints.

2. Devices:

   a. General: Must Provide for maximum movement potential of piping.
   b. Types: Expansion bands; swing joints made of fittings; other approved devices.

3. Anchors: Suitable type each side of device.
4. Plastic Piping: Follow pipe manufacturer's printed

recommendations. G. Piping Passing Through Sleeves:

1. Exterior Walls: Caulk watertight between pipe and sleeve with PRC Rubber Caulk.
2. Water Lines: Isolate pipes from sleeves with hair-felt pads.

H. Piping Encased In Concrete: Wrap with 3 layers minimum of 15# asphalt-saturated roofing felt.

I. Flashing: Install flashing device, watertight on each pipe, vent, or penetration through roof

plane. J. Cleaning: keep interior of piping and fittings free from dirt and debris.

3.04 INSTALLATION; PIPE JOINTS

A. Cast Iron Pipe:

1. No-Hub; Stainless Steel Coupling:

   a. Place neoprene gasket on end of pipe or fitting. Place stainless steel housing with clamps on end of other pipe.
   b. Butt ends of pipe together within gasket until both are firmly seated against inner ring.
   c. Slide housing into position directly over gasket. Using torque wrench, alternately tighten clamps to about 100 to 115 psi of pressure.

2. No-Hub; "MG" Cast Iron Coupling:

a. Place neoprene gasket on end of one pipe, and clamp assembly on end of the other pipe.
b. Fit both hubless pipe ends into neoprene gasket, firmly butting them against the internal center rib or shoulder between them. Make certain that the pipe and/or fittings to be joined are in proper alignment, and that necessary support is available to maintain that alignment during installation.
c. Pull loose clamp assembly over gasket so that gasket is completely covered, keeping the bolting flanges evenly separated at both ends.
d. Tighten nuts alternately and gradually to 175 inch pounds torque. Use an accurate torque wrench.

B. Brass Or Steel Screwed Pipe:

1. Cut threads full and clean with sharp dies.

slightly bell-mouthed.
3. Apply joint compound or tape to male threads only.
4. Tighten joints. For brass pipe, use non-marring friction clamps and

wrenches. C. Plastic Pipe:

1. Cutting: Cut with knife or saw, square with pipe end, in miter box. Deburr and smooth edges with tapered burring tool, knife, file, or sand paper.
2. Socket Weld Joints:

a. Clean joining surfaces of dirt, moisture and foreign matter.
b. Apply cement first to fitting then to pipe, in rapid continuous operation.
c. Join parts immediately. Push pipe into contact with fitting shoulder using a slight twisting motion of 1/8 to 1/4 turn, to distribute solvent and remove air bubbles. Hold joint, approximately 15 seconds, to overcome its tendency to push apart.
d. Wipe off excess cement with clean rag, to prevent weakening of pipe and joint.

3. Integral Compression Ring Joints:

a. Clean and lubricate gaskets.
b. Drive spigot into bell with pulling tool or suitable

device. D. Plastic Pipe To Metal Pipe:

1. Plastic To Cast Iron & Unthreaded Metal Pipe: No-Hub coupling.
2. Plastic To Threaded Metal Pipe: Plastic adaptor, socket-weld x male thread.
3. Where change from underground plastic piping to concealed above-ground metal piping is mandatory, extend plastic piping 6" above grade or floor slab, then make transition; where above-ground metal piping is exposed, extend it below grade or floor slab before making transition to plastic piping.

E. Copper Tubing:

1. Cut tubing, and ream to remove burrs.
2. Clean and polish tubing and fitting contact surface to a bright copper color.
3. Apply soldering paste, insert tubing to full depth of socket.
4. Heat joint; obtain full fusion, continuous solder bead full joint circumference. Do not overheat and/or burn joints.

F. Coated Piping:

1. Make joint connections specified for type and use of piping system.
2. Clean all fittings and uncoated portions of pipe just prior to application of joint protection. Clean piping, by sandblasting or other approved means, of burrs, projections, rust, oil, moisture, or other foreign material; conform to Section 3.2, "Standard for Coal-Tar Enamel Protective Coatings", AWWA C203.
3. Prime as required.
4. Joint Protection: Use one of the following "Methods." Cover all uncoated pipe and fittings. minimum thickness; lapping coating 1" minimum. Then double-wrap with overlapping layers of polyethylene tape, lapping 3" minimum beyond butyl tape.
   b. Heat-Shrink Sleeve Method: Install per manufacturer's printed recommendations.
      Place sleeve over joint area, lapping over pipe coating. Heat to shrink sleeve and encapsulate joint completely.

3.05 INSTALLATION; SEWER, SOIL & WASTE PIPING SYSTEMS

A. Slope: Uniformly slope horizontal runs toward point of disposal.

1. Typical Slope: 1/4" per foot of run, wherever possible.
2. Minimum Permissible Slope: 1/8" per foot of run; <u>except</u> where specifically indicated otherwise.

B. General: Conform to Articles 3.03

and 3.04. C. Underground Lines:

1. General: Cast iron lines under buildings to extend 5 feet minimum beyond exterior building walls, or further where indicated. Use VCP for continuation from that point on.
2. Laying: Lay true to line and gradient; uniformly support pipe along barrel only; excavate locally so hub is not bearing. Lay pipe upgrade from structure to structure, hubs upgrade.
3. Plugs: Install secure tight-fitting plugs at stubs for future extensions, and whenever workstop for any reason.

D. Cleanouts:

1. Required Locations:

   a. 100' maximum intervals; each termination, direction change, upper termination; per Code; and where indicated.
   b. Each sink; each battery of two or more fixtures; each soil riser, just outside building.

2. After testing and approval of lines, remove all plugs, coat with emulsified lead paste, and replaced gas and water tight.

E. Vents: Rise vertical to a point 6" minimum above top of fixture served; offset, if necessary, may begin at this point; slope vent upward continuously from fixture, 1/4" minimum per foot.

3.06 INSTALLATION; ROOF DRAINAGE SYSTEM

A. General: Conform to Article 3.03 and 3.04.

B. Slope For Horizontal Runs: Per Article 3.05A. C.

Underground Lines:

1. General: Roof drain downspouts to extend 5 feet minimum beyond exterior building walls, or further where indicated.

2. Laying: Per Article 3.03C, paragraphs 2 and 3.
3. Cleanouts: Per article 3.05D, paragraph 1a

and 3. D. Roof Drains; & Overflow Pipes:

1. General: Install watertight in connection with roofing. Use bottom outlet drain typically.
2. Roof Drain Connection To Downspout: Install specified expansion joint immediately below roof drain; <u>except</u> here downspout has a 3' minimum horizontal offset below drain or drain is side outlet.

E. Downspout Connections To Sheet Metal Gutters: Install as detailed.

3.07 INSTALLATION; WATER PIPING SYSTEMS

A. General:

1. System to be <u>all copper piping</u>.
2. Conform at Articles 3.03 and 3.04
3. Install to prevent air pocketing.
4. Install flushing outlets on each main and branch line.
5. Install plugged tees so future connections can be easily

made. B. Air Chambers:

1. Types: One of the following types.

   a. Factory Fabricated: As specified.
   b. Job Fabricated: Capped pipe; one pipe size larger than water service line; 18" long when serving a single fixture; 36" long when on header serving a bank of fixtures.

2. Locations:

   a. One at each single fixture.
   b. One on each header serving a bank of fixtures.
   c. Install 18" higher than fixture faucets, so chamber drains when water is shut-off.

C. Contamination Prevention: Install all systems to prevent any condition which will allow pollution of domestic or potable water.

1. Make no cross-connections.
2. Back-Flow Prevention Devices: Install at locations indicated, and all other locations necessary to prevent back-flow or back-siphonage.

D. Insulation:

1. Cold Water Lines, Above-Ground:

   a. Required Locations: All lines in exterior walls; all lines located in spaces,

between ceiling and roof planes, such as attics, furred spaces, roof joist spaces ,and similar locations.

(1) Install per manufacturer's printed recommendations.
(2) Pipe: Snap insulation around pipe. Fasten securely. Install saddles at all hangers and supports.
(3) Fittings; Except Union & Valves: Install plastic insulating cement, hand-moulded and finished; thickness equal to adjoining pipe insulation.

E. Sound Isolation:

1. General: Install isolation pads at all locations necessary to prevent transmission of water flow sound or vibration to building structure.
2. Water Lines: Isolate uninsulated lines from hangers and clamps with hair felt pads cemented in G.I. sleeve, and from structural members with 1/2" thick pads.

F. Thrust Blocks: Install per recommendations of manufacturer of piping material; concrete or other method or device.

G. Valves & Stops:

1. General: Install where specifically indicated, and at the following locations. Install where easily accessible.
2. "Fixture Group": Define as four or more fixtures in the same Room.
3. Partition Stop; Loose Key: Install at each of the following.

   a. Concealed fixture supply; locate 1 ft. above floor, below fixture.
   b. Sill cock, unless controlled by the same stop as drinking fountain.
   c. Hose bibb, unless on valve controlled branch line serving hose bibbs only.

4. Angle Stop; Loose key: Install at each of the

   following. a. Exposed fixture supply.
   b. Flush valve.

H. Water Sterilization Riser Or Service Cock: 3/4" to 1-1/4" size; locate at water service entrance.

3.08 INSTALLATION; PLUMBING SYSTEM ACCESSORIES, MISCELLANEOUS FITTINGS & MATERIALS

A. Unions:

1. Install to facilitate installation and removal of equipment; install at all gas-burning equipment; install where indicated; in accessible locations only.
2. Do <u>not</u> install in concealed locations, underground water lines; or gas lines; or gas lines, except at equipment.
3. Unions installed to facilitate erection, shall have right and left

couplings. B. Concealed Valves & Cocks:

1. Concealed In building: Install behind access doors as specified for cleanouts.
2. Outside, Below Grade: Install in yard boxes.

C. Yard Boxes:

1. General: Set boxes flush with grade.
2. Concrete or Asphaltic Concrete Paving Areas: Pour 4" thick concrete pad under and around all boxes.
3. Box Extensions: Install where necessary. Extensions at valve to be 8" diameter ACP, ASB, or PVC pipe.

D. Dielectric Couplings: Install at the following locations.

1. Where specifically indicated.
2. To isolate metal piping from dissimilar metal piping or equipment.
3. All metal utility service lines, at

property line. E. Concrete: Conform to

Spec. Section 03300.

F. Identification Markers And/Or Signs:

1. Location Makers: Install flush with finish grade or surface to mark the

following. a. All stub-outs for future extensions of system.
b. Plugged tees.

2. Flow Direction: Plainly and permanently mark on all water piping systems with supply & return loops.
3. Valve tags:

a. Required Locations:

(1) Water Lines; Cold: Each valve on main or branch line; all "Group" shut-off

valves. b. Attachment:

(1) Typical: 1/8" diameter cont. steel ring, around valve
stem. (2) At Yard Boxes: Two brass bolts, to box cover.

4. Signs: Install securely; easily visible

location. G. P-Trap & Pipe Insulation For

HDCP Fixtures:

1. Required Locations:

a. All sinks and lavatories which have hot
water. b. Where specifically indicated.

2. Installation: Completely cover all hot water piping plumbing traps and drain lines from fixture to wall. Snap-on insulation and securely fix in place with adhesive or tape wrapping.

3.9 INSTALLATION; FIXTURES & EQUIPMENT

A. General:

1. Rough-in: Install for all work, unless specifically noted otherwise.
2. Final Connections: Make for all work unless specifically noted otherwise. Where lines are indicated to be capped or plugged at floor level, make installation flush with finish surface.
3. Set all rough-ins accurately to meet actual equipment and Contract Document
4. requirements. Offsetting of traps and supplies to correct for improper rough-ins is not permitted.
5. Install all required vacuum breakers.

B. Fixtures:

1. Rough-in: Set water supplies to lavatories and double-pantry type faucets at 8" o. c., unless otherwise indicated.

   a. General: Install all Backing for plumbing work. b. Steel Plate At Fixtures:

      (1) Let-in flush with studs; except plates may be surface-mounted where ceramic tile installation is 1-1/4" or more in thickness.
      (2) Anchor securely, and countersink holes where plates are let-in flush; screw to wood studs; bolt to metal studs typically; welding permitted to #16 gauge or heavier metal studs.
      (3) Drill and tap in-field at proper locations to attach fixture hanger 5/16" diameter minimum machine screws.

2. Fixture installation:

   a. General: Install complete with all required appurtenances; set plumb, level, and square;
      make all final connections.
   b. Securely anchor; anchor aprons also on fixtures so equipped. c. Install chrome-plate cover at all unused fitting openings.

3. Pointing: Point Fixture intersections at walls and floor with sealant.

3.10 INSTALLATION; UTILITY SERVICE CONNECTIONS

A. General: Make applications to Utility Companies for service and coordinated

installations.

B. Water Service: Connect at angle meter stop.

C. Sewer Service: Connect to main site line.

3.11 INSTALLATION; WATER SUPPLY

A. General: Conform to article 3.03 and 3.04. Install complete with water lines, valves, boxes and all other required accessories.

B. Contamination Prevention: Install to prevent any condition which will allow pollution of

domestic or potable water.

C. Thrust Blocks: Install per recommendation of mfr. of piping material; concrete or other method or device.

D. Tracer Wire On Underground Plastic Lines: Install on all lines. Tape securely to piping at 20" max. on center. termite ends in yard box with an extra 18" min. loop of wire; termite in same yard box with shut-off valve.

3.12 FIELD QUALITY CONTROL

A. Field Tests; General: Test all work as required by Mechanical Engineer, in his presence, to demonstrate compliance with Contract Document requirements. Furnish all labor and devices to accomplish such testing.

B. Pressure Tests: Every system must be completely pressure tested for leaks, and all leaks repaired.

1. General:

a. Disconnect all fixtures and devices which may be damaged by the test pressure and plug or cap the lines for testings.
b. Test each piping system; maintain required pressure for stated minimum time; and until system has been examined by Engineer. Install test gauges.
c. Prove each system absolutely tight at test pressure. inspect for leaks. d. Repair any leaks found by observation or during testing.
e. Retest as required.

2. Hydrostatic Tests; General: Fill systems with water; eliminate all air accumulations, so test gauge readings will be accurate.

3. Systems Tests:

a. Complete Water Systems: Hydrostatic test at 200 psi., for 4 hours.
b. Complete Sanitary Soil, Waste, & Vent Systems: Hydrostatic test with 10-foot head at highest point in system, for 8 hours.
c. Complete Roof Drainage Systems: Test systems with drain bodies in-place and prior to concealing any piping. Fill each system completely with water, from roof drains to lower ends of downspouts 5 ft. min. outside buildings. Test for 8 hours.
d. Complete Roof Drainage System At Gymnasiums: Perform test in presence of District Designated Testing Lab representative, prior to concealing any piping. Hydrostatic test, with 10-foot Head, each system between a point above roof drain outlet joints and lower end of downspouts 5ft. min. outside buildings. Test for 8 hours.

C. Coated Piping Inspection:

1. Inspection for damage to pipe coating and adequacy of joint protection by District's Inspector.
2. Repair by Contract, as directed.

D. Water Purity; Lab Analysis:

1. Samples: After system sterilization, Lab to obtain representative water samples from

all water system (cold,hot).

2. Analysis: Shall show that:

   a. Coliform-aerogens organisms are negative.
   b. Bacteria total plate count is lass than 100/c.c. c. Water is safe to use.

3. Certificate: By Lab shall show:

   a. Job name and location.
   b. Location and date samples obtained. c. All test results.
   d. Certify water conforms to Article 2 requirements.
   e. certify analysis was performed by qualified personnel.

4. Retesting: If Analysis does not conform to Article 2, repeat procedure after water systems sterilization has been repeated.

3.13 ADJUSTMENT & CLEANING

A. Cleaning:

1. General: Keep work and premises clean as work progresses. Periodically remove accumulations of waste materials, excess construction materials and equipment. Do final cleaning of all work.

2. Piping System:

   a. Keep clear of dirt, foreign materials, blockage as work progresses. b. Water System: Flush with water until clear stream is established.
   c. Sewer, Waste, & Vent System; Roof Drainage Systems: Flush with water until clear stream is established.

3. Fixtures & Equipment: Clean and polish.
4. Finished Brass; Plate or Finish Metal Items: Clean and polish.
5. Work To Be Painted: Clean, ready to receive paint. B.

Adjustment:

1. General: Adjust items; set regulators and flow control devices at proper setting; lubricate moving parts; tighten screws.
2. Noise & Vibrations: Adjust and readjust to eliminate objectionable noise and vibration to Architect's satisfaction.
3. Clamp Rings: Tighten at roof drains, Hudee rings, and other items.
4. Test: Test and inspect all systems for leaks; repair all leaks.

C. Water System Sterilization:

1. Scope: All water system (hot, cold, etc.) after installation is complete (including piping, fixtures, equipment, etc.) and flushed clean.
2. Sterilization Agent: One of the following.

   a. Chlorine: Gas, liquid, or power.

b. Calcium Or Sodium Hypochlorite: Approved for Federal and AWWA procedures; power or liquid form.

3. Sterilization Procedure:

a. Inject agent at sterilization riser or cocks; feed slowly, evenly, and continuously with proportioning pump or device.
b. Open all outlets fully a minimum of two times during injection. Check residual agent concentration with orthotolidine solution.
c. When concentration is 50 parts/million at all outlets, close all outlets and retain residual concentration for 24 hours minimum.
d. After retention period, check test residual concentration; it must be parts/million minimum at most outlets.
e. If test is satisfactory, flush system until residual concentration is no greater than incoming water supply, checked with orthotolidine solution.
f. <u>If test is not satisfactory</u>, repeat entire sterilization process.

4. Water Purity; Lab Analysis: To be made after sterilization procedure per "Field Quality Control."

a. If water quality is not satisfactory, repeat sterilization procedure until satisfactory result are obtained.

D. Readjustment: After adjustment, running, checking operation, and testing procedures, re-work and readjust as necessary until Contract Document requirements are met.

END OF SECTION

SECTION 15800
HEATING, VENTILATING AND AIR CONDITIONING

1.00 GENERAL

1.01 WORK INCLUDED

A. Applicable provisions of General Conditions and Division One are part of the work of this Section.

B. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations of the work of this section, complete, as shown on the drawings or specified herein. Work includes, but it not necessarily limited to the following.

1. Examine drawings and all other sections for work related to those other sections and required to be included as work under this section.

2. Fans, motors, drives, and bases.

4. Sheet metal work and accessories.

5. Grilles, diffusers, registers, air control boxes.

6. Controls.

7. Noise and vibration control.

8. Access panels in walls and ceilings required for work under this section.

1.02 RELATED WORK

A. All openings for ducts, grilles, pipes, etc.

B. Curbs and platforms for equipment, where required, unless noted otherwise on the drawings.

C. Unless otherwise specified or noted, the work of the Electrical Section of the specifications will include the furnishing and installing of all disconnects, starters, switches, relays, conduits, etc., and installing all line and low voltage wiring and making all connections. The work of this section 15805 of the specifications includes furnishing all other electrical controls necessary for proper functioning of system, such as solenoids, thermostats, etc., for the electrical installer to connect.

D. Painting (unless specified otherwise in this section.)

1.03 SUBMITTALS

A. Shop Drawings: Furnish detail shop drawings or catalog plates of all special equipment as required for approval. Shop drawings or catalog plates shall show sizes, sections and dimensions of equipment, methods of connection or attaching to work of other trades and copies of all shall be furnished to other trades. Make all

erection drawings necessary for the erection of the work.

B. Material List:

1. Before entering into any Contract for purchase of materials, and before any work is started, Contractor shall submit for approval, 6 identical copies of a complete list, including catalogs and descriptive matter, of the following materials and equipment he proposes to furnish and install. Materials list shall be complete and contained in the hardbound loose-leaf notebooks. Items not contained in the submittal shall conform to design specifications as supplemental submittals will not be accepted.

2. The Materials List shall include, but shall be limited to the following:
   a. Fans, motors, drives, and bases.
   b. Filters.
   c. Grilles, registers, diffusers, air control boxes. d. Controls.
   e. Vibration isolation equipment.

3. The submittal on controls for approval shall include the following minimum items:
   a. Wiring diagram and location of all components, prepared by control manufacturer.
   b. Catalog data of all components.
   c. Complete written description of the sequence of operation, prepared by control manufacturer.

C. Wiring Diagrams: Wiring diagrams of work required for the installation of the ventilating and air conditioning equipment shall be submitted for review. Only reviewed diagrams shall be used for installation purposes.

D. Tests and Balancing:

1. Name of test and balance agency shall be submitted for review by Architect within 15 days after receipt of Construction Contract.

2. Submit to Architect 1 week prior to final inspection, 3 bound and indexed copies of the report on system operation, including air quantities at each outlet and fan, fan speeds, pulley and motor sizes, motor loads and all other pertinent data.

1.04 GUARANTEES:

A. Contractor shall guarantee the entire Heating, Ventilating and Air Conditioning System for a period of 1 year from the date of the start of beneficial use. If during this period any materials of apparatus prove defective, or any part of the system

fails to function properly this Contractor shall make good the defects without expense to Owner.

B. Furnish Owner all manufacturers' written guarantees of material and equipment as a condition of final payment.

C. Manufacturers furnishing outlets are required to inspect plans and check all outlet sizes for air quantities and throw required Manufacturers shall guarantee that outlets furnished will provide required air throw and spread with no apparent drafts or excessive air movement within the ventilated area. Manufacturer shall provide registers with bars set at angles required for producing required throw and spread. Registers or diffusers furnished and installed that cause excessive air movement or drafts shall be replaced when so directed at no additional cost.

1.05 DUTIES OF THE SYSTEM

A. It is intended that the system will provide ventilating with automatic control for the areas indicated on drawings. Equipment shall be installed to produce and automatically maintain design conditions without drafts or objectionable noises.

B. Before acceptance, quietness of operation satisfactory to Engineers shall be obtained for all apparatus and equipment.

C. Provide all indicated or required spring type vibration isolation equipment to ensure that no objectionable vibration is transmitted to the structure. Springs shall be selected to provide 50% additional travel from fully loaded to fully compressed.

1.06 DRAWINGS

A. General Drawings: Structural, Architectural, Electrical and other Mechanical Drawings form a part of this work.

B. Contractor shall examine all Architectural, Structural, Electrical and mechanical drawings to fully inform himself as to the scope and detail of work required of him.

C. Before submitting his bid, each bidder shall carefully examine all drawings and specifications visit site and fully inform himself about all conditions and limitations under which he will be obliged to perform his work. After award of Contract, no subsequent allowances will be made to Contractor due to his failure to comply with the above requirements, or due to any misunderstanding or misconception of quantities or character or work, locations, accessibility, availability, or any other condition affecting the installation and completion of all work. Submittal of a written bid shall constitute acceptance of all terms of this Specifications.

D. Furnish motors and electrical equipment suitable for use with electrical service as installed.

1.07 ORDINANCES AND REGULATIONS

A. Materials, apparatus and equipment for all work shall be designed and installed in accordance with all requirements of all public authorities, including all City or County ordinances, all Safety Orders of the State Industrial Accident Commission, Rules and Regulation of the National Fire Protection Association, and the Energy Conservation Act (Title 24).

B. Secure all permits and inspections and bear full cost of same, including Plan Check if required. Prepare all drawings required to comply with the above requirements.

C. It shall be the responsibility of the mechanical contractor to obtain from the HVAC equipment suppliers, the full and partial capacity and standby input(s) and output(s) of all equipment and components of applied systems, based on equipment in new condition, to enable determination of their compliance with the State Energy Conservation Standards. This includes performance data under the analysis outlined in these standards.

Performance data furnished by the equipment supplier or certification under a nationally recognized certification program, when available, satisfied this requirement when all energy input(s), output(s), and operating modes are included.

1.08 PRELIMINARY OPERATION

A. Should Owner demand that any portion of plant, apparatus or equipment be operated prior to final completion and acceptance of work, the Contractor shall consent and such operation shall be under the supervision and direction of the Contractor, but all expense thereof shall be paid by the Owner, separate and distinct from any money paid on account of the Contract.

B. Any preliminary operation or payment thereof is not to be construed as an acceptance of work in this contract.

1.09 INTENT OF DRAWINGS:

A. Drawings accompanying this Specification indicate in diagrammatic form, the arrangements desired for principal apparatus, piping, ducts, etc., and shall be followed as closely as possible. Use proper judgment in carrying on the work to secure the best possible headroom and space conditions throughout, to secure a neat arrangement of piping, ductwork and equipment, to overcome local difficulties and interferences of structural conditions whenever encountered.

B. Any work installed to the contrary, in opinion of Engineers, shall be relocated and reinstalled at the expense of the Contractor and at no additional cost to the Owner.

1.10 COOPERATION WITH OTHERS

A. The Contractor shall order his work in such a manner that progress will harmonize with all trades and so that all work may proceed as expeditiously as possible.

B. Contractor shall coordinate his bid with the Plumbing and Electrical Sections of the specification to make sure each and every item has been covered. No extras will be allowed for any controversies arising between trades.

C. As far as possible, the work under this Contract has been indicated on the drawings in such positions as to suit and accommodate the work of the other trades, but the work as indicated is largely diagrammatic and the correct finished positions of all equipment and materials cannot be indicated. Therefore, the Contractor is hereby made directly responsible for the correct placing of his work and the proper location and connection of his work in relation to the work of the various trades.

D. After the award of the Contract, complete drawings and specifications of all trades will be available for inspection at the job office. Contractor shall make a careful

examination of all such drawings and specifications and shall organize and layout all his work so that work will not cause conflict with, obstruction of, or conflict between, the work of the various trades.

1.11 ALTERNATES

A. Base bid must be submitted in exact accordance with the plans and Specifications.

B. Contractors desiring to use alternate equipment shall submit, in writing, the request for substitution together with all pertinent details and capacities of the alternate equipment and any addition to, or deduction from, base bid price all in manner specified in Product Options and Substitutions.

C. Contract specifications and published design, drawings or specifications of specified product or manufacturer establish complete standard of comparison for substitution of a similar product of an otherwise acceptable manufacturer.

D. Decision of the Engineers shall be final and no substitution shall be allowed without written consent of the Engineers.

E. In all cases where substitutions are proposed, the Contractor shall bear the cost of evaluation on the basis of 2-1/2 items technical salaries of personnel involved.

F. Where the terms equal to, equivalent, acceptable, etc. appear the determination of equivalency requires a judgment by Architect/Engineer or Owner and is not a Contractor's option. Refer to the Supplementary Conditions; Product Options and Substitutions.

1.12 ALTERNATE EQUIPMENT:

A. Equipment layout, piping, connections, etc., are based on units as scheduled on the Plans. It is the responsibility of this Contractor to make necessary modifications to provide an operating installation which is in complete conformance with all specifications and recommendations of the manufacturer without any additional cost to the Owner.

1.13 SUPERVISION:

A. Contractor shall furnish the service of an experienced Superintendent who shall constantly be in charge of Heating, Ventilating, and Air Conditioning Systems, together with all necessary mechanics and laborers required to properly unload, transfer, erect, connect-up, adjust, start, operate and test systems. He will give full instructions to the proper representative of the Owner, as to design, operation and other work installed under his supervision.

1.14 QUALIFICATIONS OF INSTALLERS:

A. For the actual fabrication, installation and testing of work under this section, use only thoroughly trained and experienced workmen completely familiar with the items required and with the manufacturer's recommendations as to their use. In the acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of workmen.

1.15 PATENT RIGHTS:

A. If any material installed by Contractor or any work done by him, infringes in any way whatsoever with patents held or applied for by any persons, firm or corporation, Contractor shall indemnify the costs and attorney's fees which the Engineers or Owner may sustain by reason of any such infringements.

1.16 MATERIALS APPROVAL

A. Brands of materials mentioned herein are used as a standard of quality and requests for substitutions will be considered when submitted.

B. Approval of submitted items shall not relieve the Contractor of the responsibility for any deviation from the drawings or specifications, unless he has in writing specifically called attention to such deviations at the time of submissions; nor shall it relieve him of responsibility for errors of an sort in such submittals, or for changes required to the work of other trades.

1.17 MANUFACTURER'S DIRECTIONS

A. If the manufacturers of articles used in this Contract furnish directions covering points not shown on the drawings or herein specified, such directions shall be followed.

B. No equipment shall be used in any manner or for any purpose not recommended by the manufacturer.

1.18 RECORD DRAWINGS:

A. Perform as specified in Section 01700. During progress of the work, maintain an accurate record of the installation of the system, locating each item of ductwork and equipment precisely by dimension. Upon completion of the installation, transfer all record data to transparencies of the original Design Drawings. All work shall be done by competent draftsmen.

1.19 CONFLICTS IN SHOP DRAWINGS OR SUBMITTALS:

A. Contractor agrees that shop drawing submittals processed by the Engineers do not become Contract Documents and are not Change Orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing his work and to permit the Engineer to monitor the Contractor's progress and understanding of the design. The process of review of the Contractor's submittals is not the purpose of testing the Engineer's perception. If deviations, discrepancies or conflicts between shop drawing submittals and the Contract Documents are discovered either prior to or after the shop drawing submittals are processed by the Engineer, the Contractor agrees that the Contract Documents shall control and shall be followed.

1.20 MANUAL:

A. At completion of the installation, and as a condition of its acceptance, compile a

manual in 3 copies. The Manual shall contain:

B. Identification readable from the outside of the cover, stating "Heating, Ventilating and Air Conditioning Installation, (JOB NAME), by (NAME OF) COMPANY."

C. Neatly typewritten index near the front of the Manual, furnishing immediate information as to location in the Manual of all emergency data regarding the installation.

D. Complete instructions regarding the operation and maintenance of all equipment involved.

E. Complete nomenclature of all replaceable parts, their part numbers, and name and address of the nearest vendor of replacement parts.

F. All manufacturers literature shall be clearly marked to indicate which piece of equipment (model, style, etc.) has been installed and all references to other equipment, etc., shall be crossed out as being inapplicable.

G. Copy of all guarantees and warranties issued on the installation, showing all dates of expiration.

H. Copy of the record drawings.

I. Each copy shall consist of a hard bound, three-ring notebook with all contents securely attached.

2.00 PRODUCTS

2.01 EXHAUST FANS

A. Manufacturer, model, and capacities shall be as scheduled on the plans.

B. Blowers shall be of the centrifugal type unless noted otherwise on the drawings. Units (except ceiling type exhausters) shall have ratings certified by AMCA and shall bear AMCA seal.

C. Provide units complete with motors, drives, guards, supports, vibration isolators, bases and other accessories required or recommended by the manufacturer for the use intended of the fans. Exhaust fans shall have back-draft dampers.

D. Exhaust units mounted on roof shall be Greenheck or equal by Penn, Cook, Breidert or Exitaire.

2.02 FAN BELT DRIVES

A. Belt-driven fans shall be equipped with adjustable pitch pulleys on fans and motors for V-belt drive. Drives shall be rated for 150% of motor nameplate horsepower. Drive capacities for 1 HP or larger shall have minimum of two (2) belts.

B. Drives shall be Allis-Chalmers "Tex-Rope", or equal by Gates or Browning.

2.03 FAN MOTORS

A. Motors for all fans shall be low starting current type, normal torque,40 degrees C, of the speed, horsepower, frequency and voltage as shown. Motors shall be arranged for across-the-line starting except that starting current shall meet with approval of local Power Company. If necessary, provide for increment or partial wind starting.

B. Motors for belt-driven fans shall be complete with slide rails and bases and provided with ball-bearings of approved type.

C. Motors shall be provided with fittings for pressure gun oiling.

D. Motors to shall be U.S., Westinghouse, General Electric, or equal, with copper windings.

2.04 GRILLES, REGISTERS AND DIFFUSERS

A. General: Furnish and install all outlets shown on plans and air distribution accessories required to effect a uniform distribution of air over the face of each outlet, and including removable key operated volume controllers, operable from face of each outlet or inlet. Out-lets shall be Titus, or equal by Metal-Aire, Anemostat, Kreuger, ADP.

B. Ceiling Diffusers: Titus Type TDC.

C. Sidewall Supply Registers: Titus #272-FL5, double deflection type.

D. Transfer Air Grille: Same as specified for return air registers. Omit dampers. E.

Exhaust air registers: Same as specified for return air registers.

H. Outlet Finish: All outlets shall be furnished with factory baked enamel finish.

3.00 EXECUTION

3.01 OPENING THROUGH WALLS, ROOF AND FLOORS

A. Openings will be provided by others. Contractor shall in advance of work, furnish drawings showing correct dimensions and locations of required openings and shall supply these drawings to all concerned trades.

B. All openings for pipes, ducts, etc., shall be sealed tight to prevent passage of air, smoke, fire, etc.

3.02 PATCHING AND REPAIRING:

A. Do all cutting, drilling, chipping and digging as necessary for proper installation of work. Reimburse all other contractors for any damage done to their work by any unnecessary cutting, drilling, chipping and digging or for work done in any manner not required by Engineers. Owner's representative reserves the right to deduct cost of this damage form the amount due Contractor, if above arrangements are not satisfactorily made.

3.03 FLASHING:

A. All ducts passing through walls and roof shall be flashed and counter flashed in a manner as detailed or as directed by Engineers. All joints and seams shall be soldered.

B. All pipes passing through walls and roof shall be flashed with SEMCO #1100-4 seamless four pound flashing with steel reinforced varipitch boot and cast iron counterflashing sleeve.

3.04 DAMPERS AND ACCESS PANELS:

A. Fire Dampers: Install in all ducts where they pass through fire walls, or one fire area to another, and in all other locations required by ordinance. Dampers shall be operated by fusible link and rod or wire linkage to the damper. Dampers shall be constructed to comply with all governing ordinances and UL regulations.

B. Manual Dampers: Install in all branches of ductwork and where required for distribution control. Dampers shall be as specified elsewhere in this section. A permanent black arrow shall be painted on duct to indicate proper position of the damper. Manual dampers shall be so linked that only one locking device is required.

C. Backdraft (Pressure Relief) Dampers: Shall be field adjustable, American Warming and Ventilating, Inc., Model BD-51 or equal with seals on blades and jambs and ball bearings.

E. Access Panels: Shall be installed in ducts for access to all dampers, heaters, controls, etc., and at all locations where indicated on drawings. Panels shall be felted, airtight, hinged and provided with clamp latches. It is the responsibility of Contractor to establish the required locations of access panels in walls and ceilings to permit inspection, resetting, or replacement of dampers, etc., and to provide and install such access panels.

3.05 FAN BELT GUARDS:

A. Furnish and install fan belt guards for belt-driven fans as requiredor as shown on drawings. Guards shall be constructed with heavy angle iron frames and wire mesh and in accordance with OSHA and all State Industrial Safety Orders. Provide opening for tachometer readings.

3.06 SHEET METAL WORK:

A. Furnish and install all sheet metal, ductwork, connections, etc., as required for the complete installation of the supply, recirculation and exhaust systems as shown on drawings.

B. All sheet metal work shall be made of galvanized iron in strict accordance with all current specifications and recommendations of S.M.A.C.N.A. and UMC.

C. Flat duct surfaces shall be crimped diagonally regardless of size.

D. Plenums shall be made of 18 gauge galvanized sheet steel, reinforced with galvanized angles.

E. Pocket locks and standing seams shall be hammered airtight. Pocket locks shall be

riveted at each corner. Standing seams shall be riveted at 10" on centers with not less than three rivets per side. The inside of the duct shall present a smooth surface.

F. Duct transitions shall be made with a slope of not more than one foot in five feet where possible, but not more than one foot in three feet in any event.

G. Turns shall be made with a throat radius of not less than the duct width or turning vanes shall be installed in all supply, return, exhaust ductwork.

H. Turning vanes shall be "Acousti-Turn" or equal as approved. Shop made turning vanes shall not be used.

I. Transverse duct joints shall be sealed with 4" wide 6 oz.cloth completely saturated with Foster 30-36 "Sealfas" fire-retardant coating. On exposed ductwork, the excess of coating shall be wiped off for neat appearance.

J. Lined ductwork, plenums, etc., exposed to weather shall have all seams and joints made waterproof with mastic.

K. Duct supports and hangers shall conform to S.M.A.C.N.A. requirements.

L. Access doors shall be made of galvanized sheet steel two gauges heavier than plenum or duct of the same size. Doors shall have a 1/2" Celotex core with galvanized sheet steel on both sides, shall open against air pressure, and shall be felt lined. Doors shall be provided with "Ventlock" hinges and catches.

B. Where duct runs are located above the roof, they shall be securely fastened in place in a workmanlike manner. Ducts shall be held 12" above the roof with galvanized angle iron supports to permit reroofing.

3.07 SCREENS:

A. Provide 1/2" galvanized hardware cloth to serve as a bird screen covering all outside air inlets, exhaust or relief air outlets, exhaust fan outlets.

3.08 GRILLES, REGISTERS AND DIFFUSERS:

A. Provide sheet metal register frames to permit attaching registers at openings.

B. Paint: All ductwork visible through the outlet face shall be painted with two coats of flat black paint.

C. Registers or diffusers furnished and installed that cause excessive air movement or drafts shall be replaced when so directed at no additional cost.

3.09 WIRING DIAGRAMS AND EQUIPMENT CHANGES:

A. Contractor shall pay for any extra charges arising form changes in the control system when the approved shop drawings of the control system is different from that shown on drawings. Control system shall be taken to include all wiring including power, conduit, switches, relays, starters, etc., required for the operation or control of any or all parts of Mechanical system.

B. Contractor shall also pay extra charges for changes in structure, equipment,

location and/or service connections (including plumbing) when caused by installing equipment other than that specified or in a manner different from that shown on drawings.

C. Approval by Engineers of shop drawings shall not relieve Contractor form bearing cost of changes.

3.10 TESTING AND ADJUSTING:

A. Each piece of equipment in the entire system shall be adjusted and readjusted to insure proper functioning of all controls and proper distribution of air, including a complete and thorough balancing of the system, elimination of drafts, noise and vibration, and the system shall be left in a first-class operating condition.

B. Where required, fans shall be provided with pulleys at no additional cost to the Owner to drive the fans at the speeds necessary to give the indicated volumes. C.

Testing and Balancing Air Distribution Systems:

1. Installing Contractor shall obtain the services of an independent test and balance agency that specialized in and whose business is limited to the testing and balancing of air conditioning systems.

2. The agency selected shall be a fully certified member of the Associated Air Balance Council (AABC). At least one member of the agency shall be qualified as a certified test and balance engineer by the National Examining Board, United States and Canada. All final reports shall be signed by this certified test and balance engineer and shall include his official stamp.

3. Test and balance agencies who are not members of the AABC may be approved by the engineer in his sole discretion.

4. Testing and balancing agency as a part of its contract shall act as an authorized inspection agency, responsible to the Consulting Engineer and the Owner, and shall report any discrepancies or items not installed in accordance with contract drawings and/or specifications pertaining to the exhaust systems.

5. The Installing Contractor shall coordinate work done by the testing and balancing agency with work of other trades in the following manner:

   a. Notify selected agency within 15 days after award of their contract so that the preliminary plan check and field inspection phase may be initiated.

   b. Provide two sets of final prints of plans for plan check purposes to test and balance agency prior to construction.

   c. Direct installing workmen to make all necessary changes or additions to air conditioning system on items reported by test and balance agency to be not in accordance with contract drawings and/or specifications.

d. Inform test and balance agency of any major changes made to system construction and provide complete set of "as-built" drawings.

6. Testing and balancing shall be performed in complete accordance with AABC National Standards for Field Measurement and Instrumentation. Testing and Balancing shall be performed on all systems.

7. Instruments used for testing and balancing of systems must have been calibrated within a period of six months and been checked for accuracy prior to start of work.

3.11 CLEAN-UP:

A. In addition to the requirements of the General Conditions, thoroughly clean all parts of the apparatus and equipment. Exposed parts to be painted shall be thoroughly cleaned of cement, plaster and other materials and all grease and oil spots removed with cleaning solvent. Such surfaces shall be carefully wiped, all cracks brushed down with steel brush to remove rust and other spots, and left in proper condition to receive painters finish. All exposed material installed under this Contract shall be thoroughly cleaned, and the entire installation left in a neat, clean, usable condition.

B. Upon completion of the work herein specified, Contractor shall remove all surplus materials, rubbish and debris resulting from the operation, and shall leave the entire building and involved portions of the site, insofar as the work of the Contract is concerned, in a neat, clean and acceptable condition as approved by the Engineer.

3.13 EQUIPMENT IDENTIFICATION:

A. All equipment shall be permanently identified with nameplates corresponding to identification used on the drawings or as directed by the Owner.

B. Labeling shall be by means of black laminated engraved plastic nameplates with white 1/8" high letters. Secure to equipment with brass screws or rivets.

C. Access doors on equipment of sheet metal shall be identified as to specified functions, i.e. "Compressor Section", "Filters", etc. Labeling shall be as specified for equipment.

3.14 ACCESSIBILITY OF EQUIPMENT:

A. All motors, controls and other devices or components requiring service, maintenance, and/or adjustment shall be placed in fully accessible position and locations. Provide access doors where required in ductwork or construction, whether specifically detailed or not, to render all such items accessible.

3.19 EQUIPMENT EXPOSED TO WEATHER:

A. Whether indicated on plans or not, all equipment exposed to weather shall be protected in a manner recommended by the manufacturer and subject to approval of Engineer.

B. Where possible, weatherproofing shall be by manufacturer.

C. Components requiring access for service inspection, etc. shall have hinged access openings provided with clamp latches. The use of screws in lieu of hinges or latches will not be permitted.

END OF SECTION

SECTION 16000

ELECTRICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical general requirements. These requirements shall apply to all Division 16 Sections of this Specification.

B. Disposal and recycling of demolished fluorescent ballasts.

C. Disposal and recycling of demolished fluorescent lamps.

D. Maintenance of electrical services during various phases of construction.

E. Demolition, dismantling, cutting and alterations of the existing electrical systems as indicated and/or required for demolition of existing structures and systems.

F. Disconnection and removal of existing electrical services as indicated and required by the demolition process.

G. Removal of debris and demolished equipment.

H. Coordination with the Owner to allow the Owner to salvage specific electrical and electronic items that the Owner wishes to salvage. Contractor shall allow the Owner personnel reasonable access to the site for the Owner's salvage operation. Contractor shall coordinate the timing of the salvage operation with the Owner.

1.02 RELATED SECTIONS

A. Division 1: GENERAL REQUIREMENTS

B. Division 15: MECHANICAL

C. Division 16: ELECTRICAL

1.03 REFERENCES

A. California Building Code (CBC)

B. California Electric Code (CEC)

C. National Fire Protection Association (NFPA) Standards

D. California State Fire Marshal (CSFM)

E. National Electrical Contractors Association (NECA)

F. Occupational Safety and Health Administration (OSHA)

G. California Administrative Code Title 24

H. American National Standards Institute (ANSI)

I. Institute of Electrical and Electronics Engineers

(IEEE) J. National Electric Manufacturer's Association

(NEMA)

K. City, State and other local codes and requirements as applicable

1.04 SUBMITTALS

A. Section 01300 - Submittals: Procedures for submittals.

B. Shop Drawings: Furnish shop drawings for specific electrical equipment and systems as required in the associated Section of this Specification.

C. Product Data: Furnish complete product data for specific electrical equipment and systems as required in the associated Section of this Specification.

D. Samples: Furnish samples of specific electrical equipment and components as required in the associated Section of this Specification.

1.05 QUALIFICATIONS

A. Refer to each Section of Division 16 for specific qualifications required for manufacturers and installers for each specific electrical system and component.

1.06 PROJECT CONDITIONS

A. Division 1: GENERAL REQUIREMENTS

B. The Contractor shall carefully examine the site and existing conditions, and shall compare the Drawings with the existing conditions as it affects the work under this Division. By the act of submitting a bid, the Contractor will be deemed to have made such examination and to have accepted such conditions and to have made allowance therefore in preparing bids.

C. All scaled and figured dimensions are approximate and are given for estimating purposes only. Before proceeding with the work, the Contractor shall carefully check and verify all dimensions and sizes and shall assume all responsibility for the fitting of his/her equipment and materials to other parts of the equipment and to the structure.

D. Where apparatus and equipment have been indicated on the Drawings, dimensions have been taken from typical equipment of the class indicated. The Contractor shall carefully check the Drawings to see that the exact equipment contemplated for installation will fit into the spaces provided.

E. Final dimensions, location of stub ups, junction or terminal boxes on equipment shall be obtained from approved shop or installation Drawings of the equipment being furnished, and shall be coordinated with all other sections as necessary. ***Do not "scale" the Drawings.***

1.07 GENERAL SUMMARY OF ELECTRICAL WORK

A. The work of this section shall include all services, labor, materials, transportation, equipment, plant and facilities to complete the electrical work indicated on the Drawings and specified herein.

B. The work listed or required by this Section of the Specification is not intended to limit or establish the extent of the electrical work. It shall be the Contractor's responsibility to establish to extent of the work specified hereunder and indicated on the Drawings.

C. Drawings and Specifications Coordination:

1. For purposes of clearness and legibility, the electrical Drawings are essentially diagrammatic. The size and location of equipment is shown to scale whenever possible. The Contractor shall verify all conditions, data and information as indicated on the Drawings and in specification sections where electrical work is required.

2. The electrical Drawings show the required size and points of termination of the conduits, the number and size of wires, and suggest the proper route for the conduit. It shall be the responsibility of the Contractor to install the conduits with minimum number of bends to conform to the structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and meet all applicable code requirements.

3. The routing of conduits may be changed, if approved by the Architect/Engineer, provided that the length of any conduit run is not increased or decreased more than 10% of the length shown on the Drawings.

4. It is intended that outlets be located symmetrical with architectural elements, not withstanding the fact that locations shown on the Drawings may be distorted for clarity.

D. The Specifications and Drawings are intended to cover complete operational systems. The omissions of expressed reference to any item of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.

E. Refer to the Drawings and shop Drawings of other trades for additional details that affect the proper installation of this work. Diagrams and symbols showing electrical connection are diagrammatic only. Wiring diagrams do not necessarily show the exact physical arrangement of the equipment.

F. If there are omissions or conflicts between the Drawings and Specifications, clarify these points with the Architect before submitting bid.

1. If the Contractor believes that there are conflicts within these Electrical Specifications; between the Specifications and the Drawings; or between the Electrical Documents and any Architectural, Mechanical, Plumbing, or Structural Document, the Contractor shall bid the more expensive or elaborate material, process or procedure and shall call the discrepancy to the Architects attention. Should the Owner, in its discretion, choose to implement the less expensive or simpler material, process or procedure after bid opening, a credit Change Order will be issued to the Contractor.

G. This Specification, the Drawings and General Conditions cover the complete furnishing and installation of the electrical system and all related work.

H. Terminology:

1. The term "signal system" shall apply to the clock, fire alarm, annunciator, sound, public telephone and data network systems.

2. The term "low voltage" shall apply to systems operating at 600 volts and under.

3. The term "provide" used on the Drawings and elsewhere in the Specifications shall be considered to mean "furnish and install".

4. The term "furnish" used on the Drawings and elsewhere in the Specifications shall be considered to mean "furnish and install".

5. The term "UL" means Underwriters Laboratories Inc.

1.08 WORK INCLUDED

A. Overcurrent devices in existing distribution switchboards complete.

B. Distribution panelboards complete.

C. Secondary distribution for the lighting and power systems, including panelboards, conduit, raceways, cable trays, outlets, wiring, wiring devices, equipment and miscellaneous items required for a complete and operating system.

D. Lighting fixtures, installed complete with lamps, mounting hardware and all accessories.

E. The complete connecting of all electrical equipment and devices, including motors and equipment or devices furnished under other Sections of the Specifications.

F. Disconnect switches, manual or magnetic motor starters, relays and miscellaneous control devices indicated or required.

G. Examine all other Sections for work related to those other sections and required to be included as work under this section.

H. General provisions and requirements for electrical work.

I. Conduit, raceways and outlets for signal systems including.

J. Demolition of certain existing electrical components as indicated on the Drawings

1.09 ORDINANCES AND REGULATIONS

A. All work and materials shall be in full accordance with the latest edition of the California Electrical Code, the State of California Administrative Code, Title 24, the Safety Orders of the State Division of Industrial Safety, and the Fire and Panic Safety Standards of the State Fire Marshal and with any prevailing rules and regulations pertaining to adequate protection and/or guarding of any moving parts or otherwise hazardous locations.
Material and labor shall conform to the Regulations of the National Board of Fire Underwriters for Electrical Wiring and Apparatus. All new material shall be "UL" listed.

B. Nothing in these Drawings and Specifications is to be construed as permitting work not conforming to these codes.

C. Should any changes be necessary in the Drawings or Specifications to make the work comply with the requirements, the Contractor shall notify the Architect at once and cease work on all parts of the Contract which are affected.

1.10 PERMITS AND INSPECTION

A. The Contractor shall apply and pay for all permits required by any of the legally constituted public authorities for the installation or construction of the work included under this Division. The Contractor shall arrange and pay for any inspections or examinations so required and deliver certificate of all such inspections to the Architect.

1.11 RECORD DRAWINGS

A. Section 01770 - Contract Closeout

B. Record (As-Built) Drawings shall be completed and delivered to the Architect prior to or at the time of final inspection. Record Drawings shall comply with the requirements of Division 1 of the Specifications.

C. Record Drawings shall accurately locate pull boxes and main conduit runs. Conduit runs between outlets, panels, devices, etc. that are changed from that shown on the drawing shall be clearly noted. All pull boxes indicated for future extension shall be completely dimensioned on Record Drawings.

D. The Drawings shall be complete, legible, and color-coded in the following manner: Red shall be used for removals and green shall indicate the revised conditions. Blue ink shall not be used. Record Drawings not satisfactorily prepared will be returned to the Contractor.

1.12 GUARANTEE

A. Division 1: GENERAL REQUIREMENTS

1.13 ELECTRICALLY OPERATED EQUIPMENT AND APPLIANCES

A. Equipment and Appliances Furnished by the Contractor:

1. The electrical work shall include furnishing and installing wiring enclosures for, and the complete connection of all electrically operated equipment and appliances and any electrical control devices which are specified to be furnished and installed in this or other electrical sections of the Specifications. All wiring enclosures shall be installed concealed except where exposed work is indicated on the electrical Drawings.

2. Connections shall be made as necessary to completely install the equipment ready for use. The equipment shall be tested for proper operation.

PART 2 PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

A. Products for Division 16, Electrical Work, shall be new and suited to the intended use.

B. Quality of products shall be established by specified products and substitute products shall be equal or exceed the quality of products specified. Refer to Division I for substitution procedure.

C. Provide Underwriter's Laboratories, Inc. examination and label for all products where such examination and labels are available.

D. Any products judged by Architect and/or Owner not in accordance with the Specifications either before or after installation will be rejected. If after installation, the Contractor shall replace with specified items at no cost to the Owner.

E. Products of similar nature shall be of the same type and manufacturer.

F. Where products are specified by manufacturer's brand name, type and/or catalog number, such designation is to establish standards for desired quality, style, disposition of warranty items and operating characteristics, and shall be the basis of the bid.

G. Refer to Division 1, and Section 01300, for method of submittal of required Shop Drawings, lists and data. Refer to other paragraphs in this Section for other requirements relating to product selection.

H. Confirm the electrical characteristics of powered equipment specified in other Divisions of the Specifications prior to ordering electrical equipment required for the equipment.

2.02 PROTECTION OF FINISH

A. The Contractor shall provide adequate means for and shall fully protect all finished parts of the materials and equipment against damage from any cause during the progress of the work and until acceptance by the Owner.

B. All materials and equipment in storage and during construction shall be covered in such a manner that no finished surfaces will be damaged, marred or splattered with paint. All moving parts shall be kept perfectly clean and dry. No paint spraying will be permitted in the building.

C. Verify that there is safe storage for products at the project site prior to authorizing shipment by the manufacturer.

D. Leave protective crating and wrapping in place until job site conditions will permit removal with no risk of damage to the product finish from construction processes.

E. Store equipment received at the site in a dry location during the construction period.

F. All damaged material or equipment shall be replaced or refinished by the contractor at no expense to the Owner.

2.03 SUBMITTALS

A. Material lists and Shop Drawings shall comply with the requirements of Division 1 and Section 01300, “SUBMITTALS”. All submittals shall be submitted with a minimum of eight (8) copies (or more if required by 01300).

B. A complete <u>list</u> of all proposed materials and equipment specified in Division 16 and the Electrical Drawings shall be submitted after the Contract is awarded. The <u>list</u> shall include the name of the manufacturer and such information required to identify the item. Where the Specifications show a choice, only one brand, type or manufacturer shall be listed.

C. Exact catalog number and fixture cut shall be provided for each lighting fixture.

D. Detailed Drawings, either to scale or adequately dimensioned, shall be provided for the unit substations, main switchboards, distribution switchboards, transformers, lighting and power panelboards, terminal cabinets, special relay or control cabinets and other equipment with special requirements.

E. Where electrical systems interface with systems specified in other Divisions, the electrical components shall be reviewed and approved by the Contractor furnishing those other systems, prior to submittal for review by Engineer.

F. More than one manufacturer may be utilized for rough in products, such as conduit, boxes and wire, but only one manufacturer may be used for finish work equipment or devices.

G. Product samples shall be furnished where required.

2.04 SUBSTITUTIONS

A. Where shop Drawings are being submitted for products which are being substituted for specific products, refer to Division 1 for limitations governing requests for substitutions.

B. For complex products and/or systems, the availability of qualified service organizations, so located that service can be rendered to the equipment within 24 hours upon receipt of notification, may be significant factor in considering substitution requests.

C. Product substitutions will not be allowed unless approved in writing by the Architect in accordance with the requirements of Division 1.

D. Only "standard products" of manufacturer shall be offered as substitutions for specified "standard products".

2.05 NON-SPECIFIED EQUIPMENT OR MATERIALS

A. In the event equipment or materials are indicated on the Drawings but not described in the Specifications, the Contractor shall determine from the Architect, prior to submitting his/her bid, what this descriptive information is and shall base his/her bid accordingly. Should the Contractor fail to do this, the Contractor shall furnish such equipment and material as later indicated to be the intent by the Architect without change in contract price.

PART 3 EXECUTION

3.01 GENERAL

A. All work specified in Division 16 and indicated on the electrical Drawings shall:

1. Be installed by a qualified installer and skilled craftsman experienced in the trade.
2. Be installed in a neat and workmanlike manner.
3. Conform to NECA Standards of Installation.

3.02 LOCATIONS

A. The location of conduit, outlets, apparatus and equipment indicated on the Drawings are approximate only and shall be changed to meet the architectural and structural conditions as required.

B. The location of conduit runs, outlets and pull boxes shall be verified on the job and the locations shall be adjusted as required to clear obstructions such as equipment racks, structural bracing, cable trays, duct work, piping, conduit and pull boxes.

C. Install all conduit and equipment in such a manner as to avoid all obstructions, maintaining headroom and keeping openings and passageways clear.

D. The Drawings are essentially diagrammatic to the extent that many offsets, bends, special fittings and exact locations are not indicated. The Contractor shall carefully study the Drawings and the premises in order to determine the best methods, exact locations, routes, obstructions, etc., which affect his/her installation.

E. Furnish and install additional pull boxes, fittings or offsets as required to clear obstructions or to simplify the pulling in of wires or cables.

F. Proper judgment must be exercised in executing work so as to secure the best possible installation in the available space and to overcome difficulties owing to space limitations or interference of structural conditions wherever encountered. It shall be the Contractor's responsibility to verify and coordinate the location of all outlets and lighting fixtures with the Architectural, Structural and Mechanical Drawings and with all Shop Drawings, including Shop Drawings of other trades. Architectural elevations and reflected ceiling plans shall generally take precedence. However, in the event of large variations between Architectural and Electrical Drawings, the Architect shall be consulted for instructions.

G. In the event changes in the indicated locations or arrangements are necessary due to developed conditions in the buildings' construction or rearrangement of furnishings or equipment, such changes shall be made by the Contractor at no cost, provided the work in place is not affected and no extra materials are required.

3.03 EXCAVATION

A. All excavating, trench work and backfilling required for the installation of the work shall be performed in accordance with the applicable portions of the Specifications and Plans on the subjects ‘Excavation, Backfilling, and Trenching’.

B. After the installation of work requiring excavation has been inspected and approved, all excavations shall be filled with slurry mix or clean earth (as detailed on the Drawings) and tamped to a consistency so that no settlement will occur, and the ground left flush at natural grade. All excavated earth, which is not used for backfill, shall be removed from the premises or otherwise disposed of, by the Contractor, as directed.

3.04 CONCRETE WORK

A. All rough and finished concrete required for the installation of the work shall be installed in accordance with the applicable portions of DIVISION 2 and DIVISION 3 of the specifications and/or plans.

3.05 COOPERATION WITH OTHERS

A. The Contractor shall so organize his/her work that progress will harmonize with the work of all trades, so that all work may proceed as expeditiously as possible.

B. The Contractor shall be responsible for the correct placing of his/her work and the connection to this work of all related trades.

C. The Contractor shall cross check the Drawings against the Drawings of other trades, to avoid installing work that conflicts with the work of other trades.

3.06 LAYOUT OF WORK

A. Lay out work in advance of construction so that exposed work will be parallel with the building lines.

3.07 CLEARANCES AND ACCESS

A. Install electrical materials with proper working clearances as required by the California Electrical Code.

B. Provide specified, indicated or code required access to electrical products. Where access doors in walls or ceilings are required for access to electrical products, such doors shall be of the identical manufacture as the doors utilized for access to mechanical products, and shall be provided by the Electrical Contractor.

3.08 OPENINGS

A. The Contractor shall cooperate with all trades in providing information at the proper times as to openings required in walls, slabs and footings for conduit and equipment.

B. The core drilling, cutting and patching of walls or slabs shall be as specified under the General Requirements. The Electrical Contractor shall be responsible for his/her own openings. Refer to Architectural Drawings for location of all masonry and/or fire rated walls. Contractor shall be responsible for all required core drilling even if not specifically indicated or noted on the Electrical Drawings.

3.09 CLEANING EQUIPMENT AND PREMISES

A. Thoroughly clean all parts of the materials and equipment. Exposed parts shall be thoroughly cleaned of cement, plaster and other materials, and all oil and grease spots shall be removed with a non-flammable cleaning solvent.

B. Such surfaces shall be carefully wiped and all cracks and corners scraped out.

C. Exposed metalwork shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean.

D. The interior of each panelboard, switchboard section or terminal cabinet shall be cleaned of all dust and debris.

E. During the progress of the work the Contractor shall carefully and continuously clean up after his/her men and shall leave the premises and all parts of the building in which he is working free from his/her debris.

3.10 DISPOSAL AND RECYCLING OF FLUORESCENT BALLASTS

A. It is assumed that all existing fluorescent light fixtures to be demolished contain a magnetic ballast (or multiple ballasts) that contain polychlorinated biphenyls (PCBs). The PCBs are contained in the ballasts' internal capacitor and possibly in the asphalt-potting compound.

B. The Contractor shall remove all fluorescent ballasts from all demolished light fixtures. The ballasts shall be recycled in an approved manner. The recycling shall meet all local, state and federal requirements for disposal and recycling of fluorescent ballasts that contain PCBs.

3.11 DISPOSAL AND RECYCLING OF FLUORESCENT LAMPS

A. It is assumed that all existing fluorescent light fixtures to be demolished contain fluorescent lamps that contain small quantities of mercury.

B. The Contractor shall remove all fluorescent lamps from all demolished light fixtures. The lamps shall be recycled in an approved manner. The recycling shall meet all local, state and federal requirements for disposal and recycling of fluorescent lamps that contain mercury.

3.12 MAINTENANCE OF ELECTRICAL SERVICES

A. Uninterrupted electrical services shall be maintained to Owner occupied portions of the buildings at all times, except during pre-scheduled shut-downs of the electrical service.

B. Any work that will require the shutdown of any electrical system shall be pre-scheduled with the Owner. Upon such a shutdown, the work, once started, shall continue uninterrupted until the work has been completed and service is restored.

C. The Contractor shall prepare a written method of procedure and notify the Owner two weeks in advance of any service shutdown.

D. The bid price shall include all charges for overtime work.

END OF SECTION

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE

A. This section supplements all sections of this division and shall apply to all phases of work hereinafter specified, shown on the drawings, or required to provide a complete installation of electrical systems for the Project. The Work required under this division, is not limited to the Electrical Drawings. Refer to Site, Architectural, Structural, and Mechanical Drawings that may designate Work to be accomplished. The intent of the Specifications is to provide a complete electrical system that includes all documents that are a part of the Contract.

1. Work Included: Furnish all labor, material, services and skilled supervision necessary for the construction, erection, installation, connections, testing, and adjustment of all circuits and electrical equipment specified herein, or shown or noted on the Drawings, and its delivery to the Owner complete in all respects ready for use.

B. Contract Drawings: The Contract Drawings are shown in part diagrammatic, intended to convey the Scope of Work indicating the intended general arrangement of equipment, conduit and outlets. Follow the contract drawings in laying out the work and verify spaces for the installation of the materials and equipment based on actual dimensions of equipment furnished. Where conflicts occur, the most stringent application shall apply wherever a question exists as to the exact intended location of outlets or equipment, obtain instructions from the Architect before proceeding with the Work.

C. Equipment or Fixtures: Equipment and fixtures shall be connected to provide circuit continuity in accordance with the Specifications whether or not each piece of conductor, conduit, or protective device is shown between such items of equipment or fixtures, and the point of circuit origin.

D. Work Installed but Furnished under Other Sections: The Electrical Work includes the installation or connection of certain materials and equipment furnished under other sections. Verify installation details. Foundations for apparatus and equipment will be furnished under other sections unless otherwise noted or detailed.

1.02 GENERAL REQUIREMENTS

A. Guarantee: Furnish a written guarantee for a period of one year from date of substantial completion.

B. Equipment Safety: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety.

C. Codes and Regulations:

1. Design, manufacture, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to

the latest publications or standard rules of the following:

Institute of Electrical and Electronic Engineers - IEEE
National Electrical Manufacturers' Association - NEMA
California Fire Code - CFC
California Building Code - CBC
Underwriters' Laboratories, Inc. - UL
National Fire Protection Association - NFPA
Federal Specifications - Fed. Spec.
American Society for Testing and Materials - ASTM
American National Standards Institute - ANSI
American Standard Association - ASA
California Electrical Code - CEC
National Electrical Safety Code - NESC
Insulated Power Cable Engineers Association - IPCEA
Public Utilities Commission - PUC
California Code of Regulations, Title 8, Subchapter 5
California Code of Regulations, Title 24
State & Municipal Codes in Force in the Specific Project Area
Occupational Safety and Health Administration -OSHA

The term "Code", when used within the specifications, shall refer to the Publications, Standards, ordinances and codes, listed above. In the case where the codes have different levels of requirements the most stringent rules shall apply.

D. Seismic Design of Electrical Equipment:

1. All electrical prefabricated equipment is to be designed and constructed in such a manner that all portions, elements, sub-assemblies and/or parts of said equipment and the equipment as a whole, including their attachments, will resist a horizontal load equal to the operating weights of those parts multiplied times the following factors:

Type of Equipment	Horizontal CP	Vertical CP
Rigid and rigidly supported piping or equipment such as boilers, chillers, pumps, motors, transformers, unit substations and control panels.	0.50	0.33
Flexible and flexibly supported equipment such as air-handling units, piping and other equipment so supported that the fundamental period of vibration of the equipment and its supporting system is greater than 0.05 seconds. Communication equipment and emergency stand-by equipment.	1.00	0.67

2. Load is to be applied at the center of gravity of the part and to be in any direction horizontally. Design part and to be in any direction horizontally. Design stresses shall be in accordance with the specifications for design of the American Institute of Steel Construction. Anchorage, support and/or attachment of said prefabricated

equipment to the structure should be in accordance with the details found in the plans and specifications.

3. It is the entire responsibility of the Contractor to verify the design of equipment so that the strength and anchorage of the internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.

E. Requirements of Regulatory Agencies:

1. Codes, Permits and Fees: Where the Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply unless variance is approved. Where provisions in the drawings and specifications differ in regard to code application, size, quality, quantity or type of equipment, Contractor shall include in the bid, costs for the most costly provision either denoted in the specifications or on the drawings. This provision shall apply as an amendment to the California Public Contracts Code.

a. Comply with all requirements for permits, licenses, fees and Code. Permits, licenses, fees, inspections and arrangements required for the Work shall be obtained by the Contractor at his expense, unless otherwise specified.

b. Comply with the requirements of the applicable utility companies serving the Project. Make all arrangements with the utility companies for proper coordination of the Work.

2. Substitutions: The materials, products, and equipment described in the Contract Documents establish a standard of required function, dimension, appearance, and quality. Architect may consider requests for substitutions of specified equipment, materials, or products and then only when request are submitted in accordance with the provisions of the Contract Documents, Section 01630, and are received by the Architect a minimum of 21 days prior to the date established for the receipt of the bid. No substitutions will be considered after the date of the receipt of the bid or contract award unless there is cause for a substitution which complies in every respect to the provisions of the Contract Documents, Section 01630. Substitution requests shall be made in accordance with Public Contracts Code (AB2084) revisions as follows:

a. No substitutions are allowed after bid opening.

b. All substitutions must be requested 14 days prior to bid opening date.

c. Final addendum naming approved substitutions of materials/equipment must be issued 7 days prior to bid date.

F. Record Drawings: Comply with Section 01720. Keep up to date, monthly payments withheld if not updated.

G. Shop Drawings and Submittals: Submittals on <u>all</u> material prior to installation.

1. Drawings shall be submitted, as required under Section 01300.

2. Shop drawings shall be submitted on, but not limited to, the following:

a. 16111 Conduit

b. 16120 Conductors (600 Volt)

c. 16123 Building Wire and Cable

d. 16130 Boxes

e. 16140 Wiring Devices

f. 16160 Cabinets and Enclosures

g. 16400 Distribution Switchboards and Equipment

h. 16440 Disconnect Switches

i. 16470 Panelboards

j. 16510 Interior Luminaries

H. Trenching and Backfilling: All trenching and backfilling for electrical work shall be the responsibility of the contractor and shall be done in accordance with Section 02225 of this specification. The Contractor shall examine the drawings of all other sections to determine locations of all existing underground lines. The Contractor shall use extreme caution when working in the vicinity of these lines and shall be responsible for the proper and approved repair of any damage caused by his work.

I. Cutting and Patching:

1. Obtain written permission from the Architect before core drilling or cutting any structural members. Exact method and location of conduit penetrations and/or openings in concrete walls, floors, or ceilings shall be as approved by the Architect.

2. All core drilling, cutting and patching for this work shall be performed under this Section of the specifications. Use craftsmen skilled in their respective sections for cutting, fitting, repairing, patching of plaster and finishing of materials including carpentry work, metal work or concrete work required for this Work. Do not weaken walls, partitions or floor with cutting. Holes required to be cut in floors must be drilled without excessive breaking out around the holes. Patching and/or refinishing shall be determined by the Architect.

3. Use care in piercing waterproofing. After the part piercing the waterproofing has been set in place, seal openings and make absolutely watertight.

4. Seal all openings to meet the fire rating of the particular wall floor or ceiling. Conform to Section 07810.

5. Conform to Section 01045.

1.03 JOB CONDITIONS

A. Existing Conditions:

1. The contractor shall visit the site and verify existing conditions. Where existing conditions differ from the drawings, adjustment shall be made and allowances included for all necessary equipment to complete all parts of the drawings and specifications.

2. Electrical circuits affecting work shall be de-energized while working on or near them.

3. Arrange the work so that electrical power is available to all electrical equipment within existing facility at all times. Schedule all interruptions at the convenience of the Owner, including exact time and duration. Provide temporary power during all periods of interruption, which are deemed excessive by the Owner. Costs of all premium time (overtime) resulting from the scheduled power interruptions and all costs for providing temporary power shall be included in the cost of the Work.

B. Protection:

1. Protection of apparatus, materials and equipment. Take such precautions as necessary to properly protect all apparatus, fixtures, appliances, material, equipment and installations from damage of any kind. The Engineer may reject any particular piece or pieces of material, apparatus or equipment scratched, dented or otherwise damaged.

2. Seal equipment or components exposed to the weather and make watertight and insect proof. Protect equipment outlets and conduit openings with temporary plugs or caps at all times that work is not in progress.

C. Sequencing and Scheduling:

1. Work lines and established heights shall be in strict accordance with architectural drawings and specifications insofar as these drawings and specifications extend. Verify all dimensions shown and establish all elevations and detailed dimensions not shown.

2. Lay out and coordinate all work well enough in advance to avoid conflicts or interferences with other work in progress so that in case of interference the electrical layout may be altered to suit the conditions, prior to the installation of any work and without additional cost to the Owner. Conflicts arising from lack of coordination shall be this Contractor's responsibility. Maintain all code-required clearances about electrical equipment. Unless specifically noted otherwise, establish the exact location of electrical equipment based on the actual dimensions of equipment furnished.

1.04 WORK IN COOPERATION WITH OTHER SECTIONS

A. Examine the drawings and specifications and determine the work to be performed by the electrical, mechanical and other sections. Provide the type and amount of electrical materials and equipment necessary to place this work in proper operation, completely wired, tested and ready for use. This shall include all conduit, wire, motor starters, disconnects, relays, time clocks and other devices for the required operation sequence of all electrical, mechanical and other systems or equipment. Where a conflict occurs on drawings, the most stringent shall apply.

B. Provide conduit and wire for all controls and other devices, both line and low voltage, described in this or other parts of the contract documents. Install all control housings and back boxes required for installing conduit and wire to the controls.

C. Install control wiring in separate conduit between each heating, ventilating and air conditioning sensing device and its control panel and/or control motor. Before installing

any conduit for heating, ventilating and air conditioning control wiring, verify from the control manufacturer's shop drawings where these separate conduit runs are required.

D. Plan all work so that it proceeds with a minimum of interference with other sections. Inform all parties concerned of openings required for equipment or conduit required in the building construction for Electrical Work and provide all special frames, sleeves and anchor bolts
as required. Coordinate the electrical work with the mechanical installation. Promptly report to the Architect any delay or difficulties encountered in the installation of this work which might prevent prompt and proper installation, or make it unsuitable to connect with
or receive the work of other sections. Failure to so report shall constitute an acceptance of the work of other sections as being fit and proper for the execution of this work.

1.05 TESTING AND ADJUSTMENT

A. Upon completion of all Electrical Work, the contractor shall provide all testing as follows:

1. Operational Test: Test all circuit breakers, receptacles, motors and all other electrical and communication equipment. Replace all faulty devices and equipment discovered during testing with new devices and equipment at no additional cost, and that part of the system (or devices or equipment) shall then be retested.

2. Secondary Grounding Resistance: Perform ground continuity test between main ground system and equipment frame, system neutral and/or derived neutral point.

3. Ground Fault System Test: Measure system neutral insulation resistances to ensure no shunt ground paths exist.

4. All test procedure shall be performed by an independent testing firm.

1.06 MAINTENANCE, SERVICING AND INSTRUCTION MANUALS, AND WIRING DIAGRAMS

A. Prior to substantial completion, the contractor shall submit 5 copies of operating and maintenance and servicing instructions, as well as an equal number of copies of complete wiring diagrams all neatly bound in hard cover 3-ring binders with table of contents and tabs for the following items or equipment: (See Section 01730 - Operation and Maintenance Data):

1. Section 16426 - Distribution Switchboards and Equipment.

2. Section 16470 - Panelboards

B. All wiring diagrams shall specifically cover the installed system indicating zones, wiring, and components added to the system. Typical drawings will not be accepted.

1.07 FINAL INSPECTION AND ACCEPTANCE

A. After all requirements of the specifications and/or the drawings have been fully completed, representatives of the Owner will inspect the Work. The Contractor shall provide competent personnel to demonstrate the operation of any item of system, to the full satisfaction of each representative. The Contractor shall provide 4 hours of minimum scheduled operation and maintenance training for school maintenance staff on each system indicated in 1.06A above. See specific sections for additional training/operation hours required for school personnel.

B. Final acceptance of the work will be made by the Owner after receipt of approval and recommendation of acceptance from each representative.

C. The Contractor shall furnish Record Drawings before final payment of retention.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic electrical materials and methods

B. Outlet boxes

C. Fittings

D. Pullboxes

E. Color coding

F. Receptacles

G. Local Switches

H. Plates

I. Nameplates

J. Relays and contactors

K. Time switches

L. Fire resistant sealant

M. Keys and locks

1.02 RELATED SECTIONS

A. Division 15: MECHANICAL B.

Division 16: ELECTRICAL

1.03 REFERENCES

A. California Building Code (CBC) B.

California Electric Code (CEC)

C. National Fire Protection Association (NFPA) Standards

D. California State Fire Marshal (CSFM)

E. National Electrical Contractors Association (NECA) F.

American National Standards Institute (ANSI)

G. Institute of Electrical and Electronics Engineers (IEEE)

H. National Electric Manufacturer's Association (NEMA)

I. City, State and other local codes and requirements as applicable

1.04 SUBMITTALS

A. Section 01300 - Submittals: Procedures for submittals.

B. A complete, detailed Material List shall be submitted to the Architect as specified in Section 16000 and as required by Section 01300.

1. The Material List shall include all Basic Electrical Materials (boxes, wiring devices, etc.), raceways, conductors, etc.

C. Product Data: Furnish complete product data for all basic electrical materials furnished under this section.

1.05 SUMMARY OF BASIC ELECTRICAL MATERIALS AND METHODS

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other sections for work related to those other sections and required to be included as work under this Section.

2. General provisions and requirements for electrical work.

3. Boxes, Enclosures, Keys and Locks

4. Nameplates, Identification and Signs

5. Wiring Devices and Plates

6. Control Devices

1.06 CODES, REGULATIONS AND STANDARDS

A. The materials herein shall be new and furnished in accordance with specifications of the Institute of Electrical and Electronics Engineers, National Electric Manufacturer's Association, California Fire Protection Association and the California Electrical Code.

B. Comply with requirements of California Administrative Code Title 24, California Electrical Code and all other codes referenced herein.

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Provide outlet boxes throughout the raceway system as required to mount wiring devices or fixtures, for pulling of conductors and making connections.

B. Outlet boxes or junction boxes generally refer to cast or pressed steel boxes of less than 50 cubic inches of volume for a single box.

C. Outlet or junction boxes shall be of the following type:

1. Interior boxes flush in stud walls and ceilings, or concealed overhead, shall be galvanized pressed steel or welded type boxes with knockouts, by Bowers, Rayco, Steel City, Appleton.

2. In all exposed work, interior and exterior, outlet boxes and conduit fittings required shall be cast metal with threaded cast hubs cast integral with the box or fitting. Boxes and fittings shall not have unused spare hubs except as otherwise indicated or specified.

D. Unless otherwise specified or noted on the Drawings, flush boxes for the various outlets shall be as follows:

1. For light outlet boxes, use minimum of 4" square, 1 1/2" deep, equipped with plaster ring and fixture supporting device as required by the fixture to be installed.

2. For wall switch outlet use 4" boxes with single or two gang plaster rings for one or two switches and gang boxes with gang plaster rings for more than two switches, unless noted otherwise on the Drawings.

3. For convenience outlets use 4 11/16 inch square by 2 1/8" deep boxes with single gang or two gang plaster rings.

4. For telephone/data outlets, use 4 11/16" square by 2 1/8" deep boxes with single gang plaster rings.

5. For electric thermostat outlets, use 4" square boxes with single gang plaster rings. Mount vertically or horizontally as directed by thermostat supplier - coordinate with mechanical contractor.

6. For outlets not specified, use boxes and mounting heights as directed.

7. Plaster rings shall be provided on all flush mounted outlet boxes except where otherwise indicated or specified. All plaster rings shall be the same depth as the finished surface.

E. Outlet boxes shall be accurately placed, independently and securely fastened to the structure, and in concealed work shall be set flush with finished surface of walls or ceilings.

F. All outlet boxes shall be accurately placed and securely fastened to the structure independent of the conduit.

G. Close unused openings in pressed steel boxes with knockout closures and in cast boxes with threaded plugs.

H. Use multiple gang boxes for grouping devices at one location. Provide barriers between different systems and between adjacent devices when the voltage between adjacent exposed live parts exceeds 300 volts to ground.

I. Support ceiling outlet boxes flush with the ceiling plane. Use approved bar hangers or other approved means to provide adequate support for lighting fixtures or other products attached to ceiling outlet boxes. Equip boxes with fixture studs where required by the lighting fixtures to be installed. Support boxes in suspended ceiling systems from main runner channels, or joists or other structural members. Do not support from the ceiling suspension system support wires or tile support tees or similar lightweight ceiling components unless the components are designed and approved for this purpose.

J. Locate outlets required for feeds to equipment in accordance with the requirements of the equipment and with Drawings furnished by the equipment supplier.

K. Equip outlet boxes used as junction boxes with blank device plates.

L. Outlet boxes installed in exposed, surface mounted locations shall be cast type boxes with integral threaded hubs or threaded knock-outs.

M. Equip outlet boxes with bushed cover plates where used for systems requiring an exposed cable connection from the box.

N. Locate outlet boxes so that they will be readily accessible. Boxes over suspended ceiling systems are considered readily accessible if the ceiling tile removal permits ready access to such boxes.

O. Where outlet boxes are used as junction or splice boxes, identify the enclosed circuit numbers with permanent black ink marking pen on the inside surface of the box cover, or on outside surface of box cover if located above suspended ceiling.

P. In existing plywood wall or drywall construction, and where flexible steel conduit is fished into the walls, one-gang and two-gang outlets for wiring devices may be sectional steel boxes with plaster ears. Boxes shall be fastened to plywood with a flat head screw in each plaster ear screw hole. Boxes fastened to gypsum board shall be "Griptite" by Raco.

Q. Factory made knock-out seals shall be installed to seal all box knock-outs, which are not intact.

R. At each location where flexible conduit is extended from a flush outlet box, provide and install a weatherproof universal box extension adapter by Bell Electric Company.

2.02 FITTINGS

A. Fittings shall be cast metal and non-corrosive. Ferrous metal fittings shall be cadmium plated or zinc galvanized. The 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.

2.03 PULLBOXES

A. Provide sheet metal pull boxes as required to facilitate the pulling of wire and cable. Junction and pull boxes, in addition to those indicated, shall only be used where absolutely necessary with the specific approval of the District Inspector in each case.

B. The pull boxes shown are the major boxes required due to obvious conditions. Additional pull boxes shall be provided wherever required due to the number of bends or offsets, length or other conditions that affect the pulling in of wire or cable.

C. Concealed interior 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 have auxiliary angle iron framing where necessary to ensure rigidity. Covers shall be fastened to the 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 at the Site if the boxes are not installed plumb. All surfaces of pull and junction boxes and covers shall be given one coat of metal primer, and one coat of aluminum paint. Pull boxes shall be manufactured by Hoffman, Circle A-W, Wiegmann, or equal, or by the switchboard manufacturer.

D. Weatherproof and interior/exterior exposed pull and junction boxes shall conform to the foregoing for interior boxes with the following modifications: The cover of flush mounting boxes shall have a weathertight gasket cemented to and trimmed even with the cover all around. Surface or semi-flush mounting pull and junction boxes shall be "UL" approved as Raintight and shall be complete with threaded conduit hubs for all conduit connections. Conduit hubs shall be Myers “Scru-TIte” or approved equal. All exposed portions of boxes shall be galvanized and finished with a prime coat and a coat of baked-on gray enamel.

E. All weatherproof and interior/exterior exposed pull or junction boxes 6" x 6" x 4" and larger shall be steel, raintight and NEMA 3R rated.

F. All junction and pull boxes shall be rigidly fastened to the structure and shall not depend on the conduits for support.

G. Pull boxes shall be installed wherever required so that no power feeder conduit has more than three (3) 90 degree bends or the equivalent.

H. Every conduit run entering a pull box shall be bonded together inside the box, using a ground bushing on each conduit and looping a #6 copper ground wire between bushings.

I. The interior and exterior shall be finished with only two (2) coats of primer coat, in painted areas. In areas, which are not to be painted, pull boxes shall be finished the same as the new switchgear.

2.04 COLOR CODING

A. Color code power wire and cable for feeders and branch circuits as follows. Refer also to Section 16120.

Phase	208Y/120V	480Y/277V
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	White
Ground	Green	Green

B. Fire detection and control conductors shall have a consistent system of coded colors throughout the wiring of each system. Use the IPCEA color code where practicable. Do not include two wires of the same color in any raceway unless additional distinctive marking is included at each end of such conductors.

C. Do not pull wires into raceways until raceways are permanently in place and termination points are not subject to damage. Clean conduits and dry inner surface before installing conductors.

D. Do not pull wires/conductors into raceways until the conduit/raceway system has been approved by the Inspector and the Owner. Refer to Section 16110 for additional information.

2.05 RECEPTACLES

A. All receptacles in flush type outlet boxes shall be installed with a bonding jumper for ground between the grounded outlet box and the receptacle ground terminal, except where receptacle is equipped with a UL approved self-grounding device. Grounding through the receptacle mounting straps is not acceptable. The bonding jumper shall be sized in accordance with the branch circuit protective device as tabulated herein under "Grounding". Bonding jumper shall be attached at each outlet to the back of the box

using drilled and tapped holes and washer head screws 6-32 or larger. For receptacles in surface mounted outlet boxes, direct metal-to-metal contact between receptacles mounting strap (if it is connected to the grounding contacts) and outlet may be used.

1. Duplex convenience receptacles shall be color as directed by Architect, grounding type, 125 volt, 20 ampere, and shall have two current carrying contacts and one grounding contact which is internally connected to the frame.

   a. Outlet shall accommodate standard parallel blade cap and shall be side wired only. Receptacles shall have self-grounding straps which are UL approved for installation without the bonding jumper described above. Only these receptacles listed hereinafter shall be used:

   b. Hubbell Cat. #5362-I (change suffix as required for color) or equal by Arrow-Hart, Bryant, Leviton, or P&S.

   c. Receptacles shall be installed with the "U" grounding contact at the bottom. Where receptacles have to be mounted horizontally, they shall be installed with the neutral contact at the top. All receptacles shall be marked with the panel and circuit number, with indelible marker, on back of cover plate. Refer to Drawings for circuit numbers.

2. Duplex ground fault circuit interrupting (GFCI) receptacles shall be installed at locations indicated on the plans and as required by Code. Installation requirements shall be same as specified for duplex convenience receptacles. GFCI receptacles shall be Hubbell Cat. #GF5362-I (change suffix as required for color) or equal by Arrow Hart, Bryant, Leviton or P&S.

3. Weatherproof convenience outlets shall consist of a duplex ground fault circuit interrupting type receptacle as herein before specified mounted on a 4" square box with a single gang plaster or tile ring, as required, and spring door type cover. Cover shall be Hubbell Cat. #RCV1-GFR or equal by Arrow Hart, Bryant, Leviton or P&S.

4. On exposed conduit runs, weatherproof convenience outlets shall be duplex ground fault circuit interrupting type as hereinbefore specified, installed in cast, weatherproof outlet box (or flush outlet box) with Hubbell Cat #RCV1-GFR Spring Door Cover.

2.06 LOCAL SWITCHES

A. Circuit switches shall be color as directed by Architect, totally enclosed bakelite, or composition base, toggle type with 277 V.A.C. rating for full capacity of contacts for incandescent or fluorescent lamp loads. Switch ratings shall be 20 ampere only. Switches shall be back and side wired.

B. Listed below are switches, only, which are approved:
(Ivory switches are listed - change suffix as required for color as determined by Architect)

1.

Single Pole Switches	Toggle Type	Lock Type
Hubbell	#1221-I	#1221-L

or equal by Arrow Hart, Bryant, P&S, or Leviton

2. Double Pole Switches Toggle Type Lock Type
Hubbell #1222-I #1222-L
or equal by Arrow-Hart, Bryant, P&S, or Leviton

3. Three Way Switches Toggle Type Lock Type
Hubbell #1223-I #1223-L
or equal by Arrow Hart, Bryant, P&S, or Leviton

2.07 PLATES

A. Furnish and install Pass & Seymour "Sierra", Type 302 stainless steel, plates, on all outlets for local switches, receptacles, pushbuttons, etc., or equal by Hubbell, except as follows:

1. See the sections on receptacles and switches for weatherproof plates.

2. For boxes on exposed conduit work furnish and install 1/2 inch raised galvanized iron surface type plates by same manufacturer as the outlet box.

B. Stainless Steel Plates shall be supplied for every local switch, receptacle, telephone outlet, data outlet, T.V. outlet, etc..

C. All plates shall be furnished with 3/16 inch high engraved or etched letters under any one of the following conditions:

1. Three gang larger gang switches.

2. Switches in locations from which the equipment or circuits controlled cannot be readily seen.

3. Where so indicated on the Drawings for special outlets.

4. Manual motor starting switches.

Plates shall be engraved directly. Separate engraved nameplates attached to plates are not acceptable.

D. Furnish and install blank plates (stainless steel) on all outlets installed for future devices and on all outlets installed as junction boxes.

E. Mount switch and receptacle devices in a vertical position, unless indicated otherwise, or approved to comply with job conditions.

F. Label every switch and receptacle outlet plate, indicating the panel designation and circuit number supplying the receptacle or switch, using indelible marker on the back side of each plate; or with label maker (dymo), then made permanent with clear tape over label.

G. Do not install interchangeable or combination switch/receptacle devices except with prior approval.

H. Install adjacent devices of the same type and with the same mounting height in a common outlet box. Install adjacent devices of different types in the same manner when a common mounting is indicated.

I. Prior to installation of switch outlets, examine architectural plans and verify locations. Place switches in the wall at the latch side of the door, except in glass walls. Where glass walls occur, place switches on hinge side of door to clear door swing by 6 inches.

J. Coordinate the electrical work with the work of other trades to ensure that wiring device flush outlets are positioned with box openings aligned with the face of surrounding finish material.

2.08 COLORS - DEVICES

A. All devices shall be of colors as selected by the Architect from the manufacturers standard colors. Different colors may be selected for different areas. Contractor shall coordinate color selection with Architect.

2.09 NAMEPLATES

A. Electrical Distribution System Equipment.

1. Provide black-on-white laminated plastic engraved nameplates for each switchboard, panel, terminal cabinet, control center, disconnect switch and magnetic motor starter to correspond with designations on the drawings and the nameplate schedule. Nameplates shall be secured with screws, bolts or rivets. Other means of attachment shall not be accepted. "DYMO" type labels will not be accepted.

2. Laminated plastic engraved nameplates shall be furnished for: All line voltage heating and ventilating control panels, transformers, sump and sprinkler alarms, doorbells, pilot lights, disconnect switches, magnetic and manual starting switches furnished by this contractor. Remote disconnect switches at motors shall have nameplates.

3. Each motor disconnect shall have an engraved nameplate to show the equipment name and feeder or circuit number, attached to the unit or equipment.

4. Name plates shall adequately describe the function of the particular equipment involved. Where name plates are detailed or described on the Drawings, the inscription and size of letters shall be as indicated. For terminal cabinets, the name plates shall indicate the system housed therein.

5. Name plates shall be black and white nameplate stock of bakelite with characters cut through the black exposing the white. Plates shall have beveled edges and shall be securely fastened in place with # 4 Phillips head, cadmium plated steel, self tapping screws. Characters shall be 3/16" high unless otherwise indicated.

B. Medium Voltage Cables and Equipment.

1. Cables in manholes, vaults, and where exiting a building, regardless of size, shall have brass cable identification tags at least 1 inch by 3 inches in size and 0.063 inches thick. Lettering on each tag shall be engraved at least ¼ inch high. As an alternate, reflective vinyl markers such as Panduit PRL150BY, black legend with yellow background, may be used when applied to a heavy vinyle sheeting and attached with tie wrap at four points.

2. MV Cable Tags shall be connected to cables by non-ferrous cable ties and include the following minimum information:

a. Circuit Identification as per drawings.

b. Phase of each conductor by letter (A,B,C)

c. Phase by Color Code

1) A = Black Tape – 1 ring

2) B = Red Tape – 2 rings

3) C = Blue Tape – 3 rings

3. Both ends termination point of cable segment; e.g., East Sub, Cubicle 3 & MH102.

4. An embossed brass tag with manhole number shall be permanently mounted inside the manhole and legible from outside the manhole with the cover removed.

C. Low Voltage Identification

1. Equipment Nameplates shall be engraved three-layer laminated plastic with white background and black letters. Letters shall be ¼" minimum size. Identifications shall match plan designations.

D. Telecommunications, Signal, Alarm, and Control Wiring

1. Conductors terminated or spliced in terminal cabinets, pull and junction boxes, devices, and control panel, racks or backboards shall be labeled on each end and at splices with "E-Z-Markers"

E. Conduit

1. Conduit installed below grade shall have Underground Hazard Tape (non- adhesive) installed a minimum of 12 inches above the conduit or top layer of conduits in a duct bank. The tape shall be 6 inches wide and 4 millimeters thick yellow polyethylene for low voltage conduits and red for medium voltage conduits. The tape shall be marked "Caution Buried Electric Line" for low voltage and "Danger High Voltage Line" for medium voltage. Tracer wire shall be used for PVC conduits and non-metallic tape for metallic conduits. The tape shall be installed the entire length of conduit below grade.

2. Conduits and raceway systems above grade containing emergency system and fire alarm wiring shall be identified and conduits painted red.

F. Wire Identification

1. Provide wire markers on each conductor in panelboards, gutters, pull boxes, outlets and junction boxes, and at load connections. Identify branch circuit or feeder number for power and lighting circuits, and control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

G. Panelboard Directories

1. Provide typewritten directories arranged in numerical order showing number of room in which each device is located.

2. Verify room numbers to be used with the school prior to typing. Room numbers will mist likely not be those shown on the Drawings.

3. Mount directories under a clear plastic cover inside each panelboard door.

2.10 RELAYS AND CONTACTORS

A. The contractor shall furnish and install all interlock relays and contactors as indicated or required.

B. All relays and contactors installed in panelboards, switchboard sections, relay cabinets or control cabinets, may be open type if adequately isolated and barriered as required by Code.

C. All wiring to relays , and contactors shall be make up on terminal strips and shall be neatly formed and laced.

2.11 TIME SWITCHES

A. Where indicated on the plans, furnish a time switch mounted in the panelboard cabinet, behind a separate locking door. If so noted on the Drawings, the time switch shall be furnished with a separate NEMA 1 or NEMA 3R enclosure. Time switch shall be 24 hour type, 3 pole, single throw, with spring wound carry-over and astronomic dial. Intermatic V45000CR series.

2.12 FIRE RESISTANT SEALANT

A. Each and every penetration through a fire rated floor or wall (even if not specifically indicated or noted on the Electrical Drawings) shall be sealed to maintain the fire resistive nature of the structure. The sealant shall be UL classified and meet California Electrical Code Article 300-21.

B. The sealant shall be as manufactured by 3-M Fire Detection Products. The contractor shall apply the proper 3M system according the type and size of penetration. All materials shall be installed according to the manufacturers detailed instructions.

C. The finished barrier shall be water and smoke tight.

2.13 KEY AND LOCKS

A. The Contractor shall provide two keys with each door lock furnished, including cabinet door locks, switchboard locks, etc.; and shall provide two keys for each lock switch on a switchboard or control panel; and shall provide two keys with each interlock or other lock switch he furnishes. Deliver keys to the Owner's Inspector. Unless otherwise specified, keys shall be Corbin 60.

B. Locks shall be keyed to a Corbin 60 key for access to operate the equipment and Corbin 70 key for service access. Special keys and locks shall be provided where specified.

PART 3 EXECUTION

3.01 GENERAL

A. The drawings indicate diagrammatically the desired location or arrangement of conduit runs, outlets, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome difficulties owing to space limitations or interference of structural conditions wherever encountered. It shall be the Contractor's responsibility to verify and coordinate the location of all outlets and lighting fixtures with the architectural, structural and mechanical drawings. Architectural elevations and reflected ceiling plans shall generally take precedence. However, in the event of large

variations between architectural and electrical drawings the Architect shall be consulted for instruction.

B. In the event changes in the indicated locations or arrangements are necessary due to developed conditions in the buildings' construction or rearrangement of furnishings or equipment. Such changes shall be made by the Contractor without extra cost, providing the change is ordered before the conduit runs, etc., and/or work directly connected to the same is installed, and no extra materials are required.

3.02 ELECTRICAL EQUIPMENT CONNECTIONS

A. All electric outlets, devices and equipment shall be installed and fully connected to the electric circuits.

B. All motors shall be fully connected to the electric circuits. Manual and magnetic starters shall be installed and completely connected to the equipment.

C. The Contractor shall furnish all necessary flexible, conduit, connectors, receptacles caps, cords, and other equipment that may be required for the proper connection of all equipment.

D. All motors and equipment outlets, in damp locations and in locations exposed to weather shown connected by flexible conduit from junction boxes shall be connected by "THW" wire in weatherproof flexible conduit.

E. If the connection is from a flush wall-mounted junction box, install a weatherproof universal box extension and adapter by Bell Electric Company, and extend with rigid steel conduit.

F. All exposed final connections to equipment shall be by a water tight flexible metal conduit, unless otherwise indicated. A maximum of 24" of flexible metal conduit may be used.

G. Connections to all wiring devices shall be made with “pigtails” to the device from the branch circuit wiring. No “through” wiring of any devices will be allowed. Integrity of the circuit shall not be dependent upon the integrity of the device.

3.03 GROUNDING

A. Grounding shall be executed in accordance with all applicable codes and regulations of the State of California, and as noted on the drawings.

B. A green insulated copper equipment ground wire, sized per table 250-95 of CEC shall be provided with <u>each</u> feeder or branch circuit operating over 50 volts to ground. This ground wire shall be used for the grounding of all equipment. Every feeder and branch circuit conduit (including lighting) shall include an equipment ground conductor. EG Conductor shall be installed entire length of all branch circuits and shall be bonded to each box and device in the circuit.

C. Ground conductors for branch circuit wiring shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws, 6-32 or larger. Where non-metallic raceways are used, the equipment ground conductor shall be connected directly to the ground terminal on the device with a pigtail. Do not wire “through” any device, use pigtails for all device connections.

D. Each panelboard, switchboard, pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall be equal to the phase bus size and shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

3.04 LOCATIONS

A. Contractor shall verify exact locations of all outlets prior to installation.

B. Heights: Heights of all outlets shall be verified with Architect to coordinate with case- work and furniture requirements. Refer to elevations on Architectural Drawings for heights and locations of case-work and furniture.

3.05 BOXES - INSTALLATION AND SUPPORT

A. Outlet boxes shall be flush with finished surface of wall or ceiling. They shall be plumb and securely fastened to the structure independent of the conduit. Except where otherwise indicated, factory made bar hangers shall be used to support outlet boxes.

B. Outlet boxes installed in ceilings suspended or furred with steel runner and/or furring channels shall be supported, except where otherwise indicated, by a Unistrut #P-4000 channel spanning the main ceiling runner channels. Each box shall be supported from its channel by a 3/8"-16 threaded steel rod with a Unistrut #P-4008 nut and a Tomic
#711-B Adapta-Stud. The rod shall be tightened to a jamb fit with the channel and its nut. The box shall be locked to the rod by means of a 1/2" locknut on the stud and a
3/8"-16 hex nut locking the stud to the rod.

C. The heights of outlets and equipment indicated on the Drawings shall govern, but in the absence of such indications, the following heights shall be maintained. (Heights are to centerline unless otherwise noted) : (a) manual pull stations, light switches, other switches, 4’-0"; (b) Terminal cabinets, 6'-6" to top; (c) Fire alarm visual; 80" to bottom of lamp; fire alarm horn, 96".

3.06 TESTING

A. The Contractor shall furnish all necessary instruments and equipment required for making tests and shall make test of all wiring for shorts, open circuits, grounds, etc., and shall immediately correct any defective work.

B. When the entire installation has been completed and all lighting fixtures installed, test out all circuits and switching, and demonstrate that the operation of the system is in accordance with the Contract Documents.

END OF SECTION

SECTION 16110

RACEWAYS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit materials

B. Rigid steel conduit and fittings

C. Electrical metallic tubing

D. Flexible metal conduit

E. Liquidtight flexible metal conduit

F. Nonmetallic Conduit

G. Fittings

H. Expansion joints

I. Sleeves for conduit

J. Surface raceway

K. Multichannel nonmetallic surface raceway

L. Cable tray systems

1.02 RELATED SECTIONS

A. Division 1: GENERAL REQUIREMENTS

B. Division 2: SITE WORK

C. Division 3: CONCRETE WORK

D. Division 15: MECHANICAL

E. Division 16: ELECTRICAL

1.03 REFERENCES

A. California Building Code (CBC)

B. California Electric Code (CEC)

C. National Fire Protection Association (NFPA) Standards

D. California State Fire Marshal (CSFM)

E. National Electrical Contractors Association (NECA)

F. American National Standards Institute (ANSI)

G. National Electric Manufacturer's Association (NEMA)

H. City, State and other local codes and requirements as applicable

1.04 SUBMITTALS

A. Section 01300 - Submittals: Procedures for submittals.

B. Provide materials list for all conduit, fittings, surface raceways, etc. List shall indicate Manufacturer, Catalog # and all options, accessories etc. of actual items to be provided.

C. Cable Tray Systems:

1. Product data for cable tray products.

2. Shop Drawings: Layout floor plans and elevations showing cable tray system. Designate components and accessories including clamps, brackets, hanger rods, splice plates connectors, expansion joints assemblies, straight lengths and vertical and horizontal fittings. Show accurately scaled components and spatial relationship to adjacent equipment. Show tray types, dimensions and finishes.

1.05 SUMMARY

A. The work of this section shall include all services, labor, materials, transportation, equipment, plant and facilities to furnish and install all raceways and accessory items indicated on the drawings and specified herein.

B. Examine all other sections for work related to those other sections and required to be included as work under this section.

C. General provisions and requirements for electrical work.

D. Comply with requirements of California Administrative Code Title 24, California Electrical Code and all other codes referenced herein.

1.06 CONDUITS GENERAL

A. All wiring of every description shall be installed in conduit (or surface raceway where noted). Conduit shall comply with the requirements of the Underwriter's Laboratories and shall be delivered to the site in standard lengths with each length bearing the manufacturer's trademark or stamp and the Underwriters' label of approval. Where conduit is mentioned in this specification, this shall be interpreted as rigid, standard weight steel conduit. Electrical metallic tubing, poly-vinyl-chloride (PVC), or flexible metal conduit may be used only where specified herein or noted on the drawings.

B. Marking: Each length of conduit, elbow, bend and nipple shall be marked in accordance with the requirements of Underwriter's Laboratories.

C. Cutting: Standard cutting tools shall be used on 1-1/2" or larger. A hacksaw shall be used on 1-1/4" and smaller. All cut ends shall be reamed to remove burrs and sharp edges.

D. Threading: Use clean sharp dies with standard trademarked cutting oils. Care shall be taken to avoid excessive thread length.

E. Bending: Standard hand and power benders shall be used except that EMT hand benders one size larger than conduit (for 1" or smaller conduit) may be used instead of standard hickeys. For mechanical, and or power hydraulic benders, use the same shoes as for steel conduit.

F. Joining: A suitable petroleum base lubricant containing powdered zinc shall be applied to all field cut threads to facilitate joining of conduit. Red lead will not be permitted.

G. Fishing and Pulling: Fishing of conduit shall be accomplished by means of flexible round metal tapes, or polyethylene ropes. These fishing devices or nylon or manila ropes shall be used for pulling conductors. Where extremely difficult pulling conditions are encountered, an approved wire lubricant may be used.

1.07 CONDUIT ONLY

A. All conduits that are installed at this time and left empty for future use or where conductors are to be installed by the representative of the signal system manufacturer, shall have a pull line left in place for future use.

B. A pull line shall be furnished and installed in every empty conduit installed for future conductors or for future use.

C. All empty conduits, including conduit stubs, shall be tagged at both ends with stamped brass tags marked as shown on the drawings or as directed.

1.08 EXPANSION JOINTS

A. Where conduit passes from one type of construction to another, or where there is a possibility of dissimilar movements, a suitable flexible or expansion device shall be installed.

B. Expansion joints are also required when the distance in feet X temperature rise in degrees F = minimum of 10,000 degree feet. When the resulting degree feet is over 10,000 an expansion fitting shall be used.

EXAMPLES

Distance = 120 feet	Distance = 170 feet
Temp. change = 60 degrees	Temp. change = 70 degrees
120 x 60 = 7,200	170 x 70 = 11,900
No Expansion fitting needed	Expansion joint needed

PART 2 PRODUCTS

2.01 CONDUIT MATERIALS

A. Metallic conduit and tubing shall be manufactured under the supervision of UL, Factory Inspection and Label Service Program. Each 10 foot length of conduit and tubing shall bear the UL label and manufacturer's name.

2.02 RIGID STEEL CONDUIT AND FITTINGS

A. Rigid steel standard weight conduit shall be zinc coated on the exterior and may be zinc or enamel on the interior. Couplings and locknuts, etc., shall be hot dipped galvanized or sherardized. All couplings, fittings, connectors, etc., shall be of the threaded type only.

B. Bushings for standard weight rigid steel conduit shall be non-metallic for 1" and smaller. For conduits 1-1/4" and larger, insulated metallic bushings shall be used. Bushings shall be O.Z. Electrical Mfg. Co., Type "B", regular type or Type "B" grounding type.

C. Rigid steel conduit shall be Jones Laughlin, National Electric, Pittsburgh, Rome, Youngstown Sheet and Tube, Walker, Triangle, Steelduct or Western Tube and Conduit, sherardized, zinc metallized, or hot dip galvanized, threaded type.

2.03 ELECTRICAL METALLIC TUBING

A. Electrical metallic tubing shall be galvanized or sherardized. Couplings and connectors shall be galvanized or cadmium plated and shall be of the compression type only.

B. Electric metallic tubing (EMT) shall be by the same manufacturer as listed for rigid conduit. All connectors and couplings for EMT shall be of the threadless, rain-tight, gland compression type as manufactured by General Electric or equal. Crimp-on or set screw type connectors are not acceptable.

2.04 FLEXIBLE METAL CONDUIT

A. Flexible metal conduit shall be of flexible interlocking steel strip construction with continuous zinc coating on the strips. Connectors and couplings shall be approved fittings of the type that thread into the convolutions of the flexible conduit.

B. Flexible metal conduit shall be hot dipped galvanized steel and shall have all fittings hot dipped galvanized or sherardized.

C. Flexible conduit shall be by one of the manufacturers listed for rigid conduit. "Jake" connectors shall be provided. Set screw type connectors are not acceptable. Connectors for flexible steel conduit shall be the type that threads into the convolutions of the conduit.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Liquid-tight flexible metal conduit shall be galvanized, heavywall, flexible locked steel strip construction with a smooth moisture and oil proof, abrasion-resistant, extruded plastic jacket. Connectors shall be approved for use with liquid-tight flexible conduit and shall be installed to provide a liquid-tight connection.

2.06 NON METALLIC CONDUIT

A. Nonmetallic conduit shall be rigid PVC electrical conduit extruded to Schedule 40 dimension Type II, Grade 1, high impact, polyvinyl chloride. Sweeps, couplings, reducers and terminating fittings shall be UL listed and shall bear the manufacturer's listed marking.

B. Straight lengths of PVC plastic conduit shall be Carlon, Pacific, Western, Baldwin, Stauffer Chemical Co., B.F. Goodrich or Triangle.

C. PVC elbows, off sets, and all other non-straight lengths shall be Schedule 80, extra heavy wall Type III by manufacturers listed above.

D. Fittings shall be non-tapered and non-threaded type and shall be attached with solvent cement.

E. Solvent cement shall conform to ASTM D2564 for joining Type II and Type III and shall be supplied by PVC conduit manufacturer.

2.07 FITTINGS

A. Furnish and install Appleton or Crouse-Hinds fittings, special devices and materials which may be required for the proper installation of the conduit systems. Factory ells shall be of the same make, quality and finish as the conduit used. Cast Metal "Condulet" fittings, or boxes shall be used for exposed conduit runs to make right angle turns around beams or columns, or on mechanical equipment.

B. Conduit bushings shall be Thomas and Betts Company No. 220 Series, plastic type. Grounding bushings shall be Thomas and Betts Company No. 3800 Series. Special fittings, such as ground

fittings, shall be furnished as noted or required. Expansion fittings shall be O.Z. Electrical Products Type "AX".

2.08 EXPANSION JOINTS

A. Where conduits embedded in masonry or concrete cross seismic separations between buildings, expansion joints, or at locations indicated, the Contractor shall provide a sliding or a sliding and deflecting fitting, as conditions require, in each conduit. Sliding fittings shall be O-Z Electrical Mfg. Co. Inc. Type AX, with bonding strap and clamps. At exterior locations use O-Z Electrical Mfg. Co. Inc. Type EX.

2.09 BUSHINGS

A. Bushings shall be non-metallic for 1" and smaller conduit. For conduits 1-1/4" and larger, insulated metallic bushings shall be used. Bushings shall be O.Z. Electrical Mfg. Co., Type "B", regular type or Type "B" grounding type.

2.10 SLEEVES FOR CONDUIT

A. Sleeves shall be adjustable type, of 26 gage galvanized iron, Adjusto Crete Co., Adjus-to-Crete, or Jet Line Products Inc., Jet-Line.

2.11 SURFACE RACEWAY

A. Provide surface raceway as indicated on the Drawings and paint to match surfaces where installed. Raceways shall be painted black within the planetarium area. The surface raceway shall be manufactured by the Wiremold Company, unless otherwise indicated. Provide toggle bolts or red head anchors to support surface raceway, plastic anchors are not acceptable. Wiremold type bushings shall be installed at each end of all Wiremold runs.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Provide complete and continuous systems of rigid steel conduit, outlet boxes, junction boxes, fittings and cabinets for power and signal systems, except as otherwise specified.

B. Each conduit stubbed up through a roof or an arcade shall be flashed as directed by the Architect. Refer to appropriate section of specifications.

3.02 RIGID STEEL CONDUIT

A. Rigid steel standard weight conduit shall be exclusively used for all runs underground, outside of building exterior walls, in masonry or concrete walls and slabs, exposed to the weather, or exposed (exterior <u>and/or</u> interior) below 10'-0" above finished floor, exposed where subject to mechanical injury and in all locations in size 2 1/2" or larger.

B. Bushings for all sizes of rigid steel conduit shall be threaded insulating type. Set screw bushings are not acceptable.

3.03 ELECTRICAL METALLIC TUBING

A. Electrical metallic tubing (EMT) may be used for branch circuiting above suspended ceilings, exposed subject to requirements of rigid conduit, and in sizes 2 inch and smaller subject to requirements of rigid steel conduit. EMT shall <u>not</u> be used in the following locations:

1. Outdoors, including under covered walks and roof overhangs.
2. Exposed interior conduits mounted less than ten (10) feet above the finished floor.

3. Exposed exterior conduit regardless of mounting height.
4. In concrete
5. Underground
6. In runs longer than 100'
7. In conduit sizes greater than 2".

3.04 FLEXIBLE METAL CONDUIT

A. Flexible metal conduit shall be used only for making motor connections, conduit drop from remote junction boxes to fixtures installed in the suspended ceiling, and as specifically noted on the Drawings. Flexible metal conduit shall not be used in the following cases: For runs longer than 6 feet; at exposed locations; for all conduit size 1-1/4" or greater.

B. All flexible conduits shall be cut square and not at an angle.

3.05 NON METALLIC CONDUIT

A. Nonmetallic conduit (PVC) may be used below grade in lieu of rigid steel conduit. Wherever PVC conduit is used outside of building lines, the PVC shall be encased with 3 inches (min) of concrete. All risers and bends at risers shall be rigid steel conduit.

3.06 INSTALLATION OF CONDUIT

A. All conduit shall be run concealed, except in certain approved and indicated locations. All control apparatus, outlet boxes, junction boxes and pull boxes, etc., shall be installed so as not to interfere with any piping, fixtures or equipment.

B. All exposed conduit runs shall not be installed below the minimum height directed by the Architect. The minimum height includes the bottom of any conduit rack or hanger. Where heating and ventilating ducts are installed with the bottom of the duct at the minimum height, the electrical conduit runs shall be saddled above the top of the ducts. Any conduit run installed below the minimum height will be relocated by the Contractor without any cost to the Owner.

C. 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 the building, and when installed in interior corridors, shall be mounted tight in corner at the ceiling. Conduits shall be routed to clear access openings.

D. All exposed conduit shall be run vertically and horizontally following the general configuration of the equipment, using cast threaded hub conduit fittings where required and shall be clamped to the equipment with suitable iron brackets and one hole pipe straps.

E. Conduit shall not be run through any structural member of the building, except as specifically directed by the Structural Engineer. Under no circumstances shall conduit run through column footings or grade beams, without specific permission.

1. Where conduits are to pass through or will 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, to accommodate the electrical work, such work shall conform to California Building Standards Code, Title 24, Part 2, Section 2606 for conduits and pipes embedded in concrete and 2517 for notches and bored holes in wood.

F. Run die over all factory threads and see that they are perfectly clean and free from all coating material so that they will make perfect metallic contact with the fittings. No running threads will be permitted.

G. Bends in conduit one inch and larger shall be made with standard conduit ells. Not more than four 90 degree ells, or bends or the equivalent, shall be used on any single run of conduit, except conduit for telephone cable shall have not more than three 90 degree bends, or the equivalent, without specific permission.

H. Bends or offsets will not be permitted unless absolutely necessary. Bends and offsets shall be made with standard tools and equipment made especially for the purpose or may be factory made bends or elbows complying with the requirements for radius of bend specified as follows:

1. 11/2" Conduit 18" minimum radius

2. 2" Conduit 24" minimum radius

3. 3" Conduit 36" minimum radius

4. Conduit bends not specified above shall have a radius that is not less than 10 times trade size of conduit.

I. It shall be the responsibility of the Contractor to install the conduits with a minimum number of bends in such a manner as to conform to the structure and meet all applicable code requirements.

J. Provide approved conduit unions where union joints are necessary.

K. Conduit shall be kept at least 6" from the covering on hot water and steam pipes and 18" from flues and breechings.

L. The open ends of conduits shall be kept closed with approved conduit seals during construction of the buildings and during the installation of underground systems.

M. The joints in conduits installed in concrete, wet locations, exposed to the weather or underground shall be made liquid tight. The conduit threads shall be filled with approved pipe joint compound before screwing into couplings and threaded fittings.

N. Conduit installed on fan units or other equipment shall not obstruct any removable panel, access door, or control devices.

O. All conduit to be installed in concrete work shall be carefully laid out and rigidly supported in the forms in such a manner as to provide proper clearances and so that all boxes and outlets will be in exact locations after concrete has set and forms have been removed.

P. All couplings, elbows, and special fittings, installed in conduit runs with the shop applied protective coating shall be furnished by the same manufacturers as the conduit and shall have the same shop applied PVC coating.

Q. All PVC coated conduit, with damage to the PVC coating, such as wrench marks, shall be repaired according to the recommendations of the manufacturer.

R. The routing of all conduit runs, except runs installed in a concrete slab or below grade, shall be laid out before starting the run, so that the completed runs will be parallel with the building structure and without unnecessary offsets or bends. Conduit work installed that does not conform to acceptable workmanship standards in the opinion of the Architect, shall be removed and replaced without cost to the Owner.

S. Conduit runs installed above suspended ceilings shall be fastened to or supported against the underside of the structure above with vertical drops to the outlet boxes, partitions or devices. Conduit above suspended acoustical ceilings shall <u>not</u> be secured, or fastened to, or installed or laid on the ceiling channels.

T. Conduit installed in concrete slabs shall be laid out to avoid excessive bunching or crossovers, and shall be installed near the center of the slab. Parallel conduit runs shall be separated by a minimum of one inch. All conduit runs in concrete slabs shall be securely tied down to the reinforcing steel.

U. Conduit runs, supported on conduit racks, or fastened to the building structure, must have a section of flexible conduit where the run terminates in a box, fitting or device, on fan units, air ducts, pumps, heaters, transformers or refrigeration equipment that vibrate during normal operation.

V. Conduit bushings shall be installed on the end of every conduit run in outlet boxes, panelboards, terminals or switchboards.

W. Upon completion of any run of conduit, test the run and see that it is free from all obstructions. Plug each end with conduit pennies and bushings and leave plugged until ready to pull wires.

X. Exposed conduit stubbing up through floor slab into bottom of surface mounted panels, cabinets or equipment shall be lined up, properly spaced, and shall be straight and plumb. Conduits shall be installed at a sufficient depth below slab to eliminate any part of the bend above top of slab. All risers and bends at risers shall be rigid steel conduit.

Y. All conduit stub-ups shall be wrapped with tape from a point 2" below the top of slab, to at least 3" above slab. Tape shall be removed after slab had been cured.

Z. Where conduits are terminated in groups at switchboards, panelboards, signal cabinets, etc., provide templates or spacers to hold the conduits in proper position and to preserve alignment. Conduits terminating at signal cabinets shall enter the cabinets in the following approved locations only: Conduits entering the top, side, and bottom of the cabinets shall be aligned in a single row, centered 2" from the rear of the cabinet; conduits entering the back of the cabinet shall be aligned in a single row centered 2" from the top of the cabinet. Conduits shall not be spaced closer than 3" on centers.

AA. The routing of conduits may be changed if approved by the District Inspector, providing the length of any conduit run is not increased or decreased more than 10% of the length shown on the Drawings.

3.07 ADDITIONAL REQUIREMENTS FOR UNDERGROUND CONDUITS:

A. All conduits installed underground shall be entirely encased in concrete 3" thick on all sides with multiple conduits spaced not less than 1-1/2" apart, except where otherwise specified. Provide approved conduit spacers as required to prevent any deflection of the conduits when concrete is placed and to preserve the position and alignment of the conduits in the concrete. Conduits shall be tied to the spacers. Anchors shall be installed to prevent floating of conduits during pouring of concrete.

B. All underground conduits shall be buried to a depth of not less than 24" below finished grade to the top of the concrete envelope, unless otherwise specified. All underground conduits shall be a minimum size of 1”.

C. Assemble the sections of conduit with approved fittings and stagger all joints. Cut ends of conduit shall be reamed to remove all rough edges. The joints in all conduits shall be made liquid tight. All bends at risers shall be completely below the surface where possible. All risers and bends at risers shall be rigid steel conduit.

D. Two or more conduit runs in a common trench shall be separated by at least 1-1/2" of concrete. Electric conduit runs installed in a common trench with other utility lines shall be separated from such lines by at least 12" horizontally. Public telephone conduits shall be separated from electric conduits or other utility lines by not less than 3" of concrete.

E. The Owner's Inspector shall be called to the site for approval of all underground installations before and during concrete pour. Where considered necessary by the Inspector, a mandrel shall be drawn through each run of conduit in the presence of the Inspector, before and after pouring concrete. The mandrel shall be 6" in length minimum, and have a diameter that is within 1/4" of the diameter of the conduit to be tested.

F. Nonmetallic conduit installations shall comply with the following additional requirements: All joints in PVC conduit shall be sealed by means of approved solvent-weld cement supplied by the conduit manufacturer. All nonmetallic conduit bends and deflections shall comply with the requirements of the applicable Electrical Code, except that the minimum radius of any bend or offset for conduits sized from 1/2" to 1-1/2" inclusive shall not be less than 24". All bends at risers and the risers themselves shall be rigid steel conduit and shall comply with the requirements specified herein for underground rigid steel conduit installations.

G. Rigid steel conduit installations shall comply with the following additional requirements: Conduit threads shall be filled with approved pipe joint compound before screwing into couplings. The couplings, adjacent conduit on each side of the couplings, and all wrench abrasions shall be painted with asphaltic compound. Where sweeps are specified or indicated the radius shall be not less than 10'. The radius of the curve of the inner edge of any bend or offset shall be not less than is permitted in the Conduit Bend Radii table for rigid steel conduit field bends in the applicable Electrical Code, unmodified by any exemptions, bulletins, or amendments.

H. All steel conduit installed underground in direct contact with the earth shall have a shop applied polyvinyl chloride (PVC) coating as furnished by Kor-Kap, Jones and Laughlin, Republic Steel, or Pittsburgh Standard Conduit Co. The PVC coating shall have a minimum thickness of 20 mils.

I. Penetration in Concrete Walls.

Sleeves shall have 1/2" clearance around conduits. Where conduits pass through walls below grade, caulk with approved sealant and backer materials to obtain a watertight joint.

J. Where a concrete encasement for underground conduit abuts a foundation wall or underground structure which the conduits enter, the encasement shall rest on a haunch integral with the wall or structure, or shall extend down to the footing projection, if any, or shall be doweled into the structures unless otherwise indicated. Underground structures shall include manholes, pull **boxes, vaults and buildings.**

3.08 SUPPORT OF CONDUIT AND OUTLETS

A. Outlet boxes shall be accurately placed, independently and securely fastened to the structure, and in concealed work shall be set flush with finish surface of walls or ceilings.

B. General Electric, or equal, bar hangers fitted with fixture studs shall be used to support outlet boxes in stud partitions.

C. Exposed conduit one inch and smaller shall be supported to building construction with TB, or equal, two hole pipe straps spaced at a maximum of 10 foot intervals and in all cases with a support not more than 3 feet from the outlet and where conduit changes direction. Straps shall be as manufactured by Thomas Betts, Gedney, Efcor, Bowers, Rayco or General Electric.

D. Support shall be by expansion shields or inserts in masonry or concrete. Perforated strap iron shall not be used.

E. Conduits larger than one inch shall be suspended on pipe racks with Grinnel No. 107-B, or equal, split ring hangers and rods from concrete inserts.

F. Multiple conduit runs may be supported by pipe racks, constructed of Unistrut Cat. P1000 channel, or equal by Kindorf, Super Strut or Powerstrut, supported by two 3/8 inch minimum, steel rods, with split type pipe clamps.

G. One inch and smaller conduits above metal lath ceilings shall be tied to the ceiling channels. 1-1/4" and larger conduits above metal lath ceilings shall be rigidly suspended with pipe hangers or pipe racks or shall be secured to the superstructure with factory made pipe straps. Conduits in metal lath or steel stud partitions, shall be tied to the furring channels or the studs. In ceiling spaces and in partitions, tie wires shall be spaced not more than 5' apart, shall hold the conduit tight against the channels and studs at the point of tie and shall not bear any of the weight of the conduit. Tie wire shall be 16 gage galvanized double annealed steel tie wire.

H. Where auxiliary supports, saddles, brackets,, etc., are required to meet special conditions they shall be made rigid and secure before the conduit is attached thereto.

I. Conduit in ceiling spaces, in stud walls and under floors shall be supported with factory made pipe straps or shall be suspended with pipe hangers or pipe racks. The pipe straps shall be attached to and shall hold the conduit tight at the point of support against the ceiling and floor joists, rafters, and wall studs, or 2" x 4" headers fitted between the joists or wall studs.

J. Conduits installed on exposed steel trusses and rafters shall be fastened with factory made conduit straps or clamps which shall hold the conduit tight against the supporting member at the point of support.

K. Conduits under buildings shall be strapped with factory made conduit straps to the underside of concrete floor or joists, or wood floor joists, or shall be suspended with pipe hangers or pipe racks. Conduits under the building shall not rest on the ground but shall be suspended from the building or shall be buried below the surface of the ground. 1" and larger conduits under buildings shall be suspended with conduit hangers or racks.

L. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. The pipe ring shall be malleable iron, split and hinged, and shall securely hold the conduit, or shall be springable wrought steel. Rings shall be bolted to or interlocked with the suspension rod socket. Rods shall be 3/8" for 2" conduit hangers and smaller and shall be 1/2" for 2-1/2" conduit hangers and larger.

M. 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, or Unistrut # P-1000 suspended with a 3/8" minimum diameter steel rod at each end. Each rod shall be fastened with nuts, top and bottom to the cross channel and with a square washer on top of the channel. Each conduit shall be clamped to the top for the cross channel with conduit clamps, Steel City Kindorf # C-105 or Unistrut Nos. P-1111 through P-1124. Conduits shall not be stacked one on top of the other, but a maximum of two tiers may be on the same rack providing an additional cross channel is installed. Where a pipe rack is to be longer than 18" or if the weight it is to support exceeds 500 pounds, submit details of the installation to the Architect for approval.

N. Conduits which are suspended on rods more than 2' long shall be rigidly braced to prevent horizontal motion or swaying.

O. Factory made pipe straps shall be two-hole formed galvanized clamps, heavy duty type, except as otherwise specified.

P. Hangers straps, rods, or pipe supports under concrete shall be attached to inserts drilled into the concrete. Under wood use bolts, lag bolts, or lag screws; under steel joists or trusses use beam clamps.

Q. Conduits shall be supported at intervals required by ordinance, but not to exceed 5'. A minimum of 2 supports shall be provided for every 10' length of conduit. A support shall be provided within 3' of each fitting. This requirement exceeds the "code minimum"; it is a Owner Standard and will be strictly enforced. 1" and smaller conduits installed exposed shall be fastened with one-hole malleable iron straps. Perforated strap and plumber's tape shall not be used in the support of conduits.

3.09 PENETRATIONS IN FIRE RATED STRUCTURES

A. Each and every penetration through a fire rated floor, ceiling or wall shall be sealed to maintain the fire resistive nature of the structure. Refer to Section 16050 and refer to details on the Drawings. Verify locations of all rated penetrations. All fire rated penetrations shall be fire stopped even if not specifically indicated or noted on the electrical drawings.

B. Refer to Section 16110, Paragraph 3.12 CABLE TRAYS, for cable tray penetrations through fire and smoke barriers including walls, partitions, floors and ceilings.

3.10 CONDUIT AND WIRING FOR HVAC CONTROLS AND CONTROL PANELS

A. In General, all conduit, wiring and connections for the HVAC controls shall be furnished and installed as specified under Division 15. Certain specific conduits and outlets for these systems shall be furnished and installed by the Electrical Contractor.

B. Refer to floor plans and site plans for additional information. Coordinate installation with Division 15 Contractor.

C. The Heating and Ventilating Control Diagrams are included in the set of drawings for work under this section of the specifications. The Contractor for work under this section shall be responsible for the furnishing and installing of all items indicated to be part of the electrical work, including conduit, wiring, outlets and devices.

3.11 CONDUIT INSPECTION REQUIREMENTS

A. Prior to installation of any conductors or devices, the completed conduit system (all conduit, for all electrical systems) shall be inspected by the Owner Inspector. Any items noted for correction shall be corrected at this time. After the Owner Inspector has inspected the corrected conduit system, Owner Maintenance Personnel will inspect and approve the conduit system. This approval must
be obtained by the Contractor prior to the installation of any conductors or devices.

B. The underground conduit system (if any) will be inspected by the Owner Inspector prior to encasement and backfilling. Any items noted for correction shall be corrected at this time. After the Owner Inspector has inspected the corrected underground conduit system, Owner Maintenance Personnel will inspect and approve the conduit system. This approval must be obtained by the Contractor prior to encasement and backfilling.

3.12 CONDUIT TERMINATIONS AT PANELS AND EQUIPMENT

A. Where conduits are terminated in groups at backboards, equipment racks, cabinets, etc., provide rigid frames or appropriate spacers to hold conduits in secure positions and to preserve alignment.

B. Conduits terminating at equipment racks and cabinets shall enter cabinets in following approved locations only:

1. Conduits entering top and bottom of cabinets shall be aligned in a single row, centered 2" from rear of cabinet/rack.

2. Conduits entering back of cabinet shall be aligned in a single row centered 2” from top of cabinet.

3. Conduits shall not be spaced closer than 3” on center. Wider spacing shall be required for larger conduits.

4. In locations approved by the equipment manufacturer.

END OF SECTION

SECTION 16111

CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal conduit.

B. Flexible metal conduit.

C. Electrical metallic tubing.

D. Nonmetal conduit.

E. Electrical nonmetallic tubing.

F. Flexible nonmetallic conduit.

G. Fittings and conduit bodies.

1.02 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI C80.5 - Rigid Aluminum Conduit.

D. ANSI/NEMA FB 1-88 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

E. ANSI/NFPA 70 - National Electrical Code.

F. NECA "Standard of Installation."

G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

H. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

I. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.03 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, flexible nonmetallic conduit, nonmetallic tubing, fittings, and conduit bodies.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01720.

B. Accurately record actual routing of conduits larger than 2 inches.

1.06 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction] as suitable for purpose specified and shown.

1.07 FIELD SAMPLES

A. Provide under provisions of Section 01340.

B. Provide field sample of conduit, two each at 2 feet long.

C. Provide field sample of expansion/deflection fitting, two each.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site as recommended by the manufacturer of the item.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.09 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Minimum Size: 3/4 inch unless otherwise specified.

B. Underground Installations:

1. More than Five Feet from Foundation Wall: Use rigid steel conduit, intermediate metal conduit, concrete encased PVC Schedule 40 or as indicated on drawings.

2. Within Five Feet from Foundation Wall: Use intermediate metal conduit, concrete encased PVC Schedule 40 or as indicated on drawings.

3. In or Under Slab on Grade: Use rigid steel conduit, intermediate metal conduit, and plastic coated conduit and thickwall nonmetallic conduit.

4. Minimum Size: 3/4 inch, unless otherwise noted.

C. Outdoor Locations, Above Grade: Use rigid steel conduit, and intermediate metal conduit for locations from finished grade to 10 feet above finished grade or electrical metallic tubing may be used for locations exceeding, 10 feet above grade as indicated on drawings.

D. In Slab Above Grade:

1. Use rigid steel conduit and intermediate metal conduit.

2. Maximum Size Conduit in Slab: 3/4 inch; 1/2 inch for conduits crossing each other.

OR

3. Conduit shall not be installed in any floor slabs.

E. Wet and Damp Locations: Use rigid steel conduit, intermediate metal conduit and electrical metallic tubing.

F. Dry Locations:

1. Concealed: Use rigid steel, intermediate metal conduit, and electrical metallic tubing.

2. Exposed: Use rigid steel intermediate metal conduit, and electrical metallic tubing.

2.02 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Intermediate Metal Conduit (IMC): Rigid steel.

D. Fittings and Conduit Bodies: ANSI/NEMA FB 1-88; all steel fittings.

2.03 PVC COATED METAL CONDUIT

A. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil thick.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1-88; steel fittings with external PVC coating to match conduit.

2.04 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.

B. Fittings: ANSI/NEMA FB 1-88.

2.05 ELECTRICAL METALLIC TUBING (MET)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1-88; steel or malleable iron, compression indenter type.

2.06 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.07 NONMETALLIC TUBING

A. Description: NEMA TC 2.

B. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 16190.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route conduit parallel and perpendicular to walls.

K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

L. Route conduit under slab from point-to-point.

M. Do not cross conduits in slab.

N. Maintain adequate clearance between conduit and piping.

O. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

P. Cut conduit square using saw or pipecutter; de-burr cut ends.

Q. Bring conduit to shoulder of fittings; fasten securely.

R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

S. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

T. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate bends in metal conduit larger than 2-inch size.

U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit

system. V. Provide suitable fittings to accommodate expansion and deflection where

conduit
crosses seismic, control and expansion joints.

W. Provide suitable pull string in each empty conduit except sleeves and nipples.

X. Use suitable caps to protect installed conduit against entrance of dirt and

moisture. Y. Ground and bond conduit under provisions of Section 16170.

Z. Identify conduit under provisions of Section 16195.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Section 07274.

B. Route conduits through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.

END OF SECTION

SECTION
16120

CONDUCTORS (600 VOLT)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wire and cable

B. Signal and control system conductors

C. Pull lines

D. Lugs

E. Wire joints and taping

F. Tagging

G. Testing of conductors and wiring

1.02 RELATED SECTIONS

A. Division 1: GENERAL REQUIREMENTS

B. Division 15: MECHANICAL

C. Division 16: ELECTRICAL

1.03 REFERENCES

A. California Building Code (CBC)

B. California Electric Code (CEC)

C. National Electrical Contractors Association (NECA)

D. American National Standards Institute (ANSI)

E. Institute of Electrical and Electronics Engineers (IEEE)

F. National Electric Manufacturer's Association (NEMA)

G. City, State and other local codes and requirements as applicable

1.04 SUBMITTALS

A. Section 01300 - Submittals: Procedures for submittals.

B. Product Data: Furnish complete product data for all conductors, connectors, etc. furnished under this Section of the Specification.

1.05 SUMMARY

A. The work of this section shall include all services, labor, materials, transportation, equipment, plant and facilities to furnish and install all conductors and accessory items indicated on the drawings and specified herein.

B. Examine all other sections for work related to those other sections and required to be included as work under this section.

C. General provisions and requirements for electrical work.

D. Comply with requirements of California Administrative Code Title 24, California Electrical Code and all other codes referenced herein.

1.06 CONDUCTORS - GENERAL

A. All wire shall be California Electrical Code, 600-Volt Class, soft drawn copper, with a minimum of 98% conductivity.

B. All conductors shall be delivered to site in their original unbroken packages, plainly marked or tagged as follows:

1. Underwriter's Laboratories labels.

2. Size, kind and insulation of wire.

3. Name of manufacturing company and the trade name of the wire.

4. Month and year when manufactured, which date shall not exceed 2 years prior to the date of delivery to the site.

C. The following color-coding for branch circuit and feeder conductors shall be used throughout the project.

120/208 VOLT		277/480 VOLT	
NEUTRAL	WHITE	NEUTRAL	WHITE
GROUND	GREEN	GROUND	GREEN
PHASE A	BLACK	PHASE A	BROWN
PHASE B	RED	PHASE B	ORANGE
PHASE C	BLUE	PHASE C	YELLOW

PART 2 PRODUCTS

2.01 WIRE AND CABLE

A. Furnish and install Anaconda, General Cable, General Electric, Phelps-Dodge, Rome or Triangle Wire and Cable. All wire shall be delivered to the job in unbroken packages, and each package shall bear the Underwriters' and Manufacturer's labels, showing the date of manufacturer and the maximum allowable voltage.

B. Wire smaller than #8 AWG may be solid conductor; #8 AWG and larger wire shall be stranded conductor. All conductors shall be copper.

2.02 MINIMUM SIZE

A. The minimum wire size shall be #12 AWG for all power and lighting systems unless specifically noted as #14 AWG on drawings or in other sections of this specification.

B. The minimum wire size for the fire alarm system and low voltage Class II control circuits shall be #14 AWG, unless otherwise indicated on the drawings, or in other sections of this Specification.

2.03 INSULATION

A. Conductors of the following types shall be used in the following locations:

B. Branch circuit and feeder cables in all sizes shall have "THHN" or "THWN", 600-volt insulation unless noted otherwise.

C. Type "THHN or "RHH" wire shall be used in all recessed fixtures, continuous fluorescent fixture wiring channel or other locations where subject to abnormally high temperatures.

D. Type "XHHW" shall be used for feeders installed on roofs or in areas of direct solar exposure.

2.04 SIGNAL AND CONTROL SYSTEM CONDUCTORS

A. Furnish and install the conductors for the various signal systems such as fire alarm, low voltage lighting controls, telephone/data system, etc., per the requirements of each of the applicable Sections.

2.05 PULL LINES

A. A pull line shall be furnished and installed in <u>every</u> empty conduit installed for future conductors or for future use.

PART 3 EXECUTION

3.01 INSTALLING WIRE

A. All circuit and feeder wires shall be continuous from switch to terminal or farthest outlet No joints shall be made except in pull, junction or outlet boxes, or in panel or switchboard.

B. All branch circuit and fixture wiring joints, splices and taps for conductors #10 and smaller shall be made with UL approved connectors listed for 600 volts. Connector bodies shall consist of a cone shape expandable coil insert, insulated with Teflon or plastic shell. The connectors shall be "Wing Nut" as manufactured by "Ideal Industries" or "Scotchlok" as manufactured by Minnesota Mining Manufacturing Company.

C. Make all connections and splices necessary to properly install and complete the work. All splices shall be taped. All tape shall be 3-M "Scotch" #33 plastic electrical tape. All connections and splices shall be electrically and mechanically perfect, and in strict accordance with all code requirements.

D. Bolt type solderless connectors shall be tightened and then re-tightened after 24 to 48 hours and before taping. District's Inspector shall be informed of this procedure during the waiting period and shall witness the act of re-tightening.

E. All debris and moisture shall be removed from the conduits, boxes and cabinets. No oil, grease, graphite or similar substances shall be used to facilitate the pulling on of conductors. Use mineral, linseed soap or Ideal Yellow #77 wire pulling compound.

F. Wire in panel cabinets, pull boxes and wiring gutters shall be neatly grouped, taped together with 3-M "Scotch" #33 plastic electrical tape, T&B Model Ty-Rap cable strap or laced with #12 standard twine and fanned out to the terminals.

G. All control wiring shall be color-coded and color continuity shall be maintained throughout the system.

H. Branch circuit wiring color code shall be maintained throughout the systems.

I. Connections to all wiring devices shall be made with "pigtails" to the device from the branch circuit wiring. No "through" wiring of any devices will be allowed. Integrity of the circuit shall not be dependent upon the integrity of the device.

3.02 LUGS

A. Furnish and install proper lugs in all panelboards, ground bars, switchboards, gutters, etc., required to properly terminate every cable. Where paralleled conductors or conductors of large size are to terminate on a breaker a short length of copper cable (of capacity of the breaker) shall be connected to the breaker, and the proper bolt or compression type lug installed to connect this cable to the feeder cable. The cutting of cable strands to fit the breaker will not be permitted.

3.03 WIRE JOINTS AND TAPING

A. Joints and wires smaller than #6 AWG shall be made with Ideal Cat. #4551, 452, 453 or 455 wire connectors, or Scotchlok Type "R", "Y" or "B" connectors. Joints in wires #6 AWG and larger shall be made with approved solderless connectors.

B. Connections to switch or busbar lugs shall be made with Burndy "Hydent" or similar approved 2-Hole compression type copper lugs for all wires #6 AWG and larger Lugs shall be Burndy, O.Z. Electrical Products, Ilesco or Thomas and Betts.

C. All joints shall be insulated and taped. Insulation on the joints shall be built up to equal that on the wire. Scotch Tape #33 applied in layers of half wrap built up to match the overall thickness of insulation on the cable shall be used.

3.04 TAGGING

A. All branch circuits shall be left tagged in the panelboards and in all ceiling junction boxes where unused circuits terminate for the purpose of identifying the various circuits.

B. Feeders and mains shall be tagged in the switchboards. The method of tagging shall be with the adhesive type of marker equal to "Brady" as distributed by

Graybar Electric Company. Circuits shall be identified in the following manner, for example: BA-1, BB-14, feeder LB-BA, GND, etc. Markers shall be applied after wire is installed in conduit.

C. Where it is impractical to use printed markers on certain wires or cables, use blank type with identification marked thereon with indelible ink.

3.05 TESTING

A. All systems of wiring shall be so installed that when completed the systems will be free from short circuits and from grounds, other than required grounds. The Contractor shall provide all instruments for testing and shall demonstrate in the presence of the District Inspector that each system of wiring meets requirements.

1. For circuits of #12 or smaller wires: 1,000,000 ohms.

2. For circuits of #10 or larger conductors, a resistance based on the allowable current-carrying capacities of conductors as fixed in the California Electrical Code.

END OF SECTION

SECTION 16123

BUILDING WIRE AND CABLE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building wire and cable.

B. Underground feeder and branch circuit cable.

C. Service entrance cable.

D. Armored cable.

E. Metal clad cable.

F. Wiring connectors and connections.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.03 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide for each cable assembly type.

C. Test Reports: Indicate procedures and values obtained.

D. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.04 QUALIFICATIONS

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

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.06 FIELD SAMPLES

A. Provide under provisions of Section 01400.

B. Submit two lengths, each 18 inches of cable assembly from each reel.

C. Select each length to include complete set of manufacturer markings.

D. Attach tag indicating cable size and application information.

1.07 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor sizes are based on copper.

C. Aluminum conductors shall not be used.

D. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

E. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.08 COORDINATION

A. Coordinate Work under provisions of Section 01039

B. Determine required separation between cable and other work.

C. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.01 MANUFACTURERS - BUILDING WIRE AND CABLE

A. Anaconda Power Cable.

B. Carol Cable.

C. Rome Wire and Cable.

D. Alpha Wire.

2.02 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70; Type THHN/THWN or XHHN insulation for feeders and branch circuits.

2.03 MANUFACTURERS - UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

A. Substitutions: Under provisions of Section 01600.

2.04 UNDERGROUND FEEDER AND BRANCH CIRCUIT CABLE

A. Description: ANSI/NFPA 70, Type UF.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 90 degrees C.

2.05 MANUFACTURERS - SERVICE-ENTRANCE CABLE

A. Substitutions: Under provisions of Section 01600.

2.06 SERVICE ENTRANCE CABLE

A. Description: ANSI/NFPA 70, Type USE.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: Type XHHW.

2.07 WIRING CONNECTORS

A. Split Bolt Connectors:

1. Ilsco, Model SK.
2. Burndy, Model KSU.
3. Blackburn, Model HPS.

B. Solderless Pressure Connectors:

1. Ilsco, Model SLUH.
2. Burndy, Model KA-U.
3. Panduit, Model LAM.

C. Spring Wire Connectors:

1. Buchanan, Model 31, 33, 35 and 37.
2. 3M.
3. Ideal Wirenut.

D. Compression Connectors:

1. Burndy, Model HYLUG / HYLINK
2. Panduit, Model LAA.
3. Blackburn, Model ATL.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 WIRING METHODS

A. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN or XHHN insulation, in raceway.

B. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN or XHHN insulation, in raceway.

C. Above Accessible Ceilings: Use only building wire, Type THHN/THWN or XHHN insulation, in raceway.

D. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN or XHHN insulation, in raceway.

E. Exterior Locations: Use only building wire, Type XHHW insulation, in raceway.

F. Underground Installations: Use only building wire, Type XHHW insulation, in raceway.

G. Use wiring methods indicated on Drawings.

3.04 INSTALLATION

A. Install products in accordance with manufacturers instructions.

B. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

C. Use stranded conductors for control circuits.

D. Use conductor not smaller than 12 AWG for power and lighting circuits.

E. Use conductor not smaller than 16 AWG for control circuits.

F. Use 10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.

G. Use 10 AWG conductors for 20 ampere, 277-volt branch circuits longer than 200 feet.

H. Pull all conductors into raceway at same time.

I. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

J. Protect exposed cable from damage.

K. Support cables above accessible ceiling, using spring metal clips or metal or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.

L. Use suitable cable fittings and connectors.

M. Neatly train and lace wiring inside boxes, equipment, and panelboards.

N. Clean conductor surfaces before installing lugs and connectors.

O. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

P. Terminate aluminum conductors with tin-plated aluminum-bodied compression connectors only. Fill with anti-oxidant compound before installing conductor.

Q. Use suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.

R. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

S. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

T. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.05 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 16195.

B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.06 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01400.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 16130

BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Wall and ceiling outlet boxes.

B. Floor boxes.

C. Pull and junction boxes.

1.02 REFERENCES

A. ANSI/NEMA FB 1-88 - Fittings and Supports for Conduit and Cable Association.

B. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.

C. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

D. ANSI/NFPA 70 - National Electrical Code.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.03 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately records actual locations and mounting heights of outlet, pull and junction boxes.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.05 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Verify locations of floor boxes and outlets in offices and work areas prior to rough in.

C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. Include installation within 10 feet of location shown.

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2-inch male fixture studs where required.

2. Concrete Ceiling Boxes: Concrete type.

B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.

C. Cast Boxes: NEMA FB 1, Type FD, aluminum or cast ferroalloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.02 FLOOR BOXES

A. Floor Boxes: ANSI/NEMA OS 1, fully adjustable semi-adjustable.

B. Material: Cast metal.

C. Shape: Rectangular.

D. Conform to regulatory requirements for concrete-tight floor boxes.

2.03 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.

B. Surface-Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface-mounted junction box.

1. Material: Galvanized cast iron or cast aluminum.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

C. In-Ground Cast Metal Boxes: NEMA 250; Type 6, inside flanged, recessed cover box for flush mounting.

1. Material: Galvanized cast iron or cast aluminum.

2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.

3. Cover Legend: ELECTRIC.

D. Fiberglass Handholes: Die-molded fiberglass handholes.

1. Cable Entrance: Pre-cut 6 x 6-inch cable entrance at center bottom of each side.

2. Cover: Fiberglass weatherproof cover with nonskid finish.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.

B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

C. Install pullboxes and junction boxes above accessible ceiling and in unfinished areas only.

D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

E. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Section 07270.

F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

G. Use flush mounting outlet boxes in finished area.

H. Do not install flush mounting boxes back-to-back in walls; provide minimum 6-inch separation. Provide minimum 24 inches separation in acoustic rated walls.

I. Secure flush mounting boxes to interior wall and partition studs. Accurately position to allow for surface finish thickness.

J. Use stamped steel bridges to fasten flush mounting outlet box between studs.

K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

L. Use adjustable steel channel fasteners for hung ceiling outlet box.

M. Do not fasten boxes to ceiling support wires.

N. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits, both supported within 12 inches of box.

O. Use gang boxes where more than one device is mounted together. Do not use sectional boxes.

P. Use gang box with plaster ring for single device outlets.

Q. Use cast outlet boxes in exterior locations exposed to the weather and wet locations.

R. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

S. Set floor boxes level.

T. Large Pullboxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.

1. Interior Dry Locations: Use hinged enclosure under provisions of Section 16160.

2. Other Locations: Use surface-mounted cast metal box.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations and sizes of required access doors with Section 08305.

B. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

C. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

D. Position outlets to locate luminaires as shown on reflected ceiling plans.

3.03 ADJUSTING

A. Adjust floor box flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closure in unused box opening.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Device plates and decorative box covers.

E. Floor box service fittings.

F. Poke-through service fittings.

G. Access floor box.

1.02 REFERENCES

A. NECA - Standard of Installation.

B. NEMA WD 1 - General Requirements for Wiring Devices.

C. NEMA WD 6 - Wiring Device -- Dimensional Requirements.

D. NFPA 70 - National Electrical Code.

1.03 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.04 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Submittals for information.

B. Submit manufacturer's installation instructions.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Provide Products listed and classified by Underwriters Laboratories, Inc., or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.07 EXTRA MATERIALS

A. Section [01700 - Contract Closeout and 01730 - Operation and Maintenance

Data. B. Furnish two of each style, size, and finish wall plate.

C. Provide two [protective rings] [split

nozzles]. D. Provide two carpet rings.

PART 2 PRODUCTS

2.01 WALL SWITCHES

A. Manufacturers:

1. Hubbell, 1200 Series.
2. Pass and Seymour, 20AC Series.
3. General Electric 595X Series.
4. Leviton, 1200 Series.

B. Substitutions: Refer to Section 01600.

C. Description: NEMA WD 1, Heavy-Duty, AC only general-use snap

switch. D. Body and Handle: White plastic with toggle handle.

E. Indicator Light: Lighted handle type switch; red color

handle. F. Locator Light: Lighted handle type switch; green

color handle. G. Ratings:

1. Voltage: 120-277 volts, AC.
2. Current: 20 amperes or match branch circuit and load characteristics.

2.02 RECEPTACLES

A. Manufacturers:

1. Hubbell 5351, IG 5362.
2. Pass and Seymour 5362, IG 6300.
3. General Electric 5362.
4. Leviton 5362..

B. Description: NEMA WD 1, Heavy-duty general use receptacle.

C. Device Body: White plastic.

D. Configuration: NEMA WD 6, type as specified and indicated.

E. Convenience Receptacle: Type 5-20.

F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

G. Isolated Ground Receptacle: Type.

H. Transient Voltage Surge Suppression (TVSS) Receptacle:

2.03 WALL PLATES

A. Decorative Cover Plate: White nylon smooth stainless steel.

B. Jumbo Cover Plate: White, nylon smooth stainless steel.

C. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device cover.

2.04 OCCUPANCY SENSORS

A. Ceiling mount type, combination technology, passive infrared and ultrasonic "watt stopper" Model #DT-100L or approved equal by Novitas or "UNENCO". Provide appropriate lense pattern for each space as per manufacturer's recommendations. Furnish sensors complete with power packs and relay packs as required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions prior to beginning work.

B. Verify that outlet boxes are installed at proper height.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that floor boxes are adjusted properly.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that openings in access floor are in proper locations.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.03 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

E. Do not share neutral conductor on load side of dimmers.

F. Install receptacles with grounding pole on [top] [bottom].

G. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

I. Connect wiring devices by wrapping conductor around screw terminal.

J. Use jumbo size plates for outlets installed in masonry walls.

K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

L. Install protective rings on active flush cover service fittings.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on drawings.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 18 inches above finished floor.

D. Install convenience receptacle 6 inches above counter or backsplash of counter.

E. Install dimmer 48 inches above finished floor.

F. Install telephone jack 18 inches above finished floor.

G. Install telephone jack for side-reach wall telephone to position top of telephone at 48 inches above finished floor.

H. Install telephone jack for forward-reach wall telephone to position top of telephone at 48 inches above finished floor.

I. Coordinate the installation of wiring devices with underfloor duct service fittings provided under Section 16113.

3.05 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control and 01650 - Starting of Systems: Field inspection, testing, adjusting, and balancing.

B. Inspect each wiring device for defects.

C. Operate each wall switch with circuit energized and verify proper operation.

D. Verify that each receptacle device is energized.

E. Test each receptacle device for proper polarity.

F. Test each GFCI receptacle device for proper operation.

G. Verify that each telephone jack is properly connected and circuit is operational.

3.06 ADJUSTING

A. Section 01700 - Contract Closeout and 01655 - Starting of Systems: Adjusting installed work.

B. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

A. Section 01700- Contract Closeout: Cleaning installed work.

B. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 16170

GROUNDING AND BONDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. NPFA 99 - Health Care Facilities.

1.03 GROUNDING ELECTRODE SYSTEM

A. Metal underground water pipe.

B. Metal frame of the building.

C. Concrete-encased electrode.

D. Ground ring specified in Section 02781.

E. Metal underground gas-piping system.

F. Rod electrode.

G. Plate electrode.

H. Active electrode.

1.04 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 25 ohms.

A. Submit under provisions of Section 01300.

B. Product Data: Provide data for grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately records actual locations of grounding electrodes.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum five years documented experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 ROD ELECTRODE

A. Material: Copper-clad steel.

B. Diameter: 3/4 inch.

C. Length: 10 feet.

2.02 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 2/0 AWG.

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

2.03 GROUNDING WELL COMPONENTS

A. Well Pipe 8-inch diameter by 24-inch long concrete pipe with belled end.

B. Well Cover: Cast iron with legend "GROUND" embossed on cover.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

C. Provide grounding well pipe with cover at each rod location. Install well pipes top flush with finished grade.

D. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

E. Provide bonding to meet Regulatory Requirements.

F. Bond together metal siding not attached to grounded structure; bond to ground.

G. Bond together reinforcing steel and metal accessories in pool and fountain structures.

H. Install transient suppression plate where indicated.

I. Install ground grid under access floors where indicated. Construct grid of 2 AWG bare copper wire installed on 24 inch centers both ways. Bond each access floor pedestal to grid.

J. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Use 2 AWG bare copper conductor.

K. Provide isolated equipment grounding conductor in addition to required equipment grounding conductor for circuits supplying electronic cash registers, personal computers, isolated ground receptacles, and as indicted on drawings.

L. Provide grounding and bonding in-patient care areas to meet requirements of NFPA 99 and ANSI/NFPA 70.

M. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Interface with site grounding system installed under Section 02781.

B. Interface with lightning protection system installed under Section 16670.

3.04 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of potential method.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.02 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

1.03 SUBMITTALS

A. Submit under provisions of Section 01340.

B. Product Data: Provide manufacturer's catalog data for fastening systems.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. Anchors and Fasteners:

1. Concrete Structural Elements: Use precast insert system, expansion anchors, powder-actuated anchors and preset inserts.

2. Steel Structural Elements: Use beams clamps with seismic safety strap, spring steel clips, steel ramset fasteners, and welded fasteners.

3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.

4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.

5. Solid Masonry Walls: Use expansion anchors and preset inserts.

6. Sheet Metal: Use sheet metal screws.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Do not use spring steel clips and clamps.

E. Do not use powder-actuated anchors.

F. Obtain permission from Architect before drilling or cutting structural members.

G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

I. In wet and damp locations uses steel channel supports to stand cabinets and panelboards one inch off wall.

J. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Conduit markers.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.03 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide catalog data for nameplates, labels, and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.05 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

PART 2 PRODUCTS

2.01 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

B. Locations:

1. Each electrical distribution and control equipment enclosure.

2. Communication cabinets.

C. Letter Size:

1. Use 1/8-inch letters for identifying individual equipment and loads.

2. Use 1/4-inch letters for identifying grouped equipment and loads.

2.02 WIRE MARKERS

A. Description: Tape, split sleeve, or tubing type wire markers.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

C. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings or shop drawings.

2.03 CONDUIT MARKERS

A. Location: Furnish markers for each conduit longer than 6 feet.

B. Spacing: 20 feet on center.

C. Color:

1. 480 Volt System:

2. 208 Volt System:

3. Fire Alarm System: Red.

4. Telephone System:

D. Legend:

1. 480 Volt System:

2. 208 Volt System:

3. Fire Alarm System:

4. Telephone System:

2.04 UNDERGROUND WARNING TAPE

A. Description: 4 inch wide plastic tape, detectable type, colored yellow with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws, rivets, or adhesive.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Identify conduit using field painting under provisions of Section 09900.

E. Paint colored band on each conduit longer than 6 feet.

F. Paint bands 20 feet on center.

G. Color:

1. 480 Volt System:

2. 208 Volt System:

3. Fire Alarm System: Red

4. Telephone System:

H. Identify underground conduits using underground warning tape. Install one tape per trench at 6 inches below finished grade.

END OF SECTION

SECTION 16440

DISCONNECT SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Disconnect switches.

B. Fuses.

C. Enclosures.

1.02 REFERENCES

A. ANSI/UL 198C - High-Interrupting Capacity Fuses; Current Limiting Types.

B. ANSI/UL 198E - Class R Fuses.

C. FS W-F-870 - Fuseholders (For Plug and Enclosed Cartridge Fuses).

D. FS W-S-865 - Switch, Box, (Enclosed), Surface-Mounted.

E. NEMA KS 1 - Enclosed Switches.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

A. Square D.

B. Westinghouse.

C. Siemens ITE.

D. General Electric.

2.02 DISCONNECT SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; FS W-S-865; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: FS W-F- 870.

B. Nonfusible Switch Assemblies: NEMA KS 1; Type HD; FS W-S-865; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1; Type 1, for interior dry locations; Type 3R for exterior or wet locations.

D. Switch Ratings: Number of poles, voltage, current and horsepower rating as required for particular installation.

2.03 ACCEPTABLE MANUFACTURERS - FUSES

A. Littelfuse.

B. Gould Shawmut.

C. Bussman.

2.04 FUSES

A Fuses 600 Amperes and Less: ANSI/UL 198C, Class J; ANSI/UL 198E, Class RK1; current limiting, one-time fuse, 250, 600 volt.

B. Interrupting Rating: 200,000 rms amperes.

C. Size fuses based on motor nameplate rating.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Install fuses in fusible disconnect switches, otherwise required by Code.

C. Properly align switches and support independent of the connecting raceway.

END OF SECTION

SECTION 16441

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fusible switches.

B. Nonfusible switches.

C. Fuses.

1.02 REFERENCES

A. NEMA KS 1 - Enclosed Switches.

B. NFPA 70 - National Electrical Code.

C. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.

D. UL 198E - Class R Fuses.

1.03 SUBMITTALS

A. Submit under provisions of Section 01340.

B. Product Data: Provide switch ratings and enclosure dimensions.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, installation, and starting of Product.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum five years documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Square D, General Electric, Siemens, Westinghouse, Challenger

B. Substitutions: Under provisions of Section 01014.

2.02 ENCLOSED SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R or J fuses.

B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1.

1. Interior Dry Locations: Type 1.

2. Exterior Locations: Type 3R.

2.03 FUSES

A. Manufacturers:

1. Littlefuse, Inc.

2. Eaton Electrical, Inc.

B. Description: Dual element, current limiting, time delay, one-time fuse, 600 volt, UL 198E, Class RK 5. UL 198C, Class J.

C. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install disconnect switches where indicated.

B. Install fuses in fusible disconnect switches.

C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panelboards

B. Panelboard cabinets C.

Panelboard schedules

D. Signal terminal cabinets

E. Time switches

F. Coordination study

1.02 RELATED SECTIONS

A. Division 1: GENERAL REQUIREMENTS

B. Division 16: ELECTRICAL

1.03 REFERENCES

A. California Building Code (CBC)

B. California Electric Code (CEC)

C. National Electrical Contractors Association (NECA)

D. American National Standards Institute (ANSI)

E. Institute of Electrical and Electronics Engineers (IEEE)

F. National Electric Manufacturer's Association (NEMA)

G. City, State and other local codes and requirements as applicable

1.04 SUBMITTALS

A. Section 01340 - Submittals: Procedures for submittals.

B. Shop Drawings: Include a front elevation, indicate cabinet dimensions, make, location and capacity of equipment, size of gutters, type of mounting, finish, and catalog number of locks. Also, indicate size, interrupting capacity and type of all overcurrent protection.

C. Product Data: Furnish complete product data for all electrical equipment furnished under this Section of Specification.

D. Submit complete coordination study for review prior to energizing the power distribution system. Coordination study shall be a complete overcurrent and ground fault coordination study for the new unit substations, new main switchboard, all distribution

transformers, all distribution switchboards and all panelboards. Refer to Section 16400 for additional information.

1.05 SECTION SUMMARY

A. The work of this section shall include all services, labor, materials, transportation, equipment, plant and facilities to furnish and install all panelboards and terminal cabinets indicated on the drawings and specified herein.

B. The work listed or required by this Section of the Specification is not intended to limit or establish the extent of the electrical work. It shall be the Contractor's responsibility to establish to extent of the work specified hereunder and indicated on the Drawings.

C. Work includes all labor, materials , appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein.

D. Examine all other sections for work related to those other sections and required to be included as work under this section.

1.06 MATERIAL AND EQUIPMENT IN GENERAL

A. The materials and equipment herein specified shall be new and furnished in accordance with the specifications of National Electric Manufacturers Association, Institute of Electrical and Electronics Engineers, National Fire Protection Association and the California Electrical Code.

PART 2: PRODUCTS

2.01 PANELBOARDS

A. Furnish and install new circuit breaker panelboards as manufactured by Square D Company or approved equal.

B. Panelboards shall be bussed for 120/208V, 3 phase 4 wire or 277/480V, 3 phase 4 wire as noted on the schedules. <u>All</u> bussing shall be copper. Provide breakers where noted on schedules. Panelboards shall be wall-mounted, enclosed safety type with solid neutral and mains as indicated on Drawings or specified.

C. Circuit breakers shall be bolt-on molded case, with trip rating and number of poles as noted on the schedule. Breakers shall have a minimum interrupting rating 22,000 amperes for 120/208V panelboards. Breakers shall have higher interrupting ratings where so indicated on the Drawings.

1. Single pole branches shall be molded case, thermal magnetic circuit breakers with inverse time delay, trip free, quick-make, quick-break mechanism and silver alloy contacts.

2. Circuit breakers shall be rated as indicated on Drawings, with ampere rating marked on handle and shall indicate "ON - OFF" and tripped positions. Ground fault interrupters shall be incorporated into circuit breakers where indicated. They shall be listed by UL as a ground fault device.

3. Multi-pole breakers shall be enclosed, and shall be thermal magnetic circuit breakers with inverse time delay, non-tamperable, ambient compensated, <u>single handle, internal common trip</u>, and quick-make, and quick-break mechanism with

silver alloy contacts. Circuit breakers shall be rated as indicated on the Drawings. External “handle-ties” are not acceptable.

4. Main and sub-feeder circuit breakers shall be enclosed, thermal magnetic type with inverse time delay, single handle common trip, quick-make, quick-break mechanism, corrosion resistant bearings and silver alloy contacts. Ampere frame size and trip rating shall be as indicated on Drawings. Breakers over 225 amperes shall have interchangeable trip units. Handles of main and subfeeder circuit breakers shall be under cabinet door. Voltage rating shall be as indicated on Drawings.

5. All circuit breakers shall be one-piece, bolt-on type and shall meet short circuit interrupting capacity requirements indicated on Drawings and noted in these Specifications.

D. The panelboards shall be bussed and the circuits shall be numbered as indicated on the panel schedules. Breakers shall be numbered with permanently fixed number. Adhesive type number or numbered strips will not be accepted.

E. Provide detail drawings of all panelboards.

F. Provide an engraved plastic nameplate as specified in the Section "Name-Plates", to be screwed to the dead front of the panelboard with two screws.

G. All internal connections shall be made with plated copper bus bars and the busses shall extend for full length of space available for branch circuit breakers. Feeder cable connectors shall be installed at point of feeder entrance. All terminals shall have copper conductors. Panel boards fed by conductors having overcurrent protection greater than 200 amperes shall be protected on supply side by overcurrent devices having a rating not greater than that of panelboard.

H. Where noted on the Drawings, panelboards shall be equipped with an oversized (200% minimum) neutral bar to accommodate non-linear loads. Neutral bar shall be sized to accommodate additional neutral feeder and branch circuit conductors as required.

I. Except where otherwise indicated, circuit breakers shall be in 2 vertical rows connected to bus bars in a distributed phase arrangement. Two pole branches shall be balanced on busses. Each single pole branch shall be numbered adjacent to its circuit breaker with odd numbers on left and even numbers on right.

J. All specified circuit breaker spaces shall include necessary hardware required for future installation of circuit breakers.

K. Provide locking devices for each individual circuit breaker. Padlocking device shall be secured to circuit breaker and by panel deadfront plate. Clip-on “lock-off” devices do not satisfy this requirement.

L. Panelboard Standards: All panelboards shall meet latest revisions of following standards:

1. California Electric Code, Article 384.
2. UL 67, Panelboards.
3. UL 50, Cabinets and Boxes.
4. UL 943, GFCI.
5. UL 489, Molded case circuit breakers.
6. NEMA PBI.
7. Federal Specifications W-P-115 and WC-375B.
8. Panelboards must be UL labeled.

2.02 PANELBOARD CABINETS

A. Panelboard cabinets shall be code gage galvanized steel or blue steel; fronts, doors, and trims shall be code gage furniture steel. Cabinets shall have at least 6" high gutters at top and bottom where feeder cable size exceeds #4 or where feeder cable passes through cabinet vertically. Cabinets shall have top and bottom gutters sized as required by inspection department having jurisdiction, but never less than 6" where more than one feeder enters top or bottom of cabinets. Side gutters shall not be less than 4" wide. Width of cabinets shall be 20", unless indicated different on Drawings. Cabinets for the panelboards shall be of the same manufacture as the "panelboards", single door, surface or flush type as indicted. Cabinets shall bear the Underwriters' Label.

B. Doors shall be cut true, shall accurately fit opening and finish smooth across joints. Rabbets shall be inside. Hinges shall be entirely concealed except for barrels and pins. Hinge flanges shall be welded to door and trim. Each door shall be equipped with flush type lock, spring latching, Corbin lock for metal door, keyed to a Corbin CAT 60 key. The fronts of all cabinets shall be constructed of one piece of code gauge but not less than 12 gauge steel, fastened with screws and countersunk washers.

C. Where contactors, time switches, and control devices are specified or indicated to be installed within panelboard cabinets, a separate compartment and door shall be provided at top of cabinet for such devices. Door shall be sized as required to permit removal of contactor and other devices intact. Gutters shall be provided at sides and top of compartment. Door shall be equipped with flush type lock, spring latching, Corbin lock for metal door, keyed to a Corbin Cat 60 key.

D. Outdoor cabinets shall be NEMA 3R. Construction shall be formed from code gage galvanized steel with an ANSI #61 gray enamel finish. Provide a heavy duty 3 point latching vault type door handle with padlocking provisions. Provide stainless steel butt hinges on each door. Padlocks must be furnished, keyed to a Corbin Cat 60 key.

E. The door shall be fastened to trim with substantial flush hinges. Furnish and install a spring catch latch and cylinder lock with two keys for each door. All locks shall be master keyed with all other electrical equipment.

2.03 PANELBOARD SCHEDULE

A. Contractor shall prepare a neatly typewritten schedule with number or name of room or area, or load served by each panelboard circuit. Room numbers or names used shall be determined at site and shall not necessarily be those used on Drawings.

B. Schedule shall also indicate panel designation, voltage and phase, building and distribution panel or switchboard from which it is fed. Schedule shall be mounted in a metal frame under transparent plastic 1/32" thick on inside of each panelboard cabinet door.

2.04 REPLACEMENT OF EXISTING PANELBOARDS

A. As indicated on the Drawings, certain existing panelboards shall be removed and replaced with new panelboards. The new panelboards shall be as specified including bussing, circuit breakers, cabinets and front covers.

B. Remove existing cover, interior, and backbox enclosure (cabinet). Install new panel complete per schedule. Re-work the existing conduits and conductors as necessary to install the new backbox (cabinet) – extend or shorten existing conduits as required.

C. Contractor shall re-work the existing wall for new flush panels, including enlarging the existing opening or reducing the size of the openings, or adding furring for deeper enclosure (cabinet). Refer to Architectural Drawings for furring information.

D. Any existing circuits that are not removed by demolition – even if not indicated on the plans or panel schedules – shall be investigated and reconnected to the "spare" circuit breakers in the new replacement panel. All existing circuits that are reconnected shall be indicated on the "As-Built" drawings.

2.05 SIGNAL TERMINAL CABINETS

A. Cabinets for signal terminals shall be constructed as specified for "Panelboard Cabinets".

B. Cabinets for signal terminals shall be ***by same manufacturer as panelboards*** and shall be finished to match panelboards.

C. Cabinets for multiple systems shall be provided with barriers between sections to separate each system.

D. Locks shall match panelboards and shall be keyed the same.

E. All terminal cabinets shall be equipped with 3/4" thick plywood backboards. Backboard shall be full size of cabinet and shall be fastened in place with machine screws. Backboards shall be the largest size the cabinet and conduit terminations will allow.

2.06 TIME SWITCHES

A. Where indicated on the plans, furnish a time switch mounted in the panelboard cabinet, behind a separate locking door. Time switch shall be Intermatic ETC 700 CK series.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fronts shall be flush or surface type, as required. Fronts shall be fastened to cabinets with 1/4" #20, nickel-plated oval-headed machine screws and cup washers. Sufficient screws shall be installed to prevent buckling or warping of cabinet front. Flush type fronts shall be aligned plumb and square and cabinet shall be drilled and tapped, at site, for cover screws, to accomplish this if necessary.

B. All surfaces of flush mounted cabinets shall be galvanized. Fronts shall be given 2 coats of metal primer and shall not be installed on cabinets until after finish coats of paint have been applied to wall and cabinet fronts and are thoroughly dry. Screws and cup washers shall not be painted.

C. All surfaces of surface mounted cabinets and fronts shall be given one coat of metal primer and a finish coat of baked-on gray enamel.

D. Cabinets shall be rigidly supported in place, independent of conduits. The cabinet shall be rigidly supported to the building construction in an approved manner.

E. On floor-standing units, provide 1" minimum grout to set and level cabinets.

F. Cabinets installed outdoors shall be weatherproof, NEMA 3R.

G. Exposed screws and washers on front covers of panelboards **shall not** be painted.

3.02 PANELBOARD AND TERMINAL CABINET INSTALLATION

A. The Contractor shall verify all wall construction types. Surface mounted panelboards shall be supported with (4) 1/4" toggle bolts for dry wall or 1/4" bolts and inserts for concrete walls.

B. The top of all surface panelboards and terminal cabinets shall not exceed 6'-6" to center of highest circuit breaker handle. Where cabinets of varying sizes are mounted in the same room, the top edge of all cabinets shall be evenly matched.

C. Flush mounted panelboards and terminal cabinets shall be installed flush with the wall surface. The trims shall be finished to match wall colors and shall be trim to wall surface.

1. Provide spare conduits from the top (and/or bottom) of each flush mounted panel into the ceiling space above/below as indicated on the drawings.

D. Exposed screws and washers on front covers of panelboards **shall not** be painted.

3.03 COORDINATION STUDY

A. Switchboard/panelboard manufacturer shall provide a complete overcurrent and ground fault coordination study for new main switchboard, all distribution transformers, all distribution switchboards, and all panelboards. Refer to Section 16400 for switchboards.

B. Circuit breakers selected for use in the new switchboards and panelboards shall be able to coordinate as necessary per the coordination study.

C. Coordination study shall be submitted for review prior to setting of circuit breakers.

D. All circuit breaker adjustments shall be set in accordance with the manufacturers Coordination Study.

END OF SECTION

SECTION 16500

LIGHTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. Division 1 applies to this Section. The work of this Section shall conform to the requirements of Section 16000.

1.02 SCOPE:

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing , delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to, the following:

1. Lighting fixtures either recessed, surface, pendant, or unistrut mounted.
2. Lamps and ballasts.
3. Mounting hardware complete.

B. Comply with requirements of California Administrative Code Title 24, National Electrical Code and all other codes referenced herein.

1.03 CODES, REGULATIONS AND STANDARDS:

A. The materials herein shall be new and furnished in accordance with specifications of the Institute of Electrical and Electronics Engineers, National Electric Manufacturer's Association, National Fire Protection Association and the National Electrical Code.

PART 2 PRODUCTS

2.01 LIGHTING FIXTURES GENERAL:

A. All lighting fixtures of one type shall be of one manufacturer and of identical appearance. The catalog numbers indicated on fixture list are for individual units. Where two or more fixtures are installed or combined or in a continuous row, the manufacturer shall furnish the necessary accessories and hardware required.

B. Furnish, install and connect a lighting fixture at each fixture symbol indicated on the drawings. The fixtures shall be complete with all glassware, canopies, sockets, lenses, and wiring accessories for a complete installation. All fixtures shall be supplied with lamps of the type and wattage indicated.

C. Fixtures as specified in the "Fixture List" on the Drawings include catalog numbers indicating the basic design intent. The fixtures installed shall be suitable for the circuit electrical characteristics indicated for supply, and compatible with specified ceiling systems where installed, or with alternate ceiling systems which may be substituted for the specified systems.

D. Lighting fixtures of the same type, including all fixtures represented by a single fixture type designation, and in addition fixtures of different designation but obviously intended to match each other, shall be the product of the same manufacturer. The decision of the Architect regarding the acceptability of any fixture shall be final.

E. Fixtures shall bear the label of the Underwriter's Laboratories, Inc. or other nationally recognized testing laboratory indicating compatibility with Code requirements for the location and usage indicated.

F. Some fixtures shall be supplied/wired in tandem pairs as indicated on the drawings and as required by the California Energy Commission.

2.02 RECESSED FLUORESCENT FIXTURES:

A. All fluorescent fixtures shall be constructed of die formed code gauge steel with mitered corners. All reflective surfaces within the fixture housing shall have a white baked enamel finish with a minimum of 88% reflectivity.

B. Prismatic lenses shall be acrylic pattern 12, unless specifically noted otherwise, 0.125 inches thick pre-stresses to span 48". Prisms shall be uniform to insure proper light distribution.

C. All lenses shall be installed in metal frames with positive latching mechanism and hinged from either side. Lay-in lenses are not acceptable.

D. Parabolic diffusers shall be specular anodized aluminum deep cell baffle constructed to ensure a rigidly interlocked cells to maintain the parabolic contours.

2.03 INCANDESCENT FIXTURES:

A. Recessed incandescent fixtures must all have Underwriters' Laboratories labeling for through wiring in recessed installation with plaster frame and attached pull box. Finish trim shall not be installed until finish painting of the adjacent surface is completed.

2.04 HIGH INTENSITY DISCHARGE (HID):

A. HID fixtures shall have characteristics as indicated on the "fixture list" on the drawings.

2.05 LAMPS:

A. Lamps shall be new and of wattage indicated, and shall be manufactured by General Electric, Westinghouse (W K trademark) or Sylvania. Each fixture or lighting outlet shall be supplied with the proper base.

B. Fluorescent lamps shall be 8 new General Electric Watt Miser, SP-30, 3000°K, bi pin, rapid start, T-8, 48", 32 watt, 430 ma, 20,000 hour average life with a minimum of 2850 initial lumens.

C. Incandescent "A" lamps shall be 130 volt, energy saving lamps with a 2500 hour average life.

D. Compact fluorescent lamps shall be dual or quad tube as indicated, 9, 13, 18 or 26 watt. Lamps shall be 3000°K. "color" output.

E. Low voltage lamps shall be 120 volt MR-16 or PAR 36 of wattage indicated on fixture list. Lamps shall be spot or flood type as indicated.

F. Incandescent "R" lamps shall be 130 volt, of wattage rated energy saving lamps with a 2000 hour average life. Recessed down lighting fixtures shall have reflector flood lamps and track lighting or directional lighting shall have spot lamps, or as indicated on the "Fixture List".

G. Metal Halide lamps shall be of wattage indicated, phosphor coated, mogul base, G.E. "Multi-Vapor" lamps, high-output, base-up or base-down depending on the fixture.

H. High pressure sodium lamps shall be of wattage indicated, G.E. "Lucalox" lamps or equal, high output, base configuration depending on the fixture.

2.06 BALLASTS:

A. All fluorescent lighting fixtures shall be furnished with high power factor electronic type ballasts, with 26% more energy efficient than conventional electromagnetic ballasts. Ballasts shall be by Advance Transformer Company.

B. Where fixtures are indicated to be controlled by a dimmer or a dimmer system, provide Advance Transformer Company, Mark VII controllable integrated circuit ballast. Ballast shall be internally equipped with supplementary circuits which can regulate the light output of fluorescent lamps between 20% and 100% of nominal in response to remotely activated signals. Ballast shall provide its own 0-10VDC signal directly to control unit via auxiliary pair of class 2, low voltage wiring, which shall be fully isolated from ballast input power. Ballast shall require no other intermediate trimming controls.

C. Metal halide and high pressure sodium lamp ballasts shall be auto regulated type core and coil type high ambient temperature rating ($65^{o}C$) for 277 volt or 480 volt operation. Line voltage variation shall not exceed $\pm$10%. Ballast shall be U.L. approved.

D. Compact fluorescent ballasts shall be high power factor type only. Low or normal power factor ballasts are not acceptable.

PART 3 EXECUTION

3.01 FIXTURE INSTALLATION GENERAL:

A. Fixtures shall be installed complete including lenses, lamps and finish trims. All fixtures shall be cleaned of dirt and grease.

B. The reflected ceiling drawings shall take precedent as to location of fixtures. Any discrepancies shall be brought to the architects attention before installation.

3.02 SUSPENDED CEILING INSTALLATION:

A. Recessed fluorescent fixtures installed in a suspended ceiling shall be designed for the specific ceiling type furnished. Each individual recessed fluorescent fixtures shall have two (2) #12 gauge fixture support wires, independent of ceiling support wire and shall be screwed to the ceiling grid as required.

B. Recessed incandescent fixtures installed in suspended ceilings shall have channel iron supports on two sides of fixture, bridging the main ceiling supports. Fixture supports shall have two (2) #12 gauge support wires to slab above. Tile openings shall be cut to insure fixture trim conceals the openings.

3.03 PLASTER CEILING INSTALLATIONS:

A. Fixtures installed in plaster ceiling shall be furnished with plaster frames and mounting brackets and trims. When trimless fixtures are indicated, the openings shall be finished smooth and concentric with fixture apperture.

B. Outlet boxes shall be installed to assure accessibility through to ceiling opening.

3.04 PENDANT FIXTURE INSTALLATION:

A. Supports for fluorescent fixtures shall have a minimum capacity of 150 pounds and all parts of the support shall be arranged to prevent vibrating free. For fixtures with a sheet metal backplate, provide a minimum of six square inches of substantial supporting surface inside the backplate.

B. Fixtures installed in compressor, fan and similar equipment rooms and areas shall be located and the height adjusted on the job to clear all obstructions such as ducts, piping, bracing, and supports. The plans are based on typical equipment for these areas and hence the contractor is held responsible for locating fixtures so that proper illumination will be obtained. Where the location of fixtures shown on the plans must be radically changed, approval from the architect shall be obtained before the fixture is placed.

C. Certain fixtures, where noted or required, shall be mounted against the bottom of heating and ventilating duct. In these locations, provide a "Unistrut" support channel which shall span or straddle the ducts and which shall be supported directly from the he ceiling slab with 1/4 inch steel rod. The support channels shall not be fastened to, or supported from the ducts.

D. All suspended fixtures shall be provided with ball aligners.

E. All fixtures shall be complete with accessories, end caps, plaster frames, yokes, hangers, etc., which are required for the specific installation.