Bid Specifications for Valle Lindo Park Restrooms

Request for Proposal:
Due May 28, 2019 at 2:00 pm

PLEASANT VALLEY
RECREATION & PARK DISTRICT
www.pvrpd.org • 805-482-1996

Bob Cerasuolo
Park Services Manager
Pleasant Valley Recreation
and Park District, Camarillo, CA
805-482-5396
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INVITATION TO BID

Pleasant Valley Recreation and Park District is ("District") seeking bids for the remodeling of the restrooms at Valle Lindo Park at 889 Aileen St. Camarillo CA 93010 to the specifications. There will be a mandatory job walk on March 21, 2019 at 10:00 am.

DESCRIPTION OF WORK:

A. Scope of demolition and removal work is shown on drawings and specified in Section 02225.
B. Pavilion Bid Alternate
C. Remodel the Valle Lindo Park Restroom
D. Plumbing: new construction
E. HVAC: None
F. Electrical Power and Lighting: new construction
G. Fire Suppression Sprinklers: None
H. Fire Alarm: None
I. Tile: None

BASIC OF SPECIFICATIONS

Refer to manufacturer's specifications unless otherwise noted herein, the basic of specifications for this project shall be the Standard Specifications for Public Works Construction (the "GREEN BOOK"), latest edition.

PROPOSAL PROCESS

The proposal process will consist of a written presentation (two copies).The following shall be included in your written proposal:

1. A breakdown of the work to be done.

2. History of similar projects completed within the last three years, including cost and client contact information.

3. Provide a minimum of three (3) references including service provided, name of agency, contact person, phone number and email.

4. Description of the proposed schedule and the approach that will be used to organize and prepare for the work to be done.

EVALUATION OF PROPOSALS

District staff will review the proposals. The selected Contractor will be contacted to let them know they have been awarded the bid.

The evaluation of proposal will be based on the following:

- Completeness and thoroughness of information provided and adherence to deliverables.
- Ability to meet budget, although cost will not be the sole factor.
- Ability to comply with all State, Federal and local regulations.
- Ability to possess a California State Contractor License and a District of Camarillo business license and the proper insurance and bonding
- Ability to possess a D.I.R. number

The Pleasant Valley Recreation and Park District Board of Directors will make the final award. No other officer or agent may obligate or bind the District.

HOURS OF OPERATION

Unless otherwise approved by the General Manager, the Contractor shall not work outside the following Hours of Operation on this Project:

Weekdays (M/T/W/TH/F): 7:00 AM - 7:00 PM

Weekends (Sat. & Sun.): 7:00 AM – 7:00 PM

Holidays: No Work. (Holidays are those Holidays observed by the District)

DESCRIPTION

The work to be performed under this Specification, No. VL-2019-2 consists of furnishing, by the Contractor in accordance with the contract drawings and specifications and subject to the terms and conditions of the Contract, all materials, equipment, tools, labor and incidentals necessary for the construction of the proposed project, complete and in place.

TIME LINE

Request for Proposals released	May 6, 2019	
Mandatory job walk	May 20, 2019	10:00 a.m.
Questions in by	May 24, 2019	
Proposals must be received by	May 28, 2019	2:00 p.m.
Contract award	June 5, 2019	
Project start date approx.	July 1, 2019	
Project completion date no later than	Sept 30, 2019	

PROPOSAL DEADLINE

The deadline for the proposal is **Tuesday May 28, 2019 at 2:00 p.m.** Proposal must be submitted in a sealed envelope marked ***RFP Valle Lindo Restroom Remodel,*** by the deadline. Proposal must be signed by an authorized individual to bind the firm and be valid for at least 90 days.

Please submit two (2) copies of the proposal to:

Bob Cerasuolo,
Park Services Manager
Pleasant Valley Recreation and Park District
1605 E. Burnley Street
Camarillo, CA 93010

FAXED or ELECTRONIC RESPONSES WILL NOT BE ACCEPTED

ADDITIONAL INFORMATION

For questions contact: **Bob Cerasuolo**, Park Services Manager
805-482-5396 ext 301
E-Mail bobc@pvrpd.org

Specifications
Pleasant Valley Recreation and Park District
Valle Lindo Park Restroom
Jan. 21, 2019

TABLE OF CONTENTS

Division 8 – DOORS AND WINDOWS

08111 Hollow Metal Door and Frame

Division 9 – FINISHES

09900 Paints and Coatings
09965 Anti – Graffiti Coating

Division 10 – SPECIALITIES

10155 Solid Plastic Toilet Compartments
10800 Toilet and Bath Accessories

Division 15 – MECHANICAL

15050 Mechanical General Provisions
15400 Plumbing

Division 16 – ELECTRICAL

16010 Electrical General Provisions
16050 Basic Electrical Requirements
16060 Raceways
16120 Wire and Cable (600 Volts and Below)
16400 Electrical Service & Dist.
16450 Grounding and Bonding
16460 Transformers
16470 Panelboards
16500 Lighting

SECTION 01100

SUMMARY

PART 1 GENERAL

1.03 DESCRIPTION OF WORK

A. Scope of demolition and removal work is shown on drawings

B. Not Used

C. Remodel the Valle Lindo Park Restroom

D. Plumbing: New / Remodel construction

E. HVAC: None

F. Electrical Power and Lighting: New / Remodel construction

G. Fire Suppression Sprinklers: None

H. Fire Alarm: None

I. Telephone: None

J. Data and Computer Network: None

1.04 WORK BY OWNER

A. NA

1.05 OWNER OCCUPANCY

A. The City intends to occupy the Project upon Substantial Completion: "***The stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use."***

B. Cooperate with the City to minimize conflict and to facilitate the City operations.

C. Schedule the Work to accommodate the City occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

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

A. GENERAL

1. Contractor shall at all times conduct the work so as to impose no hardship on the City or others engaged in the City's work nor cause any unreasonable delay or hindrance thereto.
2. Construction activities will be scheduled to minimize disruption to the City and to City's users.
3. The Contractor may not interrupt any utilities without prior written permission from the City. Requests for utility shutdowns shall be submitted a minimum of 72 hours in advance of the requested shutdown date.

B. PROTECTION OF EXISTING STRUCTURES AND UTILITIES

1. Locate all known existing utility installations before proceeding with construction operations which may cause damage to such installations. The existing utilities shall be

protected and maintained in continual service at the Contractor's expense. Where existing utilities cross or are adjacent to the work of this contract, the Contractor shall notify the City's Representative a minimum of 48 hours in advance of commencement of work. The Contractor shall locate the existing utility(s) by exploration; repair of damage to existing utility(s) shall be at the Contractor's expense.

2. In the event that undocumented existing structures or utilities are encountered, the contractor shall immediately notify the City's Representative and request direction concerning how to proceed with the work.
3. Should the Contractor damage any existing structure or utility, the Contractor shall take immediate action to ensure the safety of both persons and property.
4. Contractor shall visit the site and thoroughly familiarize itself with existing conditions.
5. Contractor shall include all necessary pipe offsets, fittings, etc. as required to complete the work in the base bid. No additional costs due to the Contractor's failure to survey existing conditions and review available record drawings will be allowed.
6. Contractor shall note all utility items (utility meters, junction boxes, valve boxes) at or above grade in the vicinity of the project site prior to commencing with trenching operations. These items indicate the presence of underground utilities in the area shall be located and kept in continual service. This requirement shall apply regardless of inclusion of these utilities on existing record documents.
7. When cutting, removal or alteration of existing work is required to form connections with new work or otherwise to meet the requirements of the contract documents, perform such work so as not to damage the work that will remain in place.
8. Contractor shall provide all necessary materials, equipment and labor to adequately protect existing structures, floors, architectural finishes and utilities which may be impacted by the work of this contract.

C. ALLOWABLE WORK SCHEDULE

1. Normal construction activities shall be performed Monday through Friday between the hours of 7:00 am and 5:00 pm.
2. Shutdown of existing utilities or other activities which impact City operations shall be scheduled in advance with the City's Representative in accordance with paragraph 1.05.A.3 above and shall be scheduled during off-hours at the discretion of the City and at no additional cost to the City.
3. Contractor shall submit an "Off-hours work Schedule Request Form" a minimum of 72 hours prior to any anticipated weekend or holiday work. A form must also be submitted for work outside of normal working hours. off hours work shall not be performed without prior approval by the City

D. SITE DECORUM

1. Contractor is to control the conduct of labor forces and prevent unwanted interaction initiated by workers with the City staff, Visitors or other individuals other than those associated with the project.
2. In the event that any worker initiates unwanted interaction, utilizes profanity, or (in the opinion of the City's Representative) conducts

him/herself in an offensive or unprofessional manner, the Contractor shall immediately remove the worker from the project and replace said worker with another of equivalent technical skill at no additional cost to the City.

3. No smoking is allowed on the job site
4. No radios, other than 2-way communication type, shall be allowed on the project site.

E. ACCESS PANELS

1. The contractor is responsible for locating, providing and installing all access panels required by mechanical, electrical and all other systems.
2. Coordinate locations, types and installation of all access panels and supply any not specified under other sections.

F. CONFLICTS

1. Should a conflict occur between various drawings or between drawings and specifications or between various specification sections, contractor is deemed to have estimated the most expensive method of construction unless a written decision from the Engineer or Owners Representative has been received which describes an alternate method or materials.

1.07 WORK SEQUENCE

A. Contractor shall substantially complete (see section 1.05 above) the new building

B. Contractor shall coordinate construction schedule and operations with the City

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END OF SECTION

SECTION 01400

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. References and standards.

B. Mock-ups.

C. Control of installation.

D. Tolerances.

E. Testing and inspection services.

F. Manufacturers' field services.

1.2 RELATED REQUIREMENTS – Not used

1.3 REFERENCE STANDARDS

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; 2006a.

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.

1.4 SUBMITTALS

A. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   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. Design Data: Submit for the Engineer's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for the City’s information.

C. Test Reports: After each test/inspection, promptly submit two copies of report to the Engineer 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 the Engineer, provide interpretation of results.
   2. Test report submittals are for the Engineer's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in

the contract documents, or for the City's information.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to the Engineer, 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 the Engineer.

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

F. Manufacturer's Field Reports: Submit reports for the Engineer's benefit as contract administrator or for the City.
   1. Submit report in duplicate within 30 days of observation to the Engineer 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.

G. Erection Drawings: Submit drawings for the Engineer's benefit as contract administrator or for the City.
   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 the Engineer or the City.

1.5 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 the Engineer before proceeding.

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

1.6 TESTING AND INSPECTION AGENCIES

A. The City will employ the services of an independent testing agency to perform verification testing and special inspections; payment for the cost of these services will be made by the City. Contractor will be back charged by the City for retesting required if initial testing results indicate that the work does not to conform to the requirements of the Construction Documents. It shall be the Contractors responsibility to establish it's own quality control procedures to ensure that the work conforms to the requirements of the Contract Documents.

B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing such as Cable Continuity, etc. See individual specification sections for specific requirements.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 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 the Engineer 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.

3.2 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 the Engineer and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.3 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 the Engineer before proceeding.

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

3.4 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with the Engineer 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 the Engineer and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by the Engineer.
   6. Submit reports of all tests/inspections specified.

B. 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.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that 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 the Engineer 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 the City’s agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by the Engineer.

E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.5 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 systems as applicable, and to initiate instructions when necessary.

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

3.6 DEFECT ASSESSMENT

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

B. If, in the opinion of the Engineer, it is not practical to remove and replace the Work, the Engineer will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01600

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Not Used

C. Re-use of existing products.

D. Transportation, handling, storage and protection.

E. Product option requirements.

F. Substitution limitations and procedures.

G. Procedures for the City - supplied products.

H. Spare parts and maintenance materials.

1.02 RELATED REQUIREMENTS

A. Section 01100 - Summary:

B. Section 01400 - Quality Requirements: Product quality monitoring.

1.03 REFERENCE STANDARDS

A. 16 CFR 260 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; current edition.

B. CAN/CSA Z809 - National Standard for Sustainable Forest Management; CSA International Inc.; 2002.

C. GreenSeal GS-36 - Commercial Adhesives; Green Seal, Inc.; 2000.

D. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

E. SCAQMD 1168 - South Coast Air Quality Management City Rule No.1168; current edition; www.aqmd.gov.

PART 2 PRODUCTS

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Do not use products having any of the following characteristics:
   1. Made using or containing CFC's or HCFC's.

C. Where all other criteria are met, Contractor shall give preference to products that:
   1. Are extracted, harvested, and/or manufactured closer to the location of the project.
   2. Have longer documented life span under normal use.
   3. Result in less construction waste.

D. Regionally-Sourced Products:
   1. Specific Product Categories: Provide regionally-sourced products as specified elsewhere.
   2. Indicate location of manufacture; in all cases indicate location of final assembly; for harvested products, indicate location of harvest; for extracted (i.e. mined) products, indicate location of extraction; for products involving multiple manufacturing steps, indicate all locations of manufacture or assembly; provide manufacturer or supplier certification of location information.

E. Products with Recycled Content:
   1. Overall Project Requirement: Provide products with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial recycled content constitutes at least 10 percent (2 points) of the total value of all products installed, except mechanical and electrical components.
   2. Specific Product Categories: Provide recycled content as specified elsewhere.
   3. Calculations: Where information about recycled content is required to be submitted:
      a. Determine percentage of post-consumer and post-industrial content separately, using the guidelines contained in 16 CFR 260.7(e).
      b. Previously used, reused, refurbished, and salvaged products are not considered recycled.
      c. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
      d. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of all material in the item.
      e. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
   4. State unit cost, post-consumer and post-industrial content percentages, quantity installed, total material cost, and total recycled content value; attach evidence of contents from either manufacturer or an independent agency.

F. Aerosol Adhesives:
   1. Provide only products having lower volatile organic compound (VOC) content than required by GreenSeal GS-36.
      a. Require each installer to certify compliance and submit product data showing product content.
   2. Specific Product Categories: Comply with limitations specified elsewhere.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Not used

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to the City.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

D. Substitution Submittal Procedure:
   1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   3. The City will notify Contractor in writing of decision to accept or reject request.

3.03 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Transport and handle products in accordance with manufacturer's instructions.

C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

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

E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Prevent contact with material that may cause corrosion, discoloration, or staining.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

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 the City's personnel.

I. Closeout procedures, except payment procedures.

1.02 RELATED REQUIREMENTS

A. Section 01100 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

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

C. Not Used

D. Section 02050 - Demolition; site utility demolition.

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

1.03 SUBMITTALS

A. 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, licenced in the State of California, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of the City or separate Contractor.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Description of proposed work and products to be used.
      e. Alternatives to cutting and patching.
      f. Effect on work of the City or separate Contractor.
      g. Written permission of affected separate Contractor.
      h. Date and time work will be executed.

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

1.05 PROJECT CONDITIONS

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

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

C. 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.

D. Erosion, Sediment and Pollution Control: Plan and execute in accordance with approved storm water pollution control plan (per section 706)

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

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

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Specifications to

ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. 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.

C. Coordinate space requirements, supports, and installation of mechanical and electrical work that 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.

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

E. After the City occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of the City'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 misfabrication.

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 the City 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 the City, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify the City of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to the City the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to the City.

F. Utilize recognized engineering survey practices.

G. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations, and existing walls.

I. Periodically verify layouts by same means.

J. Maintain a complete and accurate log of control and survey work as it progresses.

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 ALTERATIONS

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 the City before disturbing existing installation.
3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to, Plumbing, Electrical): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. See Section 01100 for other limitations on outages and required notifications.
      c. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to the City.
   2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
   3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for the City review and request instructions.

4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Clean existing systems and equipment.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-conforming work.

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

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

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

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

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

I. 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.

J. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 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.

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

3.10 SYSTEMS STARTUP

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

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

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

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

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

F. 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.

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

3.12 ADJUSTING

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

3.13 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by the City prior to final completion before the City occupancy.

B. Use cleaning materials that are nonhazardous.

C. 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.

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

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

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

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

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to the City.

B. Notify the Project Manager when work is considered ready for Substantial Completion.

C. 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 the Architects' review.

D. The City will occupy all of the building as specified in Section 01100.

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

F. Notify the City when work is considered finally complete.

G. Complete items of work determined by the Citys final inspection.

3.15 MAINTENANCE SERVICE

A. Furnish service and maintenance of the components where indicated in the specification. See individual sections for requirements.

B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the City.

END OF SECTION

SECTION 02050

DEMOLITION REMOVAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Plans and general provisions of the Contract, including General and Special Provisions Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:
   1. Removal of existing asphaltic concrete pavement.
   2. Recycling and Disposal of existing concrete pavement.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 02230 Site Clearing
   2. Not Used
   3. Section 02751 Site Concrete
   4. Not Used

1.3. DEFINITIONS:

A. Demolition Removal includes clearing the construction site of existing asphalt and concrete paving where indicated or necessary to prepare the site for construction and provide all materials and equipment necessary to complete the Work.

1.4. SUBMITTALS:

A. General: Submit each item in this Article according to the Conditions of the Contract and Special Provisions Specification Sections.
B. Submit schedule of demolition activities and road/Parking Area closure.

1.5 QUALITY ASSURANCE:

A. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Materials removed shall be loaded directly into hauling vehicles and shall not be stored or stockpiled on project site.

1.7 COORDINATION:

A. Coordinate schedule for demolition and road/parking area with the City, and subcontractors to minimize disruption of operations.

PART 2 - PRODUCTS

Not Applicable

PART 3 – EXECUTION

1.1. PREPARATION:

A. Protect and maintain benchmarks and survey control points form disturbance during construction.

B. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding.

C. Conduct demolition operations and remove debris to ensure minimum interference with roadways, walks, and other adjacent occupied or used facilities.
   a. Do not close or obstruct roadways, walks, or other adjacent occupied or used facilities without permission from the City and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

D. Conduct demolition operations to prevent injury to people and damage to adjacent facilities to remain. Ensure safe passage of people around demolition area.
   a. Erect temporary protection, such as walks, fences, and railing where required by authorities having jurisdiction.
   b. Protect existing site improvements, appurtenances, and landscaping to remain.
      i. Restore any damaged improvements to their original condition, as acceptable to City.

1.2. REMOVAL:

A. Demolish and remove existing construction as indicated on the plans. Use methods required to complete Work within limitations of governing regulations and as follows:
   a. All cutting shall be done to a neat and even line with proper tools.

END OF SECTION

SECTION 02221

EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Plans and general provisions of the Contract, including General and Special Provisions Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Excavating, backfilling and compacting trenches for utility pipes, water, gas, irrigation and sewer lines, storm drain lines, manholes, vaults, valve boxes, catch basins, underground tanks, thrust blocks, yard boxes, pull boxes and concrete encased electrical conduits.

B. The following Sections contain requirements that relate to this Section:

1. Section 02050 Demolition Removal
2. Section 02230 Site Clearing
3. Section 02300 Earthwork
4. Not Used
5. Section 02751 Concrete Paving

1.3 DEFINITIONS:

Not Used

1.4 SUBMITTALS:

A. Product Data: Submit samples of import pipe bedding materials and import fill materials to Engineer or testing laboratory designated by Engineer, for testing and approval prior to importation. Submit name of source location for imported pipe bedding materials and import fill materials for approval by the Engineer prior to importation. Submit certification for import materials indicating presence of organic contaminants, whether or not below EPA action levels, and presence of hazardous and/or regulated wastes and contaminants, whether or not below EPA acti

B. **QUALITY ASSURANCE:**

A. Perform all work under the superintendence of competent foreman or superintendent and in conformance with geotechnical report

B. All grade staking shall be performed by a licensed surveyor registered in the State of California.

C. Perform materials testing per Standard Specifications for Public Works Construction, Part 2.

Sieve analysis by ASTM C136
Compaction tests by ASTM D1557
Sand equivalent tests by California Test 217 or ASTM D2419
Permeability by ASTM D2434

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Fees: Pay as required by governing authority having jurisdiction over area.

B. Bonds: Post as required by governing authority having jurisdiction over area.

C. Hauling Routes and Restrictions: Comply with requirements of the City and any other governing authority having jurisdiction over the area.

PART 2 - PRODUCTS

2.1 FILL AND BACKFILL MATERIALS

A. The native materials encountered on-site should be acceptable for use as general compacted fill provided:
1. The native materials are free of organics, trash, debris and oversize particles greater than 4 inches in diameter.
2. All native fill materials shall be placed and compacted to at least 90 percent of their laboratory determined maximum dry density, unless otherwise specified.

B. In addition to the general fill requirements noted above, general fill materials shall have the following characteristics:
1. Expansion index less than 50.
2. Plasticity index less than 15.
3. Percentage between 4 inches and 2 inches is less than 15.
4. Percentage passing the No. 200 sieve is less than 70.

C. The expansion index of general fill materials placed in the office building subgrade area shall be verified prior to the completion of site grading.

D. Where fill material exhibits a wide variation in consistency, the Engineer may require blending to stabilize and upgrade material.

E. Imported Fill Material:

1. If amount of suitable earth materials obtained from jobsite excavations is not sufficient to properly construct required fill, furnish imported earth materials as necessary.
2. Import fill materials shall be free from organic material, hazardous materials, unsuitable fill debris, and other deleterious materials. Select fill material shall not contain rocks, blocky material, lumps over 4 inches in maximum dimension and be primarily granular with fines content of between 40 and 60 percent and have an expansion index (EI) of less than 20 (non-expansive). Rock particles shall not be placed in concentrated pockets and shall be surrounded by sufficient soil material to preclude open interstices. The Soils Engineer shall evaluate and approve the suitability of proposed select fill materials.

F. Pipe Bedding:
1. Pipe bedding for all utilities shall conform to the City Standards. Pipe bedding for utilities shall consist of sand that has a minimum sand equivalent of 30. The sand shall be placed in a zone that extends to a minimum of 6 inches below and 12 inches above the pipe for the full trench width. The thickness of the bedding sand below the pipe may be decreased to 4 inches for ductile iron pipe materials.
2. Trench backfill above the pipe bedding may consist of onsite soils or import fill materials, per this specification.

PART 3 - EXECUTION

3.1 GENERAL:

A. Trenches, ditches, pits, sumps, and similar items which are outside the barricaded working area shall be barricaded to conform to Cal OSHA standards.

B. Trenches over 5'-0" in depth shall conform to the Construction Safety Orders of the California Division of Industrial Safety.

C. Backfill excess excavations to the required level with earth, gravel, sand, or concrete as directed by the Engineer and compact thoroughly. Grade ground adjacent to all excavations to prevent entry of water.

D. No pipe shall be laid lengthwise under concrete walks without approval of the Engineer.

E. Do not excavate trenches parallel to footings closer than 18 inches from the face of the footing or below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footings.

i. Unless otherwise indicated on Drawings, depth of excavations outside the buildings shall allow for a minimum coverage above top of pipe, tank or conduit measured from adjoining finished grade, as follows:

Steel Pipe	24" below finished grade
Copper Water Tube	18" below finished grade

Cast-Iron, Pressure Pipe	36" below finished grade
Plastic Pipe (other than waste)	30" below finished grade
Tanks or other structures	36" below finished grade
Soil, sewer & storm drain	minimum 18" below finished grade, and as required for proper pitch and traffic load. (Install polypropylene sewer pipe with not less than 24" coverage)

2. Trench width shall provide ample space for working and joining. Dig holes for bells for all bell and spigot pipe, and for fittings for all pipe.

G. Excavate trenches for utilities, pipes, concrete encased electrical conduits and fuel tanks, to required depth, as indicated on Drawings. Grade bottom of trenches to a uniform surface to prevent pockets. Remove all loose soil from the excavation before placing 6" layer of sand bedding, compacted to 90 percent of the maximum relative compaction as determined by ASTM D1557. Place pipes, encased conduits and other utilities on a uniformly bearing sand bed. Jetting of bedding material shall not be permitted.

H. Keep excavations free of water during installation work. Dispose of water in such a manner as not to endanger public or private property or public health. Remove accumulated water in excavations by pumping, or other approved means.

I. Where portions of existing structures, walks, paving, etc. must be removed or cut for pipe or conduit installation, replace the material with equal quality, finished to match adjacent work.

J. Provide a minimum space of 2 inches between outer surfaces of buried pipes, including conduits placed in the same trench or, where used, outside surfaces of containers.

K. Do not place backfill until the work installed has been inspected, tested and approved by the Engineer.

L. Backfill shall be placed in layers not exceeding 4 inches in thickness, moisture conditioned as necessary to at or near optimum moisture content, and compacted to 90 percent of the maximum dry density as determined by ASTM D1557.

3.8 INSPECTION AND TESTING:

A. Excavation of existing fills, reworking of natural soils and compaction of all required fills shall be inspected and tested by the Geotechnical Engineer.

B. Imported fill materials, and its sources, shall be subject to approval by the Geotechnical Engineer prior to importation.

C. Place fills and backfills under supervision of the Geotechnical Engineer.

D. The Geotechnical Engineer shall inspect all subgrades and excavations prior to placing of fill materials.

A. Compaction: Test compacted fill in accordance with ASTM D1557 (latest edition).

F. The Engineer will inspect all utility trenches prior to placement of bedding material and prior to placement of trench backfill.

3.9 EXCESS MATERIAL DISPOSAL:

A. Remove all excess excavated and imported materials, not used for fill or backfill, and all waste from job-site.

END OF SECTION

SECTION 02230

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Plans and general provisions of the Contract, including General and Special Provisions Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:
   1. Protecting existing trees, shrubs, groundcovers, plants, and grass to remain.
   2. Removing existing trees, shrubs, groundcovers, plants, and grass.
   3. Clearing and grubbing.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 02050 Demolition Removal
   2. Section 02300 Earthwork

1.3 MATERIALS OWNERSHIP

A. Except for materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project Site.

1.4 SUBMITTALS:

A. NA

1.5 QUALITY ASSURANCE:

A. Conduct conference at Project Site to comply with all requirements in Division 1– General Requirements

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Cleared materials shall not be stored or stockpiled on project site.

1.7 WORK CONDITIONS:

A. Do not commence site clearing operations until temporary erosion and sediment control measures are in place.

B. 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, and other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways.

1.8 COORDINATION:

A. Coordinate schedule for demolition and road/lane closure with City of Ventura, and subcontractors to minimize disruption of operations.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Protect and maintain benchmarks and survey control points form disturbance during construction.

B. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding.

C. Conduct site clearing operations to prevent injury to people and damage to adjacent facilities to remain. Ensure safe passage of people around demolition area.
   a. Erect temporary protection, such as walks, fences, and railing where required by authorities having jurisdiction.
   b. Protect existing site improvements, appurtenances, and landscaping to remain.
      i. Restore any damaged improvements to their original condition, as acceptable to City.

3.2 CLEARING AND GRUBBING:

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

a. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

B. Fill depressions caused by clearing and grubbing with satisfactory soil material unless further excavation or earthwork is indicated.
   a. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal or adjacent to original ground.

3.3 DISPOSAL:

A. Remove surplus soil material, unsuitable top soil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
   a. Separate recyclable materials produced during site clearing from other non-recyclable materials, and transport the recyclable materials to the proper recycling facilities.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Plans and general provisions of the Contract, including General and Special Provisions Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. General exterior grading, cutting and filling, including grading for paving, planting areas, banks and hillsides.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 02050 Demolition Removal
2. Section 02221 Excavating, Backfilling, and Compacting for Utilities
3. Section 02230 Site Clearing
4. SNot Used
5. Section 02751 Concrete Paving

1.3 DEFINITIONS:

Not Used

1.4 SUBMITTALS:

Not Used

1.5 QUALITY ASSURANCE:

A. All staking shall be performed by a licensed surveyor registered in the State of California.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Unless otherwise specified or indicated on Drawings, remove from site all soil which is not required for work of this Section.

PART 2 – PRODUCTS

2.1 MATERIALS:

A. Provide all fill material required.

PART 3 - EXECUTION

3.1 VERIFICATION OF GRADES:

A. The contractor shall provide all staking required to construct the job.

B. No credit allowances will be given for any discrepancy between existing grades and grades indicated on grading plan, unless such discrepancies are called to attention of Engineer at time grades are set.

3.2 OVER-EXCAVATION REQUIREMENTS:

See Soils Report (Appendix C)

3.3 ROUGH AND FINE GRADING

A. Rough grade area sufficiently high to require cutting by fine grading.

1. Grade area for bituminous surfacing and other paving to a depth below finish grades indicated, equal to base and pavement thickness to be constructed.

2. Cut banks neatly to required finish grades as cut progresses, or leave cuts full and finish grading by mechanical equipment, which will produce finish grades indicated on Drawings.

3. Grade filled banks full and compact beyond grade of finish bank so that when trimmed to finish grades, soil is compacted to density specified for final slope face.

4. Grade Only Areas: Bring areas to be graded only (with no pavement) to approximate finish grades and then scarify, moisten and roll to obtain required density. Scarify, moisten and roll resulting high and low areas to obtain required finish grades by cutting and filling.

5. Grade future planting areas so that, upon cultivation and fertilization, they will conform to finish grades indicated for planting areas.

6. Tolerances: Completed grades shall be within a tolerance of 0.05 of 1 foot above or below grades indicated. Variation of tolerances shall be compensating, so that average grade indicated is met.

B. Base or Subgrade:

1. Subgrade shall be prepared as follows:

a. Scarify the exposed surface to a depth of at least 6 inches, moisture condition the surface to within 2 percent of optimum moisture content, and compact to at least 90 percent of the maximum dry density determined from ASTM D1557. Scarification shall be performed prior to any placement of compacted fill.

b. Base course where indicated or specified, shall be installed in accordance with geotech report

2. Tolerance of completed grades of base or subgrade shall not vary more than 0.05 of 1 foot from grades indicated. Variation within tolerances shall be compensating so that average grade indicated is met.

3.4 EXCESS MATERIAL DISPOSAL

A. Unless otherwise specified or indicated on Drawings, remove from site all soil material which is not required for work of this Section.

END OF SECTION

SECTION 02751

CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Plans and general provisions of the Contract, including General and Special Provisions Specification Sections and City Standard Details, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:
   1. Concrete Walkway, Patios & interior repair

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 02300 Earthwork

1.4 SUBMITTALS:

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

B. Product data for each type of product including admixtures.

C. Design mixture for concrete pavement.

1.5 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C94M requirements fir production facilities and equipment.

B. ACI Publications: Comply with ACI 301, “Specification for Structural Concrete” unless modified by requirements in the Contract Documents.

C. All work to be performed and all materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements.

D. The Contractor shall have a copy of the Standard Specifications for Public Works Construction at the job site.

E. The Standard Specifications for Public Works Construction apply only to performance and materials.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT:

A. Reinforcing Bars: ASTM A 615/A 615M. Grade 60; deformed

B. Bar Supports: Bolsters, chairs, spacers, and othere devises for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

2.2 CONCRETE MATERIALS:

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
   1. Portland Cement: ASTM C 150, Type II, low alkali. Supplement with the following:
      a. Pozzolan: ASTM C618, Class F or N Fly Ash, 100 pounds maximum per cubic yard, containing one percent or less carbon. Fly ash shall not be used in excess of 15 percent by weight of total cement quantity.

B. Combined Aggregates: Gradation "C" conforming to SSPWC Section 201-1.3.2.

C. Water: ASTM C 94/C 94M.

2.3 CURING MATERIALS:

A. Liquid Curing Compound: ASTM C309, fugitive dye dissipating type, complying with Rule II 13 of the South Coast Air Quality Management City and Federal Air Quality Regulation 40 CFR 52.254.

B. Moisture-Retaining Cover (Curing Sheet): ASTM C 171, non-staining polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.
D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

2.4 RELATED MATERIALS:

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. 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 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with Caltrans Standard Specifications - Section 84 (Federal Specification No. TT-P-1952 for Blue paint; and State of California Standard Specification No. PTWB-01 for White paint) with drying time of less than 45 minutes.

1. Color: As indicated.

2.5 CONCRETE MIXTURES:

A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:

1. Compressive Strength (28 Days): 2,500 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.60
3. Slump Limit: 4 inches**,** plus or minus 1 inch.

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates to Architect for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

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

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.4 JOINTS

A. General: Form construction, isolation, and control joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

C. 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.

D. Control Joints: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of the concrete thickness.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. 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.

D. Screed pavement surfaces with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and 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. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer'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 nonslip aggregate.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to 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.

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

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these methods.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances as follows

1. Elevation: 1/4 inch
2. Thickness: Plus 3/8 inch minus 1/4 inch
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.9 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for a minimum 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material.

END OF SECTION

SECTION 03150

FORMS

PART 1 - GENERAL

1.1 DESCRIPTION Provide forms for all Work constructed of cast-in-place concrete as indicated, specified, and required.

A. Related Work Not in This Section.
1. Forms for precast concrete.
2. Screeds for slabs.
3. Furnishing and placing reinforcing for cast-in-place concrete.
4. Furnishing, placing, finishing and curing of cast-in-place concrete.
5. Placing of embedded anchor bolts and inserts.

1.2 QUALITY ASSURANCE

A. Allowable Tolerances and Design. Construct forms conforming to ACI 301, "Specifications for Structural Concrete for Buildings", and ACI 347, "Recommended Practice for Concrete Formwork" as applicable, unless exceeded by requirements of regulatory agencies or otherwise indicated or specified.

1. 3 SUBMITTALS Refer to Section 01300 for procedures.

A. Shop Drawings. Form pattern layouts of all exposed exterior concrete dimensioned to precisely locate grooves, indicate panel jointing and sealing of joints, precisely dimension locations of all form tie cones, casting and finishing sequence for formed special concrete, and similar features. Review and approval will not include form strength and adequacy.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING Deliver materials in timely manner to ensure uninterrupted progress. Store materials by methods that prevent damage and permit ready access for inspection and identification.

PART 2 - PRODUCTS

2.1 MATERIALS Furnish materials meeting the test requirements of Paragraph "Quality Assurance" hereinbefore, as applicable, and following requirements:

Form lumber: WCLIB "Construction" grade or better, WWPA No. 1 or better, or equal.

Form plywood: PS 1-83, Group I, Exterior B-B Plyform or better, minimum 5-ply and 5/8" thickness, grade marked, not mill oiled. Plywood having medium or high density overlay is acceptable.

Tube forms: Sonoco "Seamless Sonotubes", Alton Building Products "Sleek Seamless Standard Wall", or equal, type leaving no marks in concrete.

Joist forms: Approved steel or molded plastic types as required.

Special forms: For exposed integrally-colored concrete, plywood as above with high density overlay, plywood with integral structural hardboard facing of fibrous glass reinforced plastic facing, or approved equal producing specified finish.

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

Form coating: Resin type coating free of oil, silicon, wax, and non-drying material, not grain-raising.

Form liner: Rigid or resilient type by L.M. Scofield, Labrado Forms, Symons, Greenstreak, or equal, types shown or directed, matching approved Sample.

PART 3 - EXECUTION

3.1 FORM ERECTION AND REMOVAL Conform to ACI 301 and ACI 347 except as exceeded by requirements of Code, regulatory agencies, or herein.

A. Construction. Coat forms with the specified resin coating, not form oil. Build forms to exact shapes, sizes, lines, and dimensions required to obtain level and plumb surfaces. Provide openings, offsets, keys, anchorages, recesses, reglets, moldings, chamfers, blocking, screeds, drips, bulkheads, and all other required features. Make forms removable without hammering or prying against concrete. Space forms apart with metal spreaders. Construct forms to accurate alignment, location and grades, and provide against sagging, leakage or concrete mortar, or displacement occurring during and after placing of concrete. Secure all inserts in forms according to shop drawings and instructions of other trades.

B. Camber. Place suitable jacks, wedges, or similar means to induce camber and to correct settlement in forms before or during concrete placing. Induce camber of 1/8" per 8 feet of span plus 1/4" for beams, and 1/8" per 10 feet of span plus 1/8" for slabs other than 2-way slabs. For 2-way slabs supported on beams or walls, camber of 1/8" per 10 feet of span in the diagonal or column centerline dimension plus 1/4".

C. Corners and Angles. Provide 3/4" by 3/4" beveled chamfer strips for concealed concrete corners and angles unless otherwise indicated. Form exposed concrete corners and angles square unless otherwise indicated.

D. Reglets and Rebates. Form all required reglets and rebates to receive flashing, frames and other equipment. Obtain dimensions, details, and precise positions from related trades and form concrete accordingly.

E. Form Joints. Fill joints to produce smooth, flush surfaces, intersections and arises. Use polymer foam or equivalent fillers at joints, tie holes or gaps in forms, and where forms abut or overlap existing concrete to prevent leakage of mortar.

F. Recesses, Drips and Profiles. Provide smooth milled wood or performed rubber or plastic shapes of types shown and required.

G. Cleanouts and Cleaning. Form temporary openings in wall forms for cleaning and inspection. Clean forms and surfaces to receive concrete prior to placing.

H. Re-Use. Clean and recondition form material before re-use.

I. Time of Form Removal. Do not remove forms until the concrete attains sufficient strength to support its own weight and all superimposed loads. Leave all bottom forms in place until concrete has attained at least 66% of required strength but not less than 10 days. Reshore until full concrete strength is attained but in no case less than 21 days from date of concrete placing.

J. Reshoring of not less than half of the full required shoring shall be added under the last placed floor, over which full shoring is to be placed for the next floor above. Leave reshoring in place for at least 7 days after the floor above is placed, but in no case remove reshoring until the next placing has attained a compressive strength equal to 66% of that required for 28 day age as determined by control test cylinders specified hereinafter.

K. Record. Maintain a form and shoring removal record. Also provide survey of a few typical bays of framing as approved by the architect. Survey shall be at selected points before and after shore removal.

L. Shoring for Tributary Loads. Set temporary shoring for steel beams which support cast-in-place concrete slabs. Such shoring is not required where the beams are partially or totally encased with concrete nor for steel beams supporting walls resting on the beams.

3.2 EMBEDDED PIPING AND ROUGH HARDWARE Consult with trades needing openings for passage of pipes, conduits, ducts and other inserts. Necessary pipe sleeves, anchors, or other required inserts shall be accurately installed by respective trades so as not to reduce the strength of concrete. No aluminum material shall be placed in concrete.

A. Conduits or Pipes. Place only conduits in slabs of 4-1/2" or greater thickness. Conduit buried in a concrete slab shall not have an outside diameter greater than 1/4 the slab thickness nor be placed below the bottom reinforcing steel or over top reinforcing steel, nor shall conduit restrict placing of concrete around the reinforcing steel. Conduits or pipes may be embedded in walls only if the outside diameter does not exceed 1/4 the wall thickness, are not spaced closer than three diameters on centers, and are between the curtains of reinforcing bars. In all cases pipes and conduits shall have 1-1/2" clear between pipes or conduits.

B. Pipe Sleeves may pass through slabs or walls if not exposed to rusting or other deterioration and are of uncoated or galvanized iron or steel. Provide sleeves of diameter large enough to pass any hub or coupling on the pipe, including any insulation.

3.3 MISCELLANEOUS CONCRETE WORK Provide forms for concrete areaways, cast-in-place valve boxes, pits, bases and other miscellaneous concrete as shown and required to complete all Work. Conform to applicable requirements herein.

3.4 FIELD QUALITY CONTROL

A. Supervision. Perform Work of this Section under the supervision of a capable concrete form superintendent.

B. Inspection. Obtain inspection and approval of forms before placing structural concrete.

END OF SECTION

SECTION 03200

REINFORCING STEEL

PART 1 - GENERAL

1.1 DESCRIPTION Division 1 applies to this Section. Provide steel bar and welded wire fabric reinforcing for cast-in-place concrete and furnish and deliver steel bar reinforcing for masonry as indicated, specified and required.

A. Related Work Not in This Section.
1. Reinforcement for precast concrete.
2. Mesh reinforcement for composite insulating concrete.
3. Installation of reinforcing bars in masonry.

1.2 QUALITY ASSURANCE

A. Source Quality Control. Refer to Section 01400 for general testing requirements and to following paragraphs for specific procedures. Testing Laboratory shall perform following conformance testing.

B. Reinforcing Bars. Testing Laboratory shall select the test samples of bars, ties and stirrups from material at the site or from place of distribution, each sampling including at least two 18" long pieces, and perform the following tests according to ASTM A615.

C. Identified Bars. If samples are obtained from bundles as delivered from the mill, identified as to the heat number, accompanied by the mill analyses and mill test reports, and properly tagged with Identification Certificate so as to be readily identified, perform one tensile and one bend test for each 25 tons or fraction thereof of each size of bars. Submit mill reports when samples are selected.

D. Unidentified Bars. When positive identification of bars cannot be made and when random samples are obtained, perform tests for each 10 tons or fraction thereof, one tensile and one bend test from each size of reinforcement.

1.3 SUBMITTALS

A. Shop Drawings. Submit including complete layouts, sections and details for congested conditions, typical bending diagrams and offsets, splice lengths and locations, proposed layout where vertical and horizontal bars intersect, and where mechanical connections are proposed, detailed to conform to Code requirements. After approval of initial submission, subsequent submittals may be waived.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING Deliver materials in timely manner to ensure uninterrupted progress. Store materials by methods that prevent damage and permit ready access for inspection and identification.

PART 2 - PRODUCTS

2.1 MATERIALS Furnish materials meeting the test requirements of Paragraph "Quality Assurance" hereinbefore, as applicable, and following requirements:

Reinforcing bars:	ASTM A615, Grade 40 and 60 as noted. Grade 75 for #14 bars only. 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.
Reinforcing mesh:	ASTM A185, mesh size and gage as indicated, 60 ksi minimum tensile strength.
Tie wire:	Annealed steel, 16 gage minimum.
Welding electrodes:	Table 5.1, 80 or 90 Series, low hydrogen type per AWS D1.4.
Steel Coupler:	Lenton reinforcing steel couplers or Cadweld splices by Erico Concrete Products, or equal.

2.2 FABRICATION OF REINFORCING BARS

A. Bending and Forming. Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Maintain tolerances as noted in latest ACI Detailing Manual SP-66 and/or CRSI Manual of Standard Practice. Do not heat reinforcement for bending. Bars with unscheduled kinks or bends are subject to rejection. Use tested and approved bar materials.

B. Splices. Reinforcing bars may be lapped, welded or mechanically spliced, as noted and approved.
   1. A full welded splice shall have bars butted and welded to develop in tension at least 140 percent of specified yield strength of the bar and shall be located outside of frame hinge regions. For a full welded splice located in an intended hinge region or within one beam depth either side of the hinge region, the splice shall develop in tension at least 165 percent of specified yield strength.
   2. A full mechanical connection shall develop in tension or compression, as required, at least 140 percent of specified yield strength of the bar and shall be located outside of frame hinge regions. For a full mechanical connection located in an intended hinge region or within one beam depth either side of the hinge region, the splice shall develop in tension at least 165 percent of specified yield strength.

C. Welding. Perform welding where shown or approved, by the direct electric arc process in accordance with AWS D1.4 using the specified low-hydrogen electrodes. Preheat 6" each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is prohibited. Do not tack weld bars. Clean metal surfaces to be welded of all 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 found defective with chisel and replace with proper welding. Employ only experienced certified welding operators. Prequalification of welds shall be in accordance with Code. Reinforcing bars to be welded shall have a maximum 0.75 carbon equivalent and prequalification is not required for material less than 0.65 carbon equivalent.

D. Galvanizing. Hot-dip galvanize completed reinforcing assemblies in accordance with ASTM A123 where indicated.

E. Marking and Shipping. Bundle bars, tag with identification, and transport and store so as not to damage any material. Keep a sufficient supply of tested and approved bars at site to avoid delays.

PART 3 - EXECUTION

3.1 INSTALLATION OF REINFORCING Provide additional bars at sleeves and openings as detailed. Before placing bars, and again before concrete is placed, clean bars of loose mill scale, oil or other coating that might destroy or reduce bond. Maintain tolerances and clearances per Building Code and Drawings.

A. Securing in Place. Accurately place bars and wire tie in precise position where bars cross. Bend ends of wire ties away from forms. Wire tie bars to corners of ties and stirrups. Support bars according to current edition of "Recommended Practice for Placing Bar Supports" of the Concrete Reinforcing Steel Institute, using approved accessories and chairs. Use precast concrete cubes with embedded wire ties to support reinforcing steel bars in concrete placed on grade and in footings.

B. Exposed Surfaces. Provide approved stainless steel or plastic tipped chairs, bolsters and accessories where exposed on exterior or interior concrete surfaces not to be painted or covered.

C. Clearances. Maintain minimum clear distances between reinforcing bars and face of concrete as indicated or directed. Maintain 1.0 d_b or 1" clear between bars in layers and 1.5d_b or 1-1/2" clear between main bars of columns. Clearances shall also apply to dowels or lapped bars.

D. Splices. Do not splice bars at points of maximum stress except where indicated. Lap splices as shown or required to develop the full strength of bars. Stagger splices in horizontal wall bars at least 48" longitudinally in alternate bars and opposite faces. Splices to be in contact or spaced one bar diameter or 1" clear and in columns 1-1/2 bar diameter or 1-1/2" clear.

E. Field Welding or Mechanical Connection of Bars. As specified for Fabrication.

F. Maintaining Bars in Position. Assign a competent ironworker mechanic at every concrete placing location to inspect reinforcement and maintain all bars in the correct positions.

G. Reinforcing Mesh. Lap one full mesh plus 2" at splices, wire tie and support the same as specified for bars.

3.2 MISCELLANEOUS CONCRETE WORK Provide reinforcing for areaways, cast-in-place valve boxes, pits, splash blocks, bases and other miscellaneous concrete as shown and required to complete all Work. Conform to applicable requirements herein.

3.3 FIELD QUALITY CONTROL Refer to Section 01400.

A. Supervision. Perform Work of this Section under the supervision of a capable superintendent.

B. Inspection. Obtain inspection and approval of reinforcing before concrete is placed.

C. Welded or Mechanical Connection Inspection. Whether connection is done in the shop or at the site, perform welding or mechanical connection of reinforcing bars under inspection of the Testing Laboratory Inspector.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION. Division 1 applies to this Section. Provide all Work constructed of cast-in-place concrete as indicated, specified, and required.

A. Work in This Section. Principal items include:
1. Furnishing, erection, and removal of forms.
2. Furnishing and placing reinforcing for cast-in-place concrete.
3. Furnishing and placing reinforcing for precast concrete fabricated at site.
4. Furnishing and delivery of reinforcing bars for masonry.
5. Furnishing, placing, finishing, and curing of cast-in-place concrete unless otherwise specified.
6. Site concrete.
7. Off-site concrete.
8. Grout and drypack work, except as otherwise specified.
9. Placing of embedded anchor bolts and inserts.
10. Vapor barrier under interior floor slabs on grade.
11. Waterstops including testing.

B. Related Work Not in This Section.
1. Preparation and grading of earth subgrade under concrete.
2. Concrete and reinforcement in piles or caissons.
3. Gravel fill under interior floor slabs.
4. Subslab drainage fill.
5. Insulating concrete.
6. Composite insulating concrete.
7. Precast concrete.
8. Grouting of masonry.
9. Metal decking.

1.02 QUALITY ASSURANCE

A. Concrete Manufacturer. Furnish all concrete from licensed commercial ready-mix concrete plants conforming to ASTM C 94 and approved by Building Official. The requirements herein govern when exceeding ASTM C 94.

B. Allowable Tolerances. Construct concrete conforming to tolerances specified in ACI 301, Specifications for Structural Concrete for Buildings, as applicable, unless exceeded by requirements of regulatory agencies or otherwise indicated or specified.

C. Source Quality Control. Refer to Section 01400 for general testing requirements and to following paragraphs for specific procedures. Concrete materials which by previous tests or actual service, have shown conformance may be used without testing when approved by Engineer and Building Official. Testing Laboratory shall perform following conformance testing.

D. Portland Cement. Furnish Mill Certificates, acceptable to the Architect and Building Official, showing conformance with requirements specified; otherwise, the Testing Laboratory shall test each 250 barrels of cement in accordance with ASTM C 150.

E. Aggregate for Normal Weight Concrete. Test the aggregate before and after concrete mix is designed and whenever character of aggregate varies or source of material is changed. Include a sieve analysis. Obtain samples of aggregates at source of supply or at the ready-mix concrete plant in accordance with ASTM D 75 and perform tests for the following properties:

Sieve analysis:	ASTM C 136.
Organic impurities:	ASTM C 40, fine aggregate color not darker than the referenced standard color.
Soundness:	ASTM C 88, loss after 5 cycles not over 8% of coarse aggregate or 10% fine aggregate.
Abrasion:	ASTM C 131, weight loss not more than 102 % after 100 revolutions, 42 % after 500 revolutions.
Deleterious materials:	ASTM C 33.
Materials finer than No. 200 sieve:	ASTM C 117, not over 1 % for gravel, 1.5 % for crushed aggregate, per ASTM C 33.
Reactivity potential:	ASTM C 227, C 289, C 342, ratio of silica released to reduction in alkalinity not to exceed 1.0; include full report for Architect's evaluation.
Sand equivalent:	ASTM D 2419, California Sand Equivalent values not below 80 percent.

F. Lightweight Aggregates. Test before mix is designed and whenever character of aggregate varies or source is changed in accordance with ASTM C 330. Include a sieve analysis and report on unit weights, deleterious substances, unburned or underburned lumps, loss on ignition, soundness, and staining materials. Provide Building Department approved report for structural use and fire-rating requirements.

1.03 CONCRETE MIX DESIGNS. Testing Laboratory shall design concrete mixes for all structural concrete requiring 28-day compressive strength exceeding 2,000 psi. The trial batch strength for each mix shall exceed indicated or specified strength by 750 psi or a lesser amount based on standard deviations of strength test records according to ACI 318. Refer to Section 01400 for requirements pertaining to costs of mix designs.

A. Mix designs shall be made by the Testing Laboratory of Record under the supervision of a California Registered Civil Engineer, who shall determine mix proportions to fulfill the specified requirements for strength, aggregate size and workability of concrete, and such designs shall ge used in proportioning all structural concrete. Mix designs shall bear the signature and seal of the California Registered Engineer. Two copies of the mix designs shall be filled with the Architect for record purposes only, not for review or approval.

B. Mix Design for Special Concrete. In addition to conforming to requirements specified above, submit mix designs for formed special concrete, for special concrete toppings, and slabs. The mix design for formed special concrete shall include a retarding admixture proportioned in accordance with the manufacturer's recommendations. The intent is that the concrete represented by the mix designs shall be based on the same materials and shall closely match

the concrete color, texture, and appearance of sandblast finished concrete approved for use except coarse aggregate size shall be as specified in this Section.

C. Basis of Mix Designs. Design concrete mixes for workability and durability of concrete. Control mixes in accordance with Chapter 4, ACI 318 Building Code Requirements for Reinforced Concrete. Make adjustments in cement content as necessary for required concrete strengths at the Contractor's expense. Do not exceed 0.58 water-cement or cement plus fly ash ratio, by weight.

D. Admixes. Admixes shall be used for workability and/or water reduction. The admix may contain an air-entraining agent producing air content of 3.5% to 6.5% by volume and adjusted for weather conditions. Air entrainment or other admix is not required for footing and foundation concrete. Do not use calcium chloride. Other admixtures containing material releasing nitrates in solution are limited to 0.06% by weight for the chloride ion.

E. Maximum Aggregate Sizes. Not exceeding 3/4 of minimum clear space between bars and between bars and forms, nor larger than 1/5 of least dimensions between the forms. Design the mixes with 3/4" maximum size, except maximum 1-1/2" size for foundations and maximum 3/8" size where congested reinforcing or thin sections occur.

F. Lightweight Structural Concrete. Design for air-dry density of 115 pounds per cubic foot maximum. Expanded clay or shale shall be vacuum or thermally saturated and pumice aggregate saturated. Pumice aggregate shall be combined with pea-gravel materials.

G. Test for Structural Concrete. Perform the following tests for each mix prior to starting structural concrete work for walls and floors.

H. Shrinkage Test Specimens. 4" by 4" by 11" long bars, cured for 7 days in a moist room and as specified in ASTM C 157. Make measurements at 7-day intervals to 35 day age. Not to exceed 0.05% after period of 35 days.

I. Modulus of Elasticity. Tests at 3, 7 and 28 days in conformance to ASTM C 469.

J. Previous Tests. The ready-mix concrete manufacturer may furnish certified test reports from an approved Testing Laboratory as proof of meeting requirements provided aggregates used and concrete covered by such test reports conform to the mix design approved for use in the Work.

1.04 SUBMITTALS.

A. Shop Drawings. Submit for following items:

B. Slab and Beam Construction Joint Plan. Submit showing dimensioned locations and types of construction details and expansion joints.

C. Product Data. Submit manufacturer's technical data for products, methods and control procedures. Submit applicable Building Department approved reports for proposed materials and methods.

PART 2 - PRODUCT

2.01 MATERIALS. Furnish materials meeting the test requirements of Paragraph Quality Assurance hereinbefore, as applicable, and following requirements:

Portland cement:	ASTM C 150, Type II, low alkali. Do not change brand without prior approval.
White Portland cement:	ASTM C 150, Type I, from one approved source. Use for integrally-colored concrete.
Stone aggregates:	ASTM C 33, from approved its, free from vegetable matter and of opaline, feldspar, and siliceous magnesium substances; clean, hard, fine-grained sound crushed rock or washed gravel; not over 5% by weight of flat, think elongated, friable or laminated pieces (pieces having the major dimension over 5 times average dimension) or over 2% by weight of shale or cherty material.
Lightweight aggregates:	ASTM C 330, approved coated expanded clay or shale, or pumice product; coarse aggregate, dry loose weight minimum 38 pounds per cubic foot and maximum 9/16" size.
Admixtures:	ASTM C 494. All material shall be non-corrosive and have chloride content not exceeding potable water. Type A - Water-reducing Type C - Water-reducing, accelerator Type D - Water-reducing, retarding Type F or G - High range water reducing, optional subject to approval of Structural Engineer.
Fly ash:	ASTM C 618, Class F, maximum content not to exceed 18% of cement content by weight.
Air-entraining admix:	ASTM C 260.
Water:	From potable domestic source.
Curing compound:	ASTM C 309, fugitive dye dissipating type.
Curing sheet:	ASTM C 171, non-staining white types.
Evaporation retardant and finishing aid:	Master Buildings Confilm, or equal.
Anti-Spalling Sealer:	A siloxane-based compound of 92% chloride-ion screen and 92% repellency screen in accordance with NCHRP #244. Tests shall indicate no scaling when exposed to 120 cycles of freeze-thawing per ASTM C 672.
Vapor barrier:	ASTM D 2103, polyethylene sheeting, 8 mil thickness, with minimum 2" wide waterproof plaster tape, self-adhering type.

Non-shrink grout: Master Builders Embeco, or equal, non-gas-forming type, free of oxidizing catalysts and inorganic accelerators, performance characteristics when mixed to fluid consistency meeting CRD-C-79 and CRD-C-588, non-staining type in exposed areas.

Waterstops: Williams Product Inc. Efficiency Waterstops, Gates Rubber Co. Kwik-Seal Waterstops, Electrovert Inc. Durojoints or Duroseal, or approved equal, neoprene or polyvinyl-chloride types shown, joints per manufacturer's directions. For walls, flat ribbed type, minimum 6" width by 3/8" thick at center with minimum 7 ribs each side of each flange. For slabs, ribbed center bulb type, minimum 9" wide by 3/8" thick next to bulb, minimum 9 ribs on each side of each flange, bulb minimum 2" ID and 7/8" OD.

Bonding and Repair: Bonding material shall be a polyvinyl acetate compound for use in areas not subject to moisture.

Epoxy adhesive shall be a two-part compound suitable for wet or dry areas.

Patching mortar shall be a free-flowing, polymer-modified cementious coating.

Bonding admixture shall be a latex, non-wettable type.

2.02 CONCRETE MIXING. Furnish ready-mixed concrete from an approved commercial off-site plant. Conform to ASTM C 94, except materials, testing, and mix designs as specified herein. Use transit mixer trucks equipped with automatic devices for recording number of revolutions of drum.

A. Limitation of Mix Water. Do not deliver ready-mixed concrete to site with total amount of mixing water included. Withhold 2-1/2 gallons of water per cubic yard at the plant, unless a lesser amount is approved by the Structural Engineer, then add to mix before concrete is discharged from the mixer truck under supervision of Inspector. Each mixer truck shall arrive at the site with full water tank; if the tank is not full and concrete tests to a slump greater than specified, entire load is subject to rejection.

B. Adjust quantity of water so concrete at the point of placing does not exceed slumps indicated on the Drawings when tested according to ASTM C143. Use the minimum water necessary for workability required by part of structure being cast. The maximum slumps shall not be exceeded unless approved by the Structural Engineer.

C. Form Material. Conform to Section 03150.

D. Reinforcement. Conform to Section 03200.

PART 3 - EXECUTION

3.01 PREPARATION FOR CONCRETE PLACING. Remove free water from forms before concrete is deposited. Remove hardened concrete, debris, and all foreign materials from metal decking surfaces, forms and from surfaces of mixing and conveying equipment.

A. Surface Preparation: Before new concrete is deposited against hardened concrete, and before masonry is placed on concrete, remove all incrustations and laitance from forms, reinforcing, and surface of hardened concrete. If the surface mortar and laitance of the first concrete pour has not been completely removed by water blasting, the hardened concrete surface shall receive a sandblast treatment exposing the coarse aggregate, to 3 inch amplitude. Surfaces which are to receive dryplack shall also be prepared as herein specified.

B. Gravel Fill. Recompact disturbed gravel and bring to correct elevation.

C. Subslab Drainage Fill. Recompact disturbed material and bring to the correct elevation.

D. Vapor Barrier. Install under interior floor slabs on grade. Lap all joints 6" in the direction of concrete spreading and tape seal. Seal the joints at walls and around penetrations with tape. Cover barrier with 2" layer of clean sand.

E. Slab Areas on Grade. Place slabs on subgrade with maximum 40-foot edge dimension. Generally locate slab joints along column lines, exact locations as directed or approved.

F. Slab Joints. Use standard product type construction joints equivalent to key-Kold at column lines and Kwik-Joint contraction joints or saw cut 1/8" or 3/4" deep joints at intermediate spacing as indicated or approved. Fill cracks larger than 1/8" width in conformance to Section 07900.

G. Expansion Joints. Conform to details and the approved submittal. Provide expansion joint filler finished flush with slab surface except for those joints shown to be sealed with sealant. Conform to Section 07920 where sealant sealed joints are shown or specified, including the polymer joint filler or backing.

H. Screeds. Set screeds at all walls or beams and maximum 8-foot centers between. Use weighted pad or cradle type screeds over vapor barrier and do not drive stakes through vapor barrier. Set to provide level floor after form removal and specified minimum thickness. Check with an instrument level, transit, or laser prior to placing operation to maintain proper rebar placement.

I. Wetting. Wet wood forms sufficiently to tighten up cracks. Wet other materials sufficiently to reduce suction and maintain concrete workability.

J. Earth Subgrade. Lightly dampen subgrade 24 hours before placing concrete but do not muddy. Re-roll where necessary for smoothness and remove loose material. Lightly dampen prior to concrete placement.

3.02 CONCRETE PLACING

A. Joints in Concrete. Locate joints only where approved. Obtain prior approval for points of stoppage of any pour. Clean and roughen surface of aggregate solidly embedded in mortar matrix by wet process sandblasting, chipping, or equal. Keep hardened concrete wet for not less than 24 hours before placing new concrete. Cover horizontal surfaces of existing or concrete less 50% of coarse aggregate just before balance of concrete is placed. Carefully control amount of moisture applied so that no free water will be present at any time.

B. Conveying and Placing. Do not place concrete until reinforcing steel, forms, or metal decking have been approved by the Inspector and other authorities having jurisdiction. Architect shall also approve forms for special concrete. Do not use aluminum tubes or any aluminum equipment

for pumping concrete, nor allow concrete to free fall from its point of release at mixer, hoppers, tremmies, or conveying equipment more than 6 feet for concealed concrete and 3 feet for exposed concrete. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one portion to another. Place concrete in horizontal layers not more than 18" thick within 45 minutes after water is first added to the batch. Place concrete by methods that prevent segregation of materials. For special exposed concrete do not use first batch of concrete at each start up.

C. Consolidation. Vibrate each layer of concrete as placed with mechanical vibrators or equivalent equipment to accomplish thorough consolidation. Supplement by hand rodding or spacing adjacent to forms. Vibration through forms shall be used only as approved by the Structural Engineer. Compact concrete into corners and angles of forms and around reinforcement and embedded fixtures. Recompact deep sections with heavy congestion from reinforcing steel.

D. Operation of Vibrators. Do not transport concrete in forms by use of vibrators nor allow vibrators to contact forms or reinforcing. Push vibrators vertically into preceding layers that are still plastic and slowly withdraw, producing maximum obtainable density in concrete without creating voids or segregation. Under no circumstances disturb concrete that has stiffened or partially set. Vibrate at intervals not exceeding two-thirds the effective visible vibration diameter of the submerged vibrator and generally at 18" on centers. Avoid excessive vibration and conform to ACI 309 ARecommended Practice for Consolidation of Concrete.

E. Re-Vibration. Place concrete containing retarding admixture by a schedule that allows layers of concrete to be in place and compacted for at least 30 minutes before the next layer of concrete is placed. Remove bleed water on the concrete surface and from forms and re-vibrate the concrete down as far as the concrete is plastic before placing the next layer.

F. Correction of Segregation. Before placing next layer of concrete, and at top of last placement for vertical elements, remove concrete containing excess water or fine aggregate or showing deficiency of coarse aggregate and fill the space with concrete or correct proportions.

G. Flatwork. Strike off excess concrete by screeding to bring top surface to proper grade. The screed template should be moved across the concrete in a sawing manner as it is brought forward. Use a darby or bull-float after the screed operation, to eliminate high and low spots. Compact and tamp concrete and bring 1/8" to 3/16" of coarse mortar to surface. Wood float to straightedges and screeds after water sheen has disappeared. Do not use steel or plastic floats of any kind for initial floating operations. Do not apply finishes until all surface water disappears and surface is sufficiently hardened. Remove bleed water and laitance as it appears.

3.03 SLAB FINISHING

Floating and troweling shall start after the concrete is hard enough and that water and fine material are not brought to the surface. Produce finished surfaces level or sloped as shown with maximum deviation of 1/8" from a 10-foot straightedge. Keep surface moist with fine fog spray of water as necessary for final finishing and curing. Dusting during finishing operations is not permitted. Finish all slab edges and joints with edging tool.

A. Swirl Non-Slip (Sweat Trowel) Finish. Apply on all slab and flatwork surfaces not otherwise indicated or specified. After surface water disappears and floated surfaces are sufficiently hardened. Steel trowel to a smooth surface. When ready, produce non-slip finish by circular

motion and slight lifting of steel trowel, done in a regular pattern. At walking areas, apply smooth finish 3" wide at edges, expansion joints, and scoring. Apply on following surfaces:

1. Exterior vehicle traffic slabs.
2. Exterior concrete walks.
3. Other slabs where indicated or directed.

3.04 SLAB CURING. Promptly apply curing material as soon as the surface water sheen has disappeared and finishing operations are completed without marring surfaces, and in any case on the same day. Apply liquid compounds in accordance with manufacturer's published application rates; apply 2 spray coats, second coat at right angle to first coat. Cover adjoining surfaces. Equip spray nozzles with a windshield suitable for wind conditions.

A. Curing Period and Protection. Maintain curing materials in sealed condition for a minimum of 10 days after application. Keep all traffic on the curing surfaces to the minimum possible, and completely off the liquid compound cured surfaces. Immediately restore all damaged or defective curing media.

B. Restriction. Do not apply liquid membrane-forming curing compound on concrete to receive subsequent concrete or mortar or on surfaces to receive subsequently applied materials unless such use and the specific compound used are approved by the manufacturer of the material to be applied; verify with related trades.

C. Liquid Curing Compound. Use for slabs, subject to above restriction.

D. Sheet Curing. Use curing sheet material. Seal all laps and edges with plastic pressure-sensitive tape; immediately repair tears during curing period. Verify that surfaces remain damp for full curing period; if necessary, lift sheeting, wet surfaces with clean water, and replace the sheeting. Use on surfaces where curing compound is not permitted.

E. Water Curing. Option to curing compound or sheet curing method. Keep concrete continuously wet for entire curing period.

F. Curing and Hardening.
   1. Hardener. Employ Ashford Formula manufacturer's authorized applicator and issue the manufacturer's 10-year material and 5-year labor warranty to Owner. Apply Ashford Formula on following surfaces:
      a. Exterior concrete walks.
      b. Exterior vehicle traffic slabs.
      c. Floor slabs, including vehicle traffic slabs, except slabs to receive traffic deck coating.
      d. Concrete stair treads and landings.
      e. Loading dock slabs.

G. Anti-spalling Sealer. All parking slabs of structure and other vehicle areas shall have a sealer such as Euco-Guard by the Euclid Company or approved equal. Surface preparation of the slabs and sealer application shall be in strict accordance with the manufacturer's recommendations.

3.05 CURING FORMED CONCRETE. Keep forms containing concrete in a continuously moist condition until removed. Keep concrete continuously moist for at least 7 days after placement. Keep concrete moist with a fine fog water spray until protected by curing media. During times of dry or excessive winds, high ambient temperature, low humidity, or other conditions causing rapid drying, use specified evaporation retardant and finishing aid material in accordance with

manufacturer's instruction and cure concrete with a fine fog spray of water, or equal, applied both during and after finishing and continued until final curing operations are started. Use water curing method, curing sheet material, or a clear liquid membrane-forming curing compound except as otherwise specified. Do not use any type of finishing or curing materials or methods that interfere with the correct application or bonding of subsequent materials; verify exact requirements with all applicable trades.

3.06 PATCHING CONCRETE. Remove fins, projections, and offsets. Cut out rock pockets, honeycomb, and other defects to sound concrete with edges of cuts straight and back-beveled. Dampen cuts and scrubs with neat Portland cement slurry just prior to patching or apply an approved concrete adhesive. Saturate form tie holes with water and fill all voids and patches with flush smooth-finished mortar of same mix as concrete (less coarse aggregate), cure, and dry.

3.07 FINISHING EXPOSED FORMED CONCRETE. Patch the surfaces as specified above. Rub exposed surfaces with carborundum brick or equivalent until smooth and free of form mark, offsets and other defects and uniform planes. Wet the rubbed surface and then brush-coat with cement grout consisting of 1-part light-colored Portland cement to 1-1/2 parts fine aggregate, and equal parts of a bonding admixture with water to consistency of thick paint. Cork or wood float grout to fill pits, air bubbles and surface holes. Scrape off grout film. After grout sets, again coat with grout and rub as required to eliminate all defects and blemishes, then damp cure the surfaces for 3 days. Finish and clean each surface as a continuous operation. Produce smooth surface free of grouting and rubbing marks or blemishes after painting or covering with flexible finish material. Except as otherwise shown or specified, apply this finish on exposed formed concrete surfaces except the following:

1. Permanently concealed concrete.
2. Concrete exposed in mechanical, electrical, utility, storage, shafts, and similar non-public rooms and areas.
3. Concrete in enclosed parking areas; finishing of heads, jambs and sills of exterior wall openings is required.
4. Surfaces to receive sandblast finish.

3.08 SANDBLAST FINISH. Employ skilled and experienced sandblast operators to perform finishing. Finish all surfaces at the same age after casting. Produce finished surfaces of uniform texture and appearance. Use at sandblasting and prevent creation of a public nuisance. Do not remove form tie cones until after sandblasting. Sandblast finish concrete surfaces as indicated or directed to match approved Samples according to the following requirements:

1. Medium sandblast finish, surface blasted from 1/8" to a nominal 3/16" depth, exposing individual coarse aggregate particles in a uniform distribution and matching the approved wall and floor Samples.
2. After completing sandblast finish on formed special concrete, apply primer and sealant to 3/8" depth in form tie cone holes according to Section 07900, sealant of approved color and tooled flat.
3. For surfaces to receive adhered veneer, sandblast sufficiently to remove mortar and glaze, and provide a coarse surface for bonding of adhesive.

3.09 GROUTING AND DRYPACKING. Install as indicated or required except for the items grouted by other trades.

A. Mixing. Mix the approved non-shrink grout material with sufficient water per manufacturer's recommendations; for grout, so it flows under its own weight and for drypacking, to just moisten and bind the material together.

B. Placing and Curing. Place drypack by forcing and rodding to fill all voids and provide complete bearing under plates. Place fluid grout from one side only and puddle, chain, or pump for complete filling of voids; do not remove the dams or forms until grout attains initial set. Finish exposed surfaces smooth and cure with damp burlap at least 3 days.

3.10 SITE CONCRETE WORK. Use bituminous type joint filler. Cure all concrete for at least 10 days with liquid curing compound or sheet material except as otherwise specified. Construct all site concrete of 2,000 psi concrete unless otherwise indicated or specified.

A. Concrete Curbs. Provide 2" thick expansion joints at beginning and at end of curbs, intersections, and 20-foot intervals between, set plumb, square, and to same profile as the curbs. Edge curb tops to 2" radius and vertical joints to 1/4" radius. Apply smooth finish followed by fine hair brush finish.

B. Concrete Gutters. Provide 2" thick expansion joints as above for curbs and apply a light broom finish with a 3" wide steel trowel finish at flow line.

C. Combination Curb and Gutter. As above for curbs and gutters including expansion joints, 3" troweled flow line at base of curb.

D. Concrete Walks. Provide 2" expansion joints as specified for curbs and where walks and rigid structures, aligned with joints in curbs where adjoining, and apply a light broom finish perpendicular to traffic direction. Provide scoring as shown or directed.

E. Control Joints. Provide for concrete walks and exterior concrete pavement as indicated. Provide Zip Strip as distributed by S.C.A. Construction Supply, Santa Fe Springs, Calif., or equal. Install tops of the joints flush with the concrete surface and depth of joint a minimum of 1/4" thickness of slab.

3.11 OFF-SITE CONCRETE WORK. Provide new concrete items where indicated, and replacing existing items damaged by Contractor's operations. Secure and pay for required permits, inspections, engineering, and surveying.

3.12 MISCELLANEOUS CONCRETE WORK. Provide areaways, cast-in-place valve boxes, pits, splash blocks, bases, and other miscellaneous concrete as shown and required to complete all Work. Conform to applicable requirements herein.

3.13 INSTALLATION OF WATERSTOPS. Heat-fuse joints and connections in accordance with manufacturer's instructions including heating tools and devices. Run waterstops continuous in joints, following all offsets and angles in joints until spliced to waterstops at intersecting joints.

3.14 FIELD QUALITY CONTROL. Refer to Section 01400.

A. Supervision. Perform Work of this Section under the supervision of a capable concrete superintendent.

END OF SECTION

SECTION 04220

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION. Division 1 applies to this Section. Provide concrete unit masonry as indicated, specified, and required.

A. Work in This Section. Principal items include:
1. Concrete block masonry to match exisiting
2. Grouting of masonry.
3. Installing reinforcing steel bars in masonry.
4. Parge coat.

Related Work Not in This Section.

1. Furnishing and delivery of steel bar reinforcing.
2. Dowels in concrete for masonry.
3. Liquid waterproofing.

1.2 SUBMITTALS.

A. Samples. Submit the following:
1. Two Samples of each type of masonry unit to show the full range of color and texture, for selection and approval.
2. Samples of cured dry mortar showing finished color.
3. Cured sealant colors for control joints.
4. Control joint filler, 12" pieces of each size and type.

B. Sample Panels. Prepare as many of the following sample panels at the site as are required for approval. Conform installed masonry to the approved panels. Approved panels may be a part of the permanent construction.
1. Minimum 6-foot long by 4-foot high Sample panel of each type and pattern of vertical masonry, including special features and one corner or angle.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING. Deliver all masonry units on pallets and cementitious materials in unopened factory containers. Store materials in dry covered locations protected from moisture. Handle and store all units by methods that prevent cracking, chipping, or defacing.

1.4 JOB CONDITIONS. Inspect and verify surfaces to receive Work of this Section. Report to City all conditions that prevent correct installation of masonry.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS.

Portland cement: ASTM C 150, Type II, low alkali. Masonry cement is not permitted. Use only one brand.

Hydrated lime: ASTM C 207, Type S.

Mortar sand: ASTM C 144, not less than 4% passing No. 100 sieve, uniformly graded from fine to coarse.

Grout sand: ASTM C 404, natural, Size No. 1.

Pea gravel: ASTM C 404, gravel, except maximum 5% passing a No. 8 sieve and all passing a 3/8" sieve.

Mortar admix: Red Label Suconem, Anti-Hydro, or equal.

Grout admix: Sika Chemical Corp. GA Grout Aid, type as required; no substitution.

Color pigment: Pure ground mineral oxides, non-fading, alkali and lime proof, factory packaged.

Water: From domestic potable source.

Control joint filler: Rapid Control Joint by Dor-O-Wal, wide flange unless regular is shown, approved sizes.

2.2 CONCRETE BLOCK MATERIALS. ASTM C 90, Grade N-1, standard lightweight aggregate units, steam-cured or yard cured for 28 days, meeting Quality Control Standards of Concrete Masonry Association, natural cement color smooth faced units unless otherwise indicated or specified. Include matching jamb, lintel, control joint, bond beam, wall cap, and other special shape, type, or size units as required. Specifically the Marina Park Restroom shall be split faced CMU exterior and Smooth Faced interior – color shall be selected by the City Engineer upon submittal.

A. Colored Concrete Block. As above, integrally colored, color as selected from full range of colors to match exisitng.

B. Split-Face Concrete Block. As above, integrally colored, color as selected from tan or buff range of colors, with approved split texture on all exposed exterior faces and ends.

2.3 MORTAR AND GROUT PROPORTIONS AND MIXING.

A. Strengths. Minimum compressive strengths of 1,800 psi for mortar and 2,000 psi for grout at 28 days.

B. Proportions. Accurately measure all mortar and grout by volume using calibrated containers. Shovel measurements are not acceptable.

1. Mortar. Type S conforming to Building Code Table 21-A, with mortar admix in mortar for exterior masonry, quantity per manufacturer's directions.
2. Colored Mortar. Same as for mortar plus color pigment to produce cured dry color matching the approved Sample.
3. Grout. By volume, 1 part portland cement, not over 3 parts damp

loose sand, and 1 to 2 parts of pea gravel; or proportions as required for minimum 2,000 psi compressive strength. Include grout admix of the correct type, proportioned per manufacturer's directions.

C. Mixing. Place half of water and sand in operating mixer; then add cement, lime, and the remainder of sand and water. Machine mix not less than 5 minutes after ingredients are charged.

D. Retemper Mortar within one hour after leaving mixer to maintain high plasticity. Add water in a basin formed in the mortar and rework mortar into water. Discard mortar which is not used within one hour or that has begun to initially set.

PART 3 - EXECUTION

3.1 INSTALLATION OF CONCRETE BLOCK MASONRY. Lay out masonry to minimize cutting of units and use of odd joint sizes or bond. Construct masonry in accordance with Code and Concrete Masonry Association for reinforced masonry. Place and embed in masonry the anchors, bolts, reglets, sleeves, conduits, and all other items required by other trades, fully grouted in place. Work out the details and be responsible for size, position, and arrangement of embedded items and necessary openings. Cut units by machine saw. Install only clean uncracked units.

A. Setting. Install masonry to preserve unobstructed vertical continuity of cells. Full bed face shells and cross webs in mortar. Fill header or end joints solid with mortar for a distance in from face of wall or unit not less than thickness of longitudinal face shells. Provide corner bond by lapping units in successive vertical courses.

B. Cleanout Openings. Provide openings at bottoms of cells containing reinforcing, and at each lift or pour of grout exceeding 48" height. Remove all overhanging mortar and other obstructions or debris from interior of cells. Seal cleanouts with matching whole units and mortar joints.

C. Reinforcing. Use deep-cut bond beam units for horizontal bars. Place open-end units for vertical bars unless otherwise shown. Hold vertical bars in position at top and bottom and at intervals not exceeding 192 bar diameters. Accurately set and place reinforcement as indicated. Hold vertical bars securely in place with wood frames or similar devices as necessary for correct alignment. Install horizontal reinforcing as erection progresses, laps wire tied. Maintain minimum 3/4" clear distance between masonry and bars. Make laps and splices in bars not less than 40 bar diameters unless otherwise indicated.

D. Grouting. Fill the cells containing reinforcement with grout except where grout filling of all cells is indicated. Pour in 4-foot lifts, waiting about 1-hour between lifts. Pour the full height in each section of the wall in one shift. Consolidate grout by puddling or internal vibration, then reconsolidate about 10 minutes later before plasticity is lost. Form horizontal construction joints by stopping grout pour 1½" below top of units. High lift grouting may be used at Contractor's option as approved and according to Code.

E. Bond and Joints. Lay units with 1/2-unit running bond, vertical joints aligned and plumb. Make all joints uniformly 3/8" size, concealed joints struck flush. Compact and dense concave tool exposed joints.

F. Weep Holes. Provide nominal quarter inch diameter weep holes at the bottom of ungrouted cells of exterior walls, or provide weep holes at maximum 32" centers with drain slots under webs of intervening units.

3.2 WALL CONTROL JOINTS. Provide in concrete block walls where shown, and not to exceed 20 feet on center where not otherwise indicated, control joint filler placed for the full height of each joint. Caulk exterior face of joints according to Section 07920.

3.3 CEMENT WASH ON WALL TOPS. Install mortar matching masonry joints. Trowel dense and smooth with clean edges, sloped as shown or directed and cross score using an approved tool at nominal 32" centers. As soon as hardened, cover with sealed plastic sheeting and keep moist for at least 10 days after placing.

3.4 CURING. Keep newly constructed masonry damp for three days with a regulated fog spray of water sufficient only to moisten faces of masonry but not in an amount as to cause water to flow down over masonry. Do not saturate with water for curing or any other purposes and protect from rain or flooding during curing period.

3.5 CLEANING. Clean mortar and grout off exposed surfaces immediately. Acceptably repair imperfect joints, holes, defaced units, chopped edges or corners, and all other defects or replace the defective units. Mortar or grout stains on exposed surfaces are subject to sandblast cleaning, as directed, to obtain clean uniform approved appearance, at no extra cost to the District.

3.6 PARGE COAT. Apply mortar parge coat on all masonry to receive built-up membrane waterproofing, troweled smooth. Keep the parge coat continuously damp for three days or spray / apply a black bituminous curing compound conforming to ASTM C 309.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.1. SUMMARY:

A. Section Includes: Rough carpentry work.

1.2. REFERENCES:

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Special Provisions Specifications for information concerning availability and use of references.
   1. American Plywood Association (APA)
   2. American Society for Testing and Materials (ASTM)
   3. American Wood Preservers Bureau (AWPB)
   4. U.S. Department of Commerce Product Standard (PS)
   5. West Coast Lumber Inspection Bureau (WCLIB)
   6. Western Wood Products Association (WWPA)
   7. Redwood Inspection Service (RIS)

1.3. SUBMITTALS:

A. Product Data: Submit copies of current ICBO Evaluation Reports for powder driven fasteners.

B. Wood Treatment Data: Submit chemical treatment manufacturers instructions for handling, storing, installing and finishing of treated materials.
   1. Preservative Treatment: For each type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.
   2. Water Borne Treatment: Include statement that moisture content of treated materials was reduced to levels specified before shipment to project site.
   3. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with specified standard and other requirements.

1.4 QUALITY ASSURANCE:

A. Requirements of Regulatory Agencies:
   1. Rough carpentry shall conform to the California Code of Regulations (CCR) Title 24 Part 2, California Building Code, and Chapter 25.
   2. Powder driven fasteners shall be furnished and installed in accordance with the manufacturer’s current ICBO Evaluation Report.

B. Grade Marks:
   1. Identify each piece of lumber by the official grade mark of WCLIB, or WWPA.
   2. Identify plywood by the official grade mark of APA.
   3. Identify pressure preservative treated lumber and plywood with the official grade

mark of AWPB. Grade stamp shall state retention: statements on grade stamp such as Aor to refusal@ are not permitted.

4. Identify fire retardant treated lumber with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing Timber Products Inspection or other testing and inspecting agency acceptable to the State Fire Marshal.

1.5. DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to the site in an undamaged condition.

B. Store lumber and plywood at the site under cover or otherwise protected against exposure to weather, raised above the ground and out of contact with other damp or wet surfaces. Stack lumber and plywood and provide for air circulation within and around the stacks and under temporary coverings. For pressure treated lumber and plywood, provide spacers between courses to permit air circulation.

1.6 PROJECT CONDITIONS:

A. Cooperate with other trades in coordinating their work with the work of this section. Provide wood grounds, blocking and nailers where indicated or as required for integration of work of other trades into the structure.

PART 2 - PRODUCTS

2.1 LUMBER:

A. Lumber Standards: Manufacture lumber to comply with PS 20-70 American Softwood Lumber Standard@ and with applicable grading rules of inspection agencies specified herein.

B. Moisture Content at Time of Placing:
   1. Untreated Lumber: Maximum 19 percent.
   2. Treated Lumber: Maximum 19 percent after pressure treatment.

C. Sizing and Surfacing: Sizes indicated are nominal; provide actual sizes in accordance with PS 20-70. Provide dressed lumber, S4S, except as otherwise indicated.

D. Dimension Lumber: Provide lumber of the grades and species listed below for the various purposes, graded in accordance with WCLIB Standard Grading Rules No. 16", 1988 Edition, WWPA Western Lumber Grading Rules 88", or RIS Standard Specifications for Grades of California Redwood Lumber. 1989 Edition.
   1. Cants, Roof Nailers, and Roof Curbs: Standard or better grade Light Framing; No. 2 or better grade Structural Light Framing; or Stud grade of any commercial softwood species, pressure preservative treated.
   2. Blocking, Nailers and Bracing: Standard or better grade Light Framing; No. 2 or better grade Structural Light Framing; or Stud grade of any commercial softwood species.
   3. Headers No. 1 or better grade.

2.2 PLYWOOD:

A. Plywood Standards: Manufacture plywood to comply with PS 1-83 AU.S. Product

Standard for Construction and Industrial Plywood.

B. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels designation, C-D Plugged grade, Exposure I durability classification, 3.4 inch thick unless otherwise indicated.

2.3 PRESSURE TREATMENT:

A. Where lumber or plywood is indicated or specified herein, or is required by CCR Title 24, to receive pressure preservative treatment, treat materials in accordance with AWPB LP-22. Incising of Douglas fir will be required where necessary to achieve the specified retention. Complete fabrication of treated items before treatment, where possible. Cuts and holes shall be retreated in accordance with AWPA H-84.

B. Fire-Retardant Treatment: Where fire-retardant treated wood is indicated or required by CCR Title 24, pressure impregnate lumber and plywood with fire-retardant chemicals to meet the requirements of AWPA C20 and C27, respectively; identify fire-retardant-treated wood with appropriate classification marking of Underwriters Laboratories, U.S. Testing, Timber Products Inspection, or other testing and inspecting agency acceptable to State Fire Marshal.

2.4. MISCELLANEOUS MATERIALS:

A. Building Paper: Fully waterproof Kraft paper conforming to Fed. Spec. UU-B-790A (1), Type I, Grade B (moderate water vapor resistance).

B. Rough Hardware:
1. Furnish items of rough hardware, connections, bolts, required to complete the work. Where carpentry work is exposed to weather or in area of high relative humidity, provide nails, bolts, nuts, washers and other fasteners with a hot-dipped zinc coating in accordance with ASTM A 153-82.
2. Nails: Common wire. Use ring or spiral shank nails for floor sheathing. Special nailing requirements shall be as indicated.
3. Bolts: Standard mild steel, square or hexagonal head machine bolts with matching nuts and cut washers, or carriage bolts with square or hexagonal nuts and cut washers.
4. Lag Bolts and Screws: Sizes indicated.
5. Toggle Bolts: Sizes indicated.

C. Powder Driven Fasteners: Provide fastener systems complete with all necessary washers, nuts and other appurtenances. Fasteners shall be as follows or approved equal:

1. Hilti, Inc.
2. Powder Power Tool Corp.: ADrive-It
3. Ramset Fastening Systems: ARamset

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Before commencing work, check concrete and masonry walls, steel, and other construction supporting rough carpentry work to ensure that they are set to the lines and levels indicated within the specified tolerances. Do not proceed until discrepancies have been corrected or adjusted.

3.2 INSTALLATION:

A. Install carpentry, making proper provisions for work of other trades. Fit neatly around exposed items, such as outlet boxes, conduit, pipes, and ducts.

B. Wood Grounds, Nailers, Blocking and Sleepers:
   1. Provide wherever indicated and where required for screeding or attachment of other work. Form to shapes as indicated and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
   2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build such items into masonry during erection of masonry. Where possible, anchor to formwork before concrete placement.
   3. Provide permanent grounds of dressed, preservative treated, key beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

3.3 LUMBER FASTENINGS:

A. Nailing and bolting of wood members shall conform to the minimum requirements of the CCR Title 24 Part 2, Chapter 25, as specified herein, and as indicated.

B. Bolting: Bolts shall be standard stock machine bolts as specified. Drill holes in wood member 1/16 inch larger than nominal bolt diameter. Exposed bolts shall be all hexagonal head with matching nuts. Retighten bolted connections before final acceptance or, in the case of bolted connections in concealed locations, immediately before the area is sealed off.

C. Lag Bolts (or Lag Screws): Provide prebored lead holes for all lag bolts. Drill lead hole for the shank to a depth equal to the length of the unthreaded portion in the main member, using a drill of the same diameter as the lag bolt. Then extend lead hole for the threaded portion with a drill whose diameter is 60 percent of the nominal lag bolt diameter. Insert lag bolt into lead hole by turning with a wrench, and not by driving with a hammer. Use soap, beeswax or other lubricant to facilitate insertion.

D. Nailing: Connections shall be as indicated in CCR Title 24 Part 2, Table 25-0 where not otherwise indicated. Nails shall be untreated steel. Unless connectors are detailed or steel connectors indicated, nails shall not be driven closer together than 1/2 of their length nor closer to the edge of a member than 1/4 their length. When wood tends to split with size of nail used, predrill holes for nails. Penetration of nails or spikes into pieces shall be not less than one-half the length of the nail or spike.

E. Washers: Provide all bolts and lag screws bearing on wood with cut washers except where malleable iron or plate washers are indicated on the structural drawings.

3.4 ROUGH HARDWARE:

A. Furnish and install all stock items of rough hardware as indicated or required, including clips, anchors, hangers, bolts, ties, and plates for connecting wood members to wood, concrete, or steel, except as specified to be provided under other Sections.

END OF SECTION

SECTION 07130

WATERPROOFING MEMBRANE SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Application of rolled, self-adhering waterproofing membrane system.

1.02 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete.

1.03 REFERENCES

A. American Railway Engineering & Maintenance of Way Association (AREMA) Specification Chapter 29 - Waterproofing.

B. ASTM D146-97 - Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Fabrics Used in Roofing and Waterproofing.

C. ASTM D412-98a(2002)e1 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

D. ASTM D570-98 - Standard Test Method for Water Absorption of Plastics.

E. ASTM E96-00e1 (Method B) - Standard Test Methods for Water Vapor Transmission of Materials.

F. ASTM E154-99 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.04 SUBMITTALS

A. Not Used

B. Submit manufacturer's product data and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean dry area in accordance with manufacturer's instructions.

C. Store adhesives and primers at temperatures of 40°F (5°C) and above to facilitate handling.

D. Store membrane cartons on pallets.

E. Do not store at temperatures above 90°F (32°C) for extended periods.

F. Keep away from sparks and flames.

G. Completely cover when stored outside. Protect from rain.

H. Protect materials during handling and application to prevent damage or contamination.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Product not intended for uses subject to abuse or permanent exposure to the elements.

B. Protect rolls from direct sunlight until ready for use

C. Do not apply membrane when air or surface temperatures are below 40°F (4°C).

D. Do not apply to frozen concrete.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. W.R. Meadows, Inc., PO Box 338, Hampshire, Illinois 60140-0338. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544. Web Site www.wrmeadows.com. **Or Equal.**

2.02 MATERIALS

A. Rolled, Self-Adhering Waterproofing Membrane: Polymeric waterproofing membrane protected by release paper on cross-laminated polyethylene carrier film with exposed polymeric membrane strips on both sides protected by pull-off release strips.

1. Performance Based Specification: Waterproofing membrane shall have the following characteristics:
   a. Compliance: AREMA Specification Chapter 29 - Waterproofing.
   b. Thickness:
      1) Carrier Film: 4 mils.
      2) Polymeric Membrane: 56 mils.
   c. Tensile Strength, ASTM D 412, Die C:
      1) Carrier Film: 5,900 psi (40.71 MPa) minimum.
      2) Polymeric Membrane: 590 psi (4.07 MPa) minimum.
   d. Elongation, ASTM D 412, Die C: Polymeric Membrane: 455 percent minimum.
   e. Peel Adhesion:
      1) Dry: 7 to 11 pounds/inch (125 to 196 g/mm) width, minimum.
      2) Wet: 7 to 12 pounds/inch (125 to 214 g/mm) width, minimum.
   f. Pliability, ASTM D 146:
      1) 180 Degree Bend: Unaffected.
      2) 1 Inch (25.4 mm) Mandrel at -25ºF (-32ºC): Unaffected.
   g. Water Vapor Permeance, ASTM E 96, Method B: 5.72×10^{-9} g/Pa-s-m^2.
   h. Water Absorption, ASTM D 570: 0.1 percent, 72 hours maximum.
   i. Resistance to Hydrostatic Head: Equivalent to 240 feet (73.1m) of water.
   j. Puncture Resistance, ASTM E 154: 67 pounds.
   k. Exposure to Fungi, Soil Test: Pass, 16 weeks.
   l. Color:
      1) Carrier Film: White.
      2) Polymeric Membrane: Black.

2. Design based on: Mel-Rol® Waterproofing System by W.R. Meadows. When air and surface temperatures are between 20ºF (-7ºC) and 60ºF(16ºC) Mel-Rol® LT (Low Temperature) can be used.

2.03 ACCESSORIES

A. Primer:
   1. Temperatures Above 40ºF (4ºC): Mel-Prime Water Base Primer
   2. Temperatures Above 20ºF (-7ºC): Mel-Prime VOC Compliant Solvent Base Primer or Standard Solvent Base Primer.

B. Flashing and Fillets: Mel-Rol Liquid Membrane.

C. Pointing Mastic: Pointing Mastic.

D. Termination Bar: Sealtight Termination Bar.

E. Corner Tape: Detail Strip.

F. Waterproofing Protection Course: Protection Course.

G. Rolled Matrix Drainage System: Mel-Drain™ Rolled Matrix Drainage System.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive membrane. Notify District if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.02 SURFACE PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.

C. Do not apply waterproofing to surfaces unacceptable to manufacturer.

D. Concrete surfaces must be clean, smooth and free of standing water.

E. Patch all holes and voids and smooth out any surface misalignments.

3.03 APPLICATION

A. Apply waterproofing membrane system in accordance with manufacturer's instructions.

B. Ensure accessory materials are compatible with membrane and approved by membrane manufacturer.

C. Prime surfaces to be covered in one working day with applicable primer. Reprime uncovered surfaces next day.

D. Inspect membrane before covering and repair as necessary. Cover tears and inadequate overlaps with membrane. Seal edges of patches with pointing mastic.

E. Perform flood testing of horizontal applications, as required. Mark leaks and repair when membrane dries.

F. Avoid use of products which contain tars, solvents, pitches, polysulfide polymers, or PVC materials that may come into contact with waterproofing membrane system.

3.04 PROTECTION

A. Protect membrane on vertical and horizontal applications with immediate application of waterproofing protection course, if no drainage system is used, or rolled matrix drainage system. Use pointing mastic as an adhesive.

B. Backfill immediately using care to avoid damaging waterproofing membrane system.

END OF SECTION

SECTION 07160

UNDERSLAB VAPOR RETARDER/BARRIER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Application of an underslab vapor retarder.

1.2 RELATED SECTIONS

A. Section 03300 - Concrete.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM E1745 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil Or Granular Fill Under Concrete Slabs.
   2. ASTM E154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
   3. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
   4. ASTM E1643 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
   5. ASTM F1249-01 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

B. American Concrete Institute (ACI)
   1. ACI 302.1R-96 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick.

1.4 SUBMITTALS

A. Not Used

B. Submit manufacturer's product data and application instructions.

. C. Not Used

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean dry area in accordance with manufacturer's instructions.

C. Stack membrane on smooth ground or wood platform to eliminate warping.

D. Protect materials during handling and application to prevent damage or contamination.

E. Ensure membrane is stamped with manufacturer's name, product name and membrane thickness at intervals of no more than 85" (220 cm).

1.6 ENVIRONMENTAL REQUIREMENTS

A. Product not intended for uses subject to abuse or permanent exposure to the elements.

B. Do not apply on frozen ground.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. W.R. Meadows, Inc., PO Box 338, Hampshire, Illinois 60140-0338. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544. Web Site www.wrmeadows.com**. Or Equal**

2.2 MATERIALS

A. Plastic Vapor Retarder
   1. Design Base on: Vapor Retarder membrane must meet or exceed all requirements of ASTM E1745 Classes A, B, & C.
      a. Maximum Permeance ASTM E96: 0.018 Perms
      b. Water Vapor Transmission Rate ASTM F1249 calibrated to ASTM E96 (water method): 0.007 grains/ft^2/hr
      c. Resistance to Organisms and Substrates in Contact with Soil ASTM E154, Section 13: 0.027 Perms
      d. Tensile Strength ASTM E154, Section 9: 84 LBS. Force/Inch
      e. Puncture Resistance ASTM D1709, Method B: 4,335 Grams
      f. Water Vapor Retarder ASTM E1745: Meets or exceeds Class A, B & C
      g. Thickness of Retarder (plastic) ACI 302.1R-96: Not less than 10 mils
   2. Design Based on:
      a. Perminator™ 15 mil by W.R. Meadows.

2.3 ACCESSORIES

A. Seam Tape
   1. High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 4 inches.

B. Pipe Boots
   1. Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive membrane. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.2 SURFACE PREPARATION

A. Prepare surfaces in accordance with manufacturers instructions.

3.3 APPLICATION

A. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643–98.

B. Unroll vapor barrier with the longest dimension parallel with the direction of the pour.

C. Lap vapor barrier over footings and seal to foundation walls.

D. Overlap joints 6 inches and seal with manufacturer's tape.

E. Seal all penetrations (including pipes) with manufacturer's pipe boot.

F. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.

G. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

END OF SECTION

SECTION 07190
WATER REPELLENTS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Water repellents applied to CMU walls.
B. Pressure Washing

1.2. RELATED SECTIONS

A. Section 04220 - For provision and installation of water repellant at Exterior Masonry Units
D. Section 07920 - Joint Sealers.

1.3. REFERENCES

A. ASTM D 3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2004.

B. ASTM D 5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes, and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2002).

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; 2002.

1.4. SUBMITTALS

A. Not Used

B. Product Data: Provide product description.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Field Reports: Report whether manufacturer's "best practices" are being followed; if not, state corrective recommendations. Email report to the Architect the same day as inspection occurs; mail report on manufacturer's letterhead to the Architect within 2 days after inspection.

1.5. QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

C. The District reserves the right to provide continuous independent inspection of surface preparation and application of water repellent.

1.6. MOCK-UP

A. Prepare a representative surface 36 x 36 inch (1 x 1 m) in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

B. For proposed substitutions, prepare side-by-side mock-ups of specified and substitute products.

C. Locate where directed.

D. Mockup of the District approved product may remain as part of the Work.

1.7. PRE-INSTALLATION MEETING

A. Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite the City.

1.8. ENVIRONMENTAL REQUIREMENTS

A. Protect liquid materials from freezing.

B. Do not apply water repellent when ambient temperature is lower than 50 degrees F (10 degrees C) or higher than 100 degrees F (38 degrees C).

1.9. EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.

B. Provide two gallons (9 l) of water repellent for Citys use.

PART 2 PRODUCTS

1.1. MANUFACTURERS

A. Water Repellents:
1. Tnemec www.tnemec.com; Dur A Pell GS Graffitti Shield Series 626.
2. Degussa Building Systems/Hydrozo: www.chemrex.com.
3. Textured Coatings of America, Inc: www.texcote.com.
4. Or equal

1.2. MATERIALS

A. Water Repellent: Silicone resin based; colorless.

PART 3 EXECUTION

1.1. EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

1.2. PREPARATION

A. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

B. Do not start work until masonry mortar substrate is cured a minimum of 60 days.

C. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.

D. Pressure wash surfaces to be coated:
1. Firm Masonry (Concrete Masonry Units, Brick, and Dense Stone): High pressure wash at 1500 to 4000 psi (10 to 30 MPa), at 6 to 12 inches (150 to 300 mm) from surface.

E. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

1.3. APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended for best results.

B. Apply at rate recommended by manufacturer, continuously over entire surface.

C. Apply two coats, minimum.

D. Provide manufacturer's field service representative to inspect preparation and application work continuously during entire application period to ensure that manufacturer's "best practices" for preparation and application are being followed.

1.4. PROTECTION OF ADJACENT WORK

A. Protect adjacent landscaping, property, and vehicles from drips and overspray.

B. Protect adjacent surfaces not intended to receive water repellent.

B. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION

SECTION 07552 –
SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

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. SBS-modified bituminous membrane roofing.
2. Hybrid built-up and SBS-modified bituminous membrane roofing.
3. Protected, SBS-modified bituminous membrane roofing.
4. Vapor retarder.

B. This Section includes the installation of acoustical roof deck rib insulation strips furnished under Division 5 Section "Steel Deck."

C. Related Sections include the following:

1. Division 3 Section "Lightweight Concrete Roof Insulation."
2. Division 5 Section "Steel Deck" for furnishing acoustical deck rib insulation.
3. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
4. Division 7 Section "Roof Expansion Assemblies."
5. Division 15 Section "Plumbing Specialties" for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F (14 deg C), measured at the mop cart or mechanical spreader immediately before application.

C. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.

D. Factored Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," after multiplication by a safety factor.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide a roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to the California Building Code.

1. Corner Uplift Pressure: <44.62> lbf/sq. ft.
2. Perimeter Uplift Pressure: <68.41> lbf/sq. ft.
3. Field-of-Roof Uplift Pressure: <20.83> lbf/sq. ft.

D. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1A

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings, cants, and membrane terminations.
2. Tapered insulation, including slopes.
3. Crickets, saddles, and tapered edge strips, including slopes.

C. Samples for Verification: For the following products:

1. 12-by-12-inch (300-by-300-mm) square of [base sheet] [ply sheet] [smooth-surfaced roofing membrane sheet base] [flashing backer sheet].
2. 12-by-12-inch (300-by-300-mm) square of [smooth-surfaced roofing membrane sheet] [mineral-granule-surfaced roofing membrane cap sheet] [metal-foil-surfaced roofing membrane cap sheet] [flashing sheet], of color specified.
3. 12-by-12-inch (300-by-300-mm) square of vapor retarder.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

F. Qualification Data: For Installer and manufacturer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

H. Research/Evaluation Reports: For components of roofing system.

I. Maintenance Data: For roofing system to include in maintenance manuals.

J. Warranties: Special warranties specified in this Section.

K. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has UL listing for roofing system identical to that used for this Project.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain components for roofing system from roofing system manufacturer.

E. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.

F. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

G. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover boards, substrate board and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. SBS-Modified Bituminous Membrane Roofing:

a. Bitec Inc.
b. CertainTeed Corporation.
c Firestone Building Products Company.

d. GAF Materials Corporation.
e. Garland Co., Inc. (The).
f. Johns Manville International, Inc.
g. Koppers Industries, Inc.
h. MBTechnology Corporation.
i. Tremco, Inc.
j. U.S. Intec, Inc.

C. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 SBS-MODIFIED ASPHALT-SHEET MATERIALS

A&B Not Used

C. Roofing Membrane Cap Sheet: ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced SBS-modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:

1. Granule Color: White

2.3 BASE-PLY & INTERMEDIATE PLY SHEET MATERIALS

A. Glass-Fiber Base-Ply Sheet: ASTM D 4897, Type II, asphalt-impregnated,ventilated glass-fiber felt. One layer.
B. Glass fiber Intermediate ply sheet: ASTM D6163 Type 1 Grade S 90 mils one layer.

2.4 BASE FLASHING SHEET MATERIALS

A. Backer Sheet: ASTM D 4601, Type II, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.

B. Flashing Sheet: ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:

1. Granule Color: White

C. Glass-Fiber Fabric: Woven glass-fiber cloth, treated with asphalt, complying with ASTM D 1668, Type I.

2.5 AUXILIARY ROOFING MEMBRANE MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.

B. Asphalt Primer: ASTM D 41.

C. Roofing Asphalt: ASTM D 312, Type III or IV as recommended by roofing system manufacturer for application.

D. Roofing Asphalt: ASTM D 6152, SEBS modified.

E. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.

G. Mastic Sealant: Polyisobutylene, plain or modified bitumen, nonhardening, nonmigrating, nonskinning, and nondrying.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

I. Metal Flashing Sheet: Metal flashing sheet is specified in Division 7 Section "Sheet Metal Flashing and Trim."

J. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 (2.36-mm) sieve and 98 percent of mass retained on No. 40 (0.425-mm) sieve, color to match roofing membrane.

K. Separator Sheet: Polyethylene sheet, 4 mils (0.1 mm) thick, minimum.

L. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 5 Section "Steel Deck."
4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry.

D. Install acoustical roof deck rib insulation strips, specified in Division 5 Section "Steel Deck," according to acoustical roof deck manufacturer's written instructions.

3.3 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."

1. Equal to Johns Manville Spec. 3 FLD

B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

C. Where roof slope exceeds 1/2 inch per 12 inches (1:24), install roofing membrane sheets parallel with slope.

1. Backnail roofing membrane sheets to substrate according to roofing system manufacturer's written instructions.

D. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.

E. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

F. Asphalt Heating: Do not raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Do not heat roofing asphalt within 25 deg F (14 deg C) of flash point. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than 4 hours.

G. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.4 BASE-SHEET INSTALLATION

A. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively.

B. Install lapped base sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:

1. Mechanically fasten vented base sheet to lightweight concrete roof insulation.

C. Install a second lapped base sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:

1. Adhere to substrate in a solid mopping of hot roofing asphalt.

D. Fabricate roof insulation vents with 4” diameter stack, 12” high, filled with glass fiber insulation. Equipment stack with 6” diameter by 3” high weatherproof vent cap to be installed at spacing required by mfr.

3.5 BASE-PLY SHEET INSTALLATION

A. Install two glass-fiber base-ply sheets according to roofing system manufacturer's written instructions starting at low point of roofing system. Align glass-fiber base-ply sheets without stretching. Shingle side laps of glass-fiber base-ply sheets uniformly to ensure required number of glass-fiber base-ply sheets covers substrate at any point. Shingle in direction to shed water. Extend glass-fiber base-ply sheets over and terminate beyond cants.

1. Embed each glass-fiber base-ply sheet in a continuous mopping of hot roofing asphalt, to form a uniform membrane without glass-fiber base-ply sheets touching.

3.6 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install modified bituminous roofing membrane sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:

1. Adhere to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F (218 deg C).
2. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.

B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.

1. Repair tears and voids in laps and lapped seams not completely sealed.
2. Apply roofing granules to cover exuded bead at laps while bead is hot.

C. Install roofing membrane sheets so side and end laps shed water.

3.7 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:

1. Prime substrates with asphalt primer if required by roofing system manufacturer.
2. Backer Sheet Application: Adhere backer sheet over roofing membrane at cants in a solid mopping of hot roofing asphalt.
3. Backer Sheet Application: Install backer sheet and adhere to substrate in a solid mopping of hot roofing asphalt.
4. Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F (218 deg C). Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.

B. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing membrane and 4 inches (100 mm) onto field of roofing membrane.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

1. Seal top termination of base flashing with a strip of glass-fiber fabric set in asphalt roofing cement.

D. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.

E. Roof Drains: Set 30-by-30-inch (760-by-760-mm) metal flashing in bed of asphalt roofing cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 6 inches (150 mm) beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.

1. Install stripping according to roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Test Cuts: Test specimens will be removed to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:

1. Approximate quantities of components within roofing membrane will be determined according to ASTM D 3617.

2. Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
   1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

D. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

   1. Owner: California State University Northridge
   2. Address: 18111 Norhoff St., University Hall Room 325, Northridge, CA 91330
   3. Building Name/Type: Parking Structure B3
   4. Address: South West corner of Prarie & Etiwanda, Northridge, CA
   5. Area of Work: Built up roofing.
   6. Acceptance Date:
   7. Warranty Period:
   8. Expiration Date:

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

    a. lightning;
    b. peak gust wind speed exceeding 90 mph (m/sec);
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. **IN WITNESS THEREOF**, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature:
2. Name:
3. Title:

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Plans and general provisions of the Contract, including General and Special Provisions Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes sheet metal flashing and trim in the following categories:
1. Roof-drainage systems.
2. Exposed trim, gravel stops, and fasciae.
3. Metal flashing.
4. Reglets.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 15"Mechanical" for set-on-type curbs, equipment supports, and other manufactured roof accessory units.
2. Section 07920 "Joint Sealants" for elastomeric sealants.
3. Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.3 PERFORMANCE REQUIREMENTS:

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:
   1. Wind Zone 2: Wind pressures of 31 to 45 psf (1.48 to 2.15 kPa).

1.4 SUBMITTALS:

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

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish.
   1. 8-inch- (200-mm-) square samples of specified sheet materials to be exposed as finished surfaces.
   2. 12-inch- (300-mm-) long samples of factory-fabricated products exposed as finished Work. Provide complete with specified factory finish.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed works with work names and addresses, names and addresses of engineers and the District, and other information specified.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Work and with a record of successful in-service performance.

1.6 WORK CONDITIONS:

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2- PRODUCTS

2.1 METALS:

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:
   1. Mill-Finish Aluminum Sheet: ASTM B 209 (ASTM B 209M), 3003-H14, with a minimum thickness of 0.040 inch (1.0 mm), unless otherwise indicated.

B. Galvanized Steel Sheet: ASTM A 526, G 90 (ASTM A 526M, Z 275), commercial quality, or ASTM A 527, G 90 (ASTM A 527M, Z 275), lock-forming quality, hot-dip galvanized steel sheet with 0.20 percent copper, mill phosphatized where indicated for painting; not less than 0.0396 inch (1.0 mm) thick, unless otherwise indicated.

C. Coil-Coated Galvanized Steel Sheet: Zinc-coated, commercial-quality steel sheet conforming to ASTM A 755, G 90 (ASTM A 755M, Z 275) coating designation, coil coated with high-performance fluoropolymer coating as specified in "Coil-Coated Galvanized Steel Sheet Finish" Article; not less than 0.0336 inch (0.85 mm) thick, unless otherwise indicated.

2.2 REGLETS / COUNTERFLASHING:

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

B. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

C. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where plans show reglet without metal counterflashing.

D. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.
   1. Material: Aluminum, 0.024 inch (0.6 mm) thick.
   2. Material: Galvanized steel, 0.0217 inch (0.55 mm) thick.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:
   1. Fry Reglet Corporation.
   2. Hickman: W.P. Hickman Co.
   3. Keystone Flashing Company.
   4. Or approved equal.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES:

A. Burning Rod for Lead: Same composition as lead sheet.

B. Solder: ASTM B 32, Grade Sn50, used with rosin flux.

C. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

D. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coat.

E. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

F. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section "Joint Sealants."

G. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

H. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

I. Paper Slip Sheet: 5-lb/square (0.244 kg/sq. m) red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

J. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- (0.15-mm-) thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

K. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

L. Gutter Screen: 1/4-inch (6-mm) hardware cloth installed in sheet metal frames. Fabricate screen and frame of same basic material as gutters and downspouts.

M. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.4 FABRICATION, GENERAL:

A. For Galvanized Sheet Metal:
   1. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. For Aluminum Flashings:
   1. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

F. Expansion Provisions: Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

G. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

H. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

I. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

J. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
   1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.5 SHEET METAL FABRICATIONS:

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Gutters, concealed or other, with Girth 16 to 20 Inches (410 to 510 mm): Fabricate from the following material:
   1. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

C. Downspouts: Fabricate from the following material:
   1. Galvanized Steel: 0.0217 inch (0.55 mm) thick.

D. Splash Pans: Fabricate from the following material:
   1. Stainless Steel: 0.0187 inch (0.5 mm) thick.

E. Roof-Drain Flashing: Fabricate from the following material:
   1. Lead: 4.0 lb/sq. ft. (1.6 mm thick), hard tempered.

F. Scuppers: Fabricate from the following material:
   6. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

H. Exposed Metal Trim, Flashing, Counter Flashing, Wall Expansion joints, Gravel Stops, and Fasciae: Fabricate from the following material
   1. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

2. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch (0.7 mm) thick.

I. Copings: Fabricate from the following material:
1. Galvanized Steel: 0.0396 inch (1.0 mm) thick.

J. Base Flashing, weep screed, drip screed: Fabricate from the following material (see drawings)
1. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

K. Counterflashing: Fabricate from the following material: (see drawings)
1. Galvanized Steel: 0.0217 inch (0.55 mm) thick.

L. Flashing Receivers: Fabricate from the following material: (see drawings)
1. Galvanized Steel: 0.0217 inch (0.55 mm) thick.

M. Drip Edges: Fabricate from the following material: (see drawings)
1. Galvanized Steel: 0.0217 inch (0.55 mm) thick.

O. Equipment Support Flashing: Fabricate from the following material:
1. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

P. Roof-Penetration Flashing: Fabricate from the following material:
1. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

2.6 ALUMINUM EXTRUSION FABRICATIONS:

A. Aluminum Extrusion Units: Fabricate extruded-aluminum running units with formed or extruded-aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.
B. Provide Exterior joints as shown on plans.

2.7 ALUMINUM FINISHES:

A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.

2.8 COIL-COATED GALVANIZED STEEL SHEET FINISH:

A. High-Performance Organic Coating Finish: Apply the following system by coil-coating process on galvanized steel sheet as recommended by coating manufacturers and applicator.
1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
a. Color and Gloss: Match Engineer's sample. Sheet metal work adjacent to standing seam metal roofing shall match standing seam metal roof color.
b. Resin Manufacturers: Subject to compliance with requirements, provide fluoropolymer coating systems containing resins produced by one of the following manufacturers:
1) Ausimont USA, Inc. (Hylar 5000)

2) If Atochem North America, Inc. (Kynar 500)
3) Or approved equal.

2. Coil-Coated Steel Sheet 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. Atas Aluminum Corporation.
   b. Copper Sales, Inc.
   c. MM Systems Corporation.
   d. Petersen Aluminum Corporation.
   e. Vincent Metals.
   f. Or approved equal.

B. Shop Finish, Rain Drainage: Integral gutters shall be fluoropolymer finished. Down spouts shall be galvanized sheet metal for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

1. Do not solder the following metals:
   a. Aluminum.

b. Coil-coated galvanized steel sheet.

2. Pretinning is not required for the following metals:
   a. Lead.
   b. Lead-coated copper.
   c. Terne-coated stainless steel.
3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
   1. Use joint adhesive for nonmoving joints specified not to be soldered.

G. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Seam tin edges, form seams and solder.

H. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

I. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
   1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
   2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

J. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.

K. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

L. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:
   1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
   2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

M. Splash Pans: Install where downspouts discharge on low-sloped roofs, unless otherwise shown. Set in roof cement or sealant compatible with roofing membrane.

N. Install continuous gutter screens on gutters with noncorrosive fasteners, arranged as hinged units to swing open for cleaning gutters.

3.3 CLEANING AND PROTECTION:

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION

SECTION 07920

JOINT SEALANTS

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 sealants for the following applications, including those specified by reference to this Section:

B. This Section includes sealants for the following applications:
1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
   a. Control and expansion joints in cast-in-place concrete.
   b. Joints between architectural precast concrete units.
   c. Control and expansion joints in unit masonry (CMU).
   d. Joints between metal panels.
   e. Joints between different materials listed above.
   f. Perimeter joints between materials listed above and frames of doors and windows.
   g. Control and expansion joints in ceiling and overhead surfaces.
   h. Other joints as indicated.
2. Exterior joints in the following horizontal traffic surfaces:
   a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
   b. Joints between architectural precast concrete paving units.
   c. Joints between different materials listed above.
   d. Other joints as indicated.
3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   a. Perimeter joints of exterior openings where indicated.
   b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
4. Interior joints in the following horizontal traffic surfaces:
   a. Control and expansion joints in cast-in-place concrete slabs.
   b. Other joints as indicated.

C. Related Sections include the following:
1. Division 2 Section Concrete Paving for sealing joints in pavements, walkways, and curbing.
2. Division 4 Section Concrete Masonry Unit for masonry control and expansion joint fillers and gaskets.

3. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

C. Products must meet SCAQMD Rule 1168 VOC limits.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

E. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

G. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.

H. Field Test Report Log: For each elastomeric sealant application. Include information specified in "Field Quality Control" Article.

I. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

J. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.

K. Warranties: Special warranties specified in this Section.

L. LEED Submittals:

1. Product Data for Credit IEQ Credit 4.1 – Low Emitting Materials Adhesives & Seaents

2. Product Data for Credit IEQ Credit 4.2 – Low Emitting Materials Paints & Coatings

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
      a. Perform tests under environmental conditions replicating those that will exist during installation.
   2. Submit not fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
   5. Testing will not be required if joint sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
   2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
   3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
   4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates as follows:
   1. Locate test joints where indicated or, if not indicated, as directed by Architect.
   2. Conduct field tests for each application indicated below:
      a. Each type of elastomeric sealant and joint substrate indicated.

b. Each type of nonelastomeric sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
5. Test Method: Test joint sealants by hand-pull method described below:
   a. Install joint sealants in 60-inch- (1500-mm-) long joints using same materials and methods for joint preparation and joint-sealant installation required for the completed Work. Allow sealants to cure fully before testing.
   b. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches (50 mm) long at sides of joint and meeting cross cut at one end. Place a mark 1-inch (25 mm) from cross-cut end of 2-inch (50-mm) piece.
   c. Use fingers to grasp 2-inch (50-mm) piece of sealant between cross-cut end and 1-inch (25-mm) mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
   c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
6. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
7. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
   1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section. Provide sealant for Exterior Wall Mock-up

1.6 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 date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F (4.4 deg C).
   2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive District of other rights the District may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

C. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 20 years from date of Substantial Completion.

D. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
   1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated for each type in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

B. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

C. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.4 SOLVENT-RELEASE JOINT SEALANTS

A. Acrylic-Based Solvent-Release Joint-Sealant Standard: Comply with ASTM C 1311 for each product of this description indicated in the Solvent-Release Joint-Sealant Schedule at the end of Part 3.

B. Acrylic-Based Solvent-Release Joint-Sealant Standard: Comply with FS TT-S-00230 for each product of this description indicated in the Solvent-Release Joint-Sealant Schedule at the end of Part 3.

C. Butyl-Rubber-Based Solvent-Release Joint-Sealant Standard: Comply with ASTM C 1085 for each product of this description indicated in the Solvent-Release Joint-Sealant Schedule at the end of Part 3.

2.5 LATEX JOINT SEALANTS

A. Latex Sealant Standard: Comply with ASTM C 834 for each product of this description indicated in the Latex Joint-Sealant Schedule at the end of Part 3.

2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
   1. Type C: Closed-cell material with a surface skin.

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
   a. Concrete.
   b. Masonry.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
   a. Metal.
   b. Glass.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to 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. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

E. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses provided for each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealants from surfaces adjacent to joint.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
   4. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.
   5. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.
      a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
   1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
   2. Apply a bead of silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's printed schedule and covering a bonded area of not less than a 3/8 inch (10 mm). Hold edge of sealant bead inside of masking tape by 1/4 inch (6 mm).
   3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.

4. Complete installation of horizontal joints before installing vertical joints. Lap vertical joints over horizontal joints. At end of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, to produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant to comply with sealant manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed elastomeric sealant joints as follows:
      a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each type of elastomeric sealant and joint substrate.
      b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
   2. Test Method: Test joint sealants by hand-pull method described below:
      a. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches (50 mm) long at sides of joint and meeting cross cut at one end. Place a mark 1 inch (25 mm) from cross-cut end of 2-inch (50-mm) piece.
      b. Use fingers to grasp 2-inch (50-mm) piece of sealant between cross-cut end and 1-inch (25-mm) mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
      c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
   3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
   4. Inspect tested joints and report on the following:
      a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field- adhesion hand-pull test criteria.
      b. Whether sealants filled joint cavities and are free from voids.
      c. Whether sealant dimensions and configurations comply with specified requirements.
   5. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
   6. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

B. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION

SECTION 08111

HOLLOW METAL DOOR AND FRAME

GENERAL

RELATED DOCUMENTS

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

SUMMARY

Section Includes:

Standard hollow metal door and frame.

Related Sections:

Division 04 Section "Concrete Masonry Units for embedding anchors for hollow metal work into masonry construction.

Division 09 Sections Exterior Painting and Interior Painting for field painting hollow metal door and frame.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.4 SUBMITTALS

Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings**,** and finishes.

Shop Drawings: Include the following:

Elevations of each door design.
Details of door, including vertical and horizontal edge details and metal thicknesses.
Frame details for each frame type, including dimensioned profiles and metal thicknesses.
Locations of reinforcement and preparations for hardware.
Details of each different wall opening condition.
Details of anchorages, joints, field splices, and connections.
Details of accessories.
Details of moldings, removable stops, and glazing.
Details of conduit and preparations for power, signal, and control systems.

Samples for Initial Selection: For units with factory-applied color finishes.

Samples for Verification:

For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 125 mm).

For the following items, prepared on Samples about 12 by 12 inches (305 by 305 mm) to demonstrate compliance with requirements for quality of materials and construction:

Door: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.

Frame: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

Other Action Submittals:

Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

QUALITY ASSURANCE

Source Limitations: Obtain hollow metal work from single source from single manufacturer.

Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C.

DELIVERY, STORAGE, AND HANDLING

Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

Provide additional protection to prevent damage to finish of factory-finished units.

Deliver welded frame with two removable spreader bars across bottom of frame, tack welded to jambs and mullions.

PROJECT CONDITIONS

Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

COORDINATION

Coordinate installation of anchorages for hollow metal frame. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PRODUCTS

MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products equal to one of the following:
Ceco Door Products; an Assa Abloy Group company.
Curries Company; an Assa Abloy Group company.

MATERIALS

Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A60 (ZF180) metallic coating.

Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frame of type indicated.

Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

STANDARD HOLLOW METAL DOOR

General: Provide door of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

Design: As indicated.
Core Construction: Manufacturer's standard vertical steel-stiffener core.
Vertical Edges for Single-Acting Door: Beveled edge.
Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).
Vertical Edges for Double-Acting Door: Round vertical edges with 2-1/8-inch (54-mm) radius.
Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Door and Frame."

Exterior Door: Face sheets fabricated from metallic-coated steel sheet. Provide door complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

Retain one or more of four subparagraphs below. If retaining more than one, indicate location of each in a door and frame schedule. See Evaluations for discussion of levels and models.

Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

STANDARD HOLLOW METAL FRAME

General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

Exterior Frame: Fabricated from metallic-coated steel sheet.

Fabricate frame with mitered or coped corners.
Fabricate frame as full profile welded unless otherwise indicated.
Frame for Level 4 Steel Door: 0.067-inch- (1.7-mm-) thick steel sheet.

Interior Frame: Fabricated from cold-rolled steel sheet.

Fabricate frame with mitered or coped corners.
Fabricate frame as full profile welded unless otherwise indicated.
Fabricate knocked-down, drywall slip-on frame for in-place gypsum board partitions.
Frame for Level 2 Steel Door: 0.053-inch- (1.3-mm-) thick steel sheet.

Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frame.

FRAME ANCHORS

Jamb Anchors:

Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

Floor Anchors: Formed from same material as frame, not less than 0.042 inch (1.0 mm) thick, and as follows:

Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frame at finish floor surface.

STOPS AND MOLDINGS

Moldings for Glazed Lites in Door: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

Fixed Frame Moldings: Formed integral with hollow metal frame, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

Loose Stops for Glazed Lites in Frame: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frame in which they are installed.

ACCESSORIES

Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- (6.4-mm-thick by 25.4-mm-) wide steel.

Grout Guards: Formed from same material as frame, not less than 0.016 inch (0.4 mm) thick.

FABRICATION

Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

Hollow Metal Door:

Exterior Door: Provide weep-hole openings in bottom of exterior door to permit moisture to escape. Seal joints in top edges of door against water penetration.
Glazed Lites: Factory cut openings in door.
Astragals: Provide overlapping astragal on one leaf of pairs of door where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.

Hollow Metal Frame: Where frame are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frame.

Welded Frame: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
Sidelight and Transom Bar Frame: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
Grout Guards: Weld guards to frame at back of hardware mortises in frame to be grouted.
Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
Jamb Anchors: Provide number and spacing of anchors as follows:

Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

Two anchors per jamb up to 60 inches (1524 mm) high.
Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

Three anchors per jamb up to 60 inches (1524 mm) high.
Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
Two anchors per head for frame above 42 inches (1066 mm) wide and mounted in metal-stud partitions.

Compression Type: Not less than two anchors in each jamb.
Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

Door Silencers: Except on weather-stripped door, drill stops to receive door silencers as follows. Keep holes clear during construction.

Single-Door Frame: Drill stop in strike jamb to receive three door silencers.
Double-Door Frame: Drill stop in head jamb to receive two door silencers.

Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
Reinforce door and frame to receive nontemplated, mortised and surface-mounted door hardware.
Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.

Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.

Provide fixed frame moldings on outside of exterior and on secure side of interior door and frame.

Provide loose stops and moldings on inside of hollow metal work.

Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

STEEL FINISHES

Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

Factory-Applied Paint Finish: Manufacturer's standard, complying with ANSI/SDI A250.3 for performance and acceptance criteria.

Color and Gloss: As selected by Architect from manufacturer's full range.

EXECUTION

EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

Proceed with installation only after unsatisfactory conditions have been corrected.

PREPARATION

Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

Prior to installation, adjust and securely brace welded hollow metal frame for squareness, alignment, twist, and plumbness to the following tolerances:

Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.

Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

Drill and tap door and frame to receive nontemplated, mortised, and surface-mounted door hardware.

INSTALLATION

General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

Hollow Metal Frame: Install hollow metal frame of size and profile indicated. Comply with ANSI/SDI A250.11.

Set frame accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

At fire-protection-rated openings, install frame according to NFPA 80.

Where frame are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.

Install frame with removable glazing stops located on secure side of opening.

Install door silencers in frame before grouting.

Remove temporary braces necessary for installation only after frame have been properly set and secured.

Check plumbness, squareness, and twist of frame as walls are constructed. Shim as necessary to comply with installation tolerances.

Field apply bituminous coating to backs of frame that are filled with grout containing antifreezing agents.

Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frame.

Masonry Walls: Coordinate installation of frame to allow for solidly filling space between frame and masonry with grout.

Concrete Walls: Solidly fill space between frame and concrete with grout. Take precautions, including bracing frame, to ensure that frame are not deformed or damaged by grout forces.

In-Place Concrete or Masonry Construction: Secure frame in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

In-Place Gypsum Board Partitions: Secure frame in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.

Installation Tolerances: Adjust hollow metal door frame for squareness, alignment, twist, and plumb to the following tolerances:

Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.

Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

Hollow Metal Door: Fit hollow metal door accurately in frame, within clearances specified below. Shim as necessary.

Non-Fire-Rated Standard Steel Door:

Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).

Between Edges of Pairs of Door: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).

Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).

Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

Fire-Rated Door: Install door with clearances according to NFPA 80.

Smoke-Control Door: Install door according to NFPA 105.

Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

ADJUSTING AND CLEANING

Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

Remove grout and other bonding material from hollow metal work immediately after installation.

Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 09900

PAINTS AND COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply to the work of this section.

1.2 SUMMARY

A. Prepare surfaces, which are to receive finish.

B. Finish surfaces as indicated herein and/or as shown on the Drawings.

C. This Section includes the following and scope shall include but is not limited to:
1. Preparation of all surfaces.
2. Painting of all interior surfaces, except as otherwise specified.
3. Painting of all exterior surfaces, except as otherwise specified.
4. Painting of all interior metal door and window frames including mullions.
5. Painting of all gyp. bd surfaces, walls, ceilings, soffits and trim.
6. Preparation and finishing of all wood trim.
7. Painting of all exterior metal including: doors, structural components, sheet metal, railings and exterior door frames etc.
8. Sealing of all interior/exterior exposed CMU block where specified.

B. Related work not in this Section:
1. Shop prime coats and factory finishes.
2. Painting specified as work of other Sections.
3. Fluoropolymer paint finish.
4. Sealants and caulking.
5. Wall fabrics.
6. Water repellent sealer.

C. Surfaces not to be painted:
1. Non-ferrous metal work (other than zinc-coated surfaces) and plated metal, unless particular items are specified to be painted.
2. Integrally colored concrete.
3. Integrally colored plaster unless otherwise indicated.
4. Exterior concrete walls and surfaces.
5. Ceramic tile and plastic surfaces.
6. Surfaces indicated not to be painted.
7. Surfaces specified to be finish painted under other Sections

1.3 RELATED SECTIONS

C. Section 06100 - Rough Carpentry

D. Section 07620 - Sheet Metal Flashing and Trim

E. Section 07920 - Joint Sealants

F. Section 08111 – Hollow Metal Door and Frame

H. Division 15 – Mechanical

I. Division 16 – Electrical

1.4 JOB MOCK-UP

A. Before proceeding with paint application, finish one complete surface 24 sq. ft. of each color scheme required, clearly indicating selected colors, finish texture, materials and workmanship. Provide temporary lighting of same intensity, type and color as permanent lights for viewing of sample panels.

B. Obtain the City's approval at sample area before proceeding.

C. If approved, sample area will serve as a minimum standard for work throughout work.

1.5 REFERENCE STANDARDS

A. All paints shall comply with State of California, Air Resources Board "Organic Solvent Rules Applicable to Architectural Coatings."
   1. Where paints specified in this Section do not comply, Contractor shall submit according to Section 01600 an equal product for approval.

B. Furnish paint materials that conform to the current rules and regulations of all governing Air Quality Management Districts and other public environmental control and protection agencies having jurisdiction. If any paint materials specified herein do not conform to said rules and regulations, paint manufacturer of proposed paint materials shall prepare a list of non-conforming specified painting materials and proposed substitute conforming paint materials: Deliver the list to the Engineer for review.

   Products must meet SCAQMD Rule 1168 VOC limits.

1.6 SAMPLES

A. Prepare 8 inch x 10 inch samples of finishes. When possible, apply finishes on identical type materials to which they will be applied on job.

B. Identify each sample as to finish, formula, color name, number, sheen name and gloss units.

C. Colors to be approved by the City prior to preparing samples.

1.7 MAINTENANCE MATERIALS

A. Leave on premises, where directed by City not less than one gallon of each color used.

B. Containers to be tightly sealed and clearly labeled for identification.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver paint materials in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, color designation and instructions for mixing and/or reducing.

B. Provide adequate storage facilities. Store paint materials at minimum ambient temperature of 45 degrees F. in well ventilated area.

C. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.9 ENVIRONMENTAL CONDITIONS

A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply

finishes unless moisture contents of surfaces are below following maximums.

1. Masonry, Concrete and concrete block: 12%
2. Plaster and Gypsum Wallboard: 12%
3. Exterior located wood: 19%
4. Interior located wood: 15%

B. Ensure surface temperatures or the surrounding air temperature is above 40 degrees F before applying Finishes. Minimum application temperature for latex paints for exterior work is 50 degrees F. Minimum application temperature for varnish finishes is 65 degrees F.

C. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 45 degrees F for 24 hours before, during and 48 hours after application of finishes.

D. Provide minimum 15-foot candles of lighting on surfaces to be finished.

1.10 PROTECTION

A. Adequately protect other surfaces from paint and damage. Repair damage as a result of inadequate or unsuitable protection.

B. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.

C. Place cotton waste, cloths and material which may constitute a fire hazard in closed metal containers and remove daily from site.

D. Remove electrical plates, surface hardware, fittings and fastenings, prior to painting operations. These items are to be carefully stored, cleaned and replaced on completion of work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.

1.11 GUARANTEE

A. Color: Guarantee for one year, as set forth in Section 01700, that the color of all surfaces finished hereunder shall remain free from fading; and that any other variation shall be uniform over the entire surface.

B. Adhesion: Guarantee all materials applied hereunder for a period of 2 years against failure due to surface conditions, materials, or application. There shall be no evidence of blisters, running, peeling, scaling, chalking, streaks, or stains. Washing with alkali-free soap shall remove surface dirt without producing the above or other deteriorating effects.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:

1. ICI.
2. Decratrend.
3. Devoe.
4. Dunn-Edwards. (Dunn Edwards Product numbers used as basis of design
5. Frazee.
6. Glidden.
7. PPG Industries.
8. Sinclair.
9. Tnemec.

10. Or approved equal.

2.2 MATERIALS

A. Paint, Varnish, Stain, Enamel, Lacquer and Fillers: Type and brand listed herein and approved by the City.

B. Paint Accessory Materials: (Linseed oil, shellac, turpentine and other materials not specifically indicated herein but required to achieve the finishes specified) of high quality and approved manufacturer.

C. Paints: Ready-mixed except field-catalyzed coatings. Pigments fully ground maintaining a soft paste consistency, capable of readily and uniformly dispersed to a complete homogeneous mixture.

D. Paints to have good flowing and brushing properties and be capable of drying or curing free of streaks or sags.

PART 3 - EXECUTION

3.1 INSPECTION

A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing to the City any condition that may potentially affect proper application. Do not commence until such defects have been corrected.

B. Correct defects and deficiencies in surfaces that may adversely affect work of this section.

3.2 PREPARATION OF SURFACES

A. Remove contamination from gypsum wallboard surfaces and prime to show defects, if any. Paint after defects have been remedied.

B. Remove surface contamination and oils from galvanized surfaces and wash with solvent. Apply coat of etching type primer.

C. Remove surface contamination and oils from zinc coated surfaces and prepare for priming in accordance with metal manufacturer's recommendations.

D. Remove dirt, loose mortar, scale, powder and other foreign matter from concrete and concrete block surfaces which are to be painted or to receive a clear seal. Remove oil and grease with a solution of tri- sodium phosphate, rinse well and allow to dry thoroughly. Power wash interior and exterior CMU walls with maximum 46-degree tip to remove contaminants. If efflorescence occurs, power wash with acidic masonry cleaner or etching solution infused water. Perform any necessary repairs prior to applying coatings.

E. Remove grease, rust, scale, dirt and dust from steel and iron surfaces. Where heavy coatings of scale are evident, remove by wire brushing, sandblasting or any other necessary method. Ensure steel surfaces are satisfactory before paint finishing.

F. Clean unprimed steel surfaces by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts and nuts are similarly cleaned. Prime surfaces to indicate defects, if any. Paint after defects have been remedied.

G. Sand and scrape shop primed steel surfaces to remove loose primer and rust. Feather out edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime steel including shop primed steels.

H. Wipe off dust and grit from miscellaneous wood items and millwork prior to priming. Spot coat knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has

dried and sand between coats. Back prime exterior woodwork.

I. Masonry: Repair minor holes and cracks with a stiff paste of finish paint and fine sand or vinyl-type block filler. Report major or unsightly defects to the Engineer for correction. Neutralize all alkali and efflorescence according to paint manufacturer's directions.

J. Enameled Woodwork: Sand smooth with grain and dust clean. After priming, putty nail holes, cracks, or other defects with putty matching color of finish paint. Cover knots and sappy areas with shellac or approved knot sealer. Sand each base coat smooth when dry.

K. Transparent Finished Woodwork: Sand smooth with the grain, using 150 grit or finer sandpaper, and dust clean. Repair all defects with filler tinted to match stain or wood color, as required, after first coat of sanding sealer and remove all smears.

3.3 APPLICATIONS

A. Apply each coat at proper consistency. Apply paint to gypsum board with roller, do not spray apply.

B. Each coat of paint is to be slightly darker than preceding coat unless otherwise approved by the City.

C. Sand lightly between coats to achieve required finish.

D. Do not apply finishes on surfaces that are not sufficiently dry.

E. Allow each coat of finish to dry before following coat is applied, unless directed otherwise by manufacturer.

F. Where clear finishes are required, ensure tint fillers match wood. Work fillers well into the grain before set. Wipe excess from the surface.

G. Backprime interior woodwork, which is to receive paint or enamel finish, with enamel undercoater paint.

H. Backprime exterior woodwork, which is to receive stain and/or varnish finish, with gloss varnish reduced 25% with mineral spirits.

I. Prime top and bottom edges of metal doors with enamel undercoat when they are to be painted.

J. Prime top and bottom edges of wood doors with gloss varnish where they are to be stained.

K. Paint as directed any miscellaneous items not specifically identified by drawings or specifications.

3.4 CLEANING

A. As work proceeds and upon completion, promptly remove paint where spilled, splashed or spattered.

B. During progress of work, keep premises free from any unnecessary accumulation of tools, equipment, surplus materials and debris.

C. Upon completion of work, leave premises neat and clean, to the satisfaction of the City.

3.5 PAINTING 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. See Article 3.06 above.

1. The Architect will issue a color schedule prior to start of painting to designate the various colors and locations required for the work.

B. Exterior Systems:

1. Concrete Block – Exterior CMU

a. CMU & Metal Doors/Jambs - Painted Surface Interior / Exterior

First Coat	ULTRA-GRIP Premium, Acrylic Multi Purpose Primer UGPR00
Second Coat	Eversheild, Exterior Flat Paint, EVSH10
Third Coat	RAINGUARD - VANDIGUARD NON-SACRIFICIAL COATING,

2. Wood – Paint Finish

a. Wood Rough Sawn – Low Sheen – Opaque: Color: TBD

First Coat	EZ-PRIME Premium, Exterior Wood Primer (EZPR00)
Second Coat	ACRI-HUES, Exterior 100% Acrylic Paint (W 720)

b. Wood Exterior – Low Sheen Finish – Opaque:

First Coat	EZ-PRIME Premium, Exterior Wood Primer (EZPR00)
Second Coat	SPARTASHEEN, Interior/Exterior Acrylic Low Sheen Paint (W 7300)
Third Coat	SPARTASHEEN, Interior/Exterior Acrylic Low Sheen Paint (W 7300)

C. Interior Systems:

12. Concrete Floors – Sealer

a. Concrete floor – Low Sheen – SealKrete, Dura - shell WB - Rust-oleum Floor Finish to meet slip resistant specifications

END OF SECTION

SECTION 09965
ANTI GRAFFITI COATINGS

GENERAL

SUMMARY

Section Includes:
Permanent anti-graffiti coating system.

Related Sections:
Section 07190 - Water Repellants: Clear water repellant coating for application on unpainted masonry or concrete surfaces.
Section 09900 – Paints and Coatings. Paint of surfaces on which graffiti coatings are applied.

QUALITY ASSURANCE

Contractor Qualifications: Installer shall be a firm with not less than three years of successful experience in application of coatings of type required on substrates similar to those of this project. The firm shall be approved by the manufacturer of the coating for installation of their product.

Manufacturer's representative shall inspect substrate conditions including alkalinity and moisture content. Obtain written approval from representative before proceeding with work.

SUBMITTALS

Submit in accordance with Section 0700

Instructions: Provide instructions bearing manufacturer's name, coating type, and recommended installation procedures. Provide methods and material instruction for graffiti removal. Include adhesive-backed graffiti removal instruction label suitable for application to interior surface.

Submit proof of purchase (Invoice of materials purchased) and proof of delivery of coating materials.

Manufacturer’s Warranty: Submit one copy of manufacturer's warranty for specified materials.

Field Sample: Apply graffiti resistant coating to field mock-up sample representing exterior wall surface to be coated. Apply coating system over a minimum 3 ft x 3 ft test area and test removal of applied spray paint in presence of Construction Manager for approval using removal methods recommended by the manufacturer.

EXTRA MATERIALS

Furnish the following to building owner upon completion of the Project.
Provide four containers of removal products as recommended by the manufacturer accompanied by removal instructions.

DELIVERY, STORAGE AND HANDLING

Section 1600 : Transport, handle, store, and protect products.

Paint orders to the manufacturer or supplier shall identify the store number, location, and address of project. Contractor shall require a record keeping account be established and maintained by the paint supplier which records graffiti resistant paint type, brand, and quantity purchased, for the specific project.

Deliver coating materials in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and/or reducing.

Store materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F in ventilated area and as required by manufacturer's instructions.

Prevent fire hazards and spontaneous combustion.

WARRANTY

Provide manufacturers written warranty guaranteeing effective graffiti removal for not less than 5 years and warrant that treated surfaces can be effectively and repeatedly cleaned of graffiti without damage or loss of effectiveness of the graffiti resistant coating. Manufacturer shall, for the duration of the warranty period, guarantee replacement of product and labor to remove graffiti and replace graffiti resistant coating where graffiti removal has shown to be ineffective.

PROJECT CONDITIONS

Environmental Requirements: Follow manufacturer's recommendations for temperature range in which coating may be applied.

PRODUCTS

GRAFFITI RESISTANT COATING

Graffiti resistant coating shall be a clear, non-sacrificial graffiti resistant coating which provides protection for exterior vertical surfaces from permanent graffiti staining and damage caused by spray paint and marking pens. Coating shall be suitable for application to painted and unpainted surfaces including masonry, concrete, metals, and EIFS. Product shall be of type such that recoating with the underlying paint is possible without removal of the graffiti resistant coating. Product shall be a coating that dries clear, non-yellowing, with a low luster.

Manufacturer:

VandlGuard10 Non-Sacrificial Graffiti Coating (Two Coat) by Rainguard International,1201 Dove Street Suite 625 Newport Beach, CA 92660 (949) 515-8800

VandlGuard Finish Coat Non-Sacrificial Graffiti Coating (One Coat) by Rainguard International, 1201 Dove Street Suite 625 Newport Beach, CA 92660 (949) 515-8800.

Micro-Seal Water Repellant (One Coat) by Rainguard International, Newport Beach, CA (949) 515-8800 (For first coat on unpainted concrete and masonry surfaces): As specified in Section 07190.

Graffiti Remover: Rainguard Vandl Clean Super graffiti remover or other product as recommended by the manufacturer.

EXECUTION

EXAMINATION

Verify all surfaces are ready to receive coating in accordance with manufacturer’s printed requirements. Beginning of installation indicates acceptance of substrate.

Unpainted Concrete and Masonry: Verify water repellant has been applied in accordance with Section 07190 to new or non-painted concrete and masonry surfaces prior to the application of the anti-graffiti coating.

PREPARATION

Surface shall be free of dirt, dust, contaminants such as curing compounds, hardeners, bond breakers, and form release. Allow painted surfaces to cure properly. Do not water blast painted surfaces. Assure surfaces are clean and dry.

Mask or otherwise protect adjacent surfaces not scheduled to receive coating. If applied on unscheduled surfaces such as glass, remove immediately, by approved method.

Protect landscaping, property, and vehicles from over spray and drift.

APPLICATION

Apply coating in accordance with manufacturer's published instructions.

Application Rate: Apply each coat at the manufacturers published application rate.

SURFACES TO BE COATED

Apply graffiti resistant coating to all exterior exposed building surfaces visible from the ground level, including concrete, masonry, metal doors and frames. Apply coating to painted and unpainted surfaces. Exclude horizontal surfaces subject to wheel or foot traffic.

Apply to exterior non-building vertical surfaces including solid or semi-solid fencing, segmental block or concrete panel retaining walls, and masonry screening as applicable.

On building surfaces, apply coating system to first definitive continuous horizontal demarcation including change in paint color or surface material but not less than 12 feet above finish grade. Apply to full height of exterior overhead or coiling door surfaces. Apply to top of building if no definitive continuous horizontal demarcation lines exist.

MAINTENANCE

Deliver cleaning products to City for storage and subsequent use for graffiti removal. Apply cleaning instructions label to interior wall location as directed by the Construction Manager.

FIELD QUALITY CONTROL:

Verify application rate by periodic on-site inspection and calculation of area covered compared to consumption of coating material used. Document inspections showing total area covered and number and volume of coating containers used.

END OF SECTION

SECTION 10155

SOLID PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid plastic toilet compartments urinal screens privacy screens

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. ASTM International (ASTM):
   1. A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   2. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.3 SYSTEM DESCRIPTION

A. Compartment Configurations:
   1. Toilet partitions privacy screens and Floor mounted, overhead braced.
   2. Urinal screens: Wall mounted.

1.4 SUBMITTALS

A. Submittals for Review:
   1. Shop Drawings: Include dimensioned layout, elevations, trim, closures, and accessories.
   2. Product Data: Manufacturer's descriptive data for panels, hardware, and accessories.
   3. Samples: [3 x 3] [__ x __] inch samples [showing available colors.] [in each color.]

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum [5] years experience in manufacture of solid plastic toilet compartments with products in satisfactory use under similar service conditions.

B. Installer Qualifications: Minimum [5] [years experience in work of this Section.

1.6 WARRANTIES

A. Provide manufacturer’s 25 year warranty against breakage, corrosion, and delamination under normal conditions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Contract Documents are based on products by Santana Products.

2.2 MATERIALS

A. Doors, Panels and Pilasters:
   1. High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
   2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
   3. 1 inch thick with edges rounded to 1/4 inch radius.
      4. Color: TBD from full range of mfr. colors

B. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.

C. Stainless Steel: ASTM A167, Type 304.

2.3 HARDWARE

A. Hinges:
   1. Continuous, fabricated from heavy-duty extruded aluminum with bright dip anodized finish, wrap-around flanges, adjustable on 30-degree increments, through bolted to doors and pilasters with stainless steel, Torx head sex bolts.
   2. Hinges operate on field-adjustable nylon cams, field adjustable in 30 degree increments.

B. Door Strike and Keeper:
   1. 45 inches long, fabricate from heavy-duty extruded aluminum with bright dip anodized finish, with wrap-around flanges secured to pilasters with stainless steel tamper resistant Torx head sex bolts.
   2. Bumper: Extruded black vinyl.

C. Latch and Housing:
   1. Heavy-duty extruded aluminum.
   2. Latch housing: Bright dip anodized finish.
   3. Slide bolt and button: Black anodized finish.

D. Coat Hook/Bumper:
   1. Combination type, chrome plated Zamak.
   2. Equip outswing handicapped doors with second door pull and door stop.

E. Door Pulls: Chrome plated Zamak.

2.4 COMPONENTS

A. Doors and Dividing Panels: 55 inches high, mounted 14 inches above finished floor,

B. Pilasters: 82 inches high, fastened to pilaster sleeves with stainless steel tamper resistant Torx head sex bolt.

C. Pilaster Sleeves: 3 inches high, [one-piece molded HDPE,] [20 gage stainless steel,] secured to pilaster with stainless steel tamper resistant Torx head sex bolt.

D. Wall Brackets: 54 inches long, Extruded PVC ,fastened to pilasters and panels with stainless steel tamper resistant Torx head sex bolts.

E. Headrail: Heavy-duty extruded aluminum, anti-grip design, clear anodized finish, fastened to headrail bracket with stainless steel tamper resistant Torx head sex bolt and at top of pilaster with stainless steel tamper resistant Torx head screws.

F. Headrail Brackets: 20 gage stainless steel, satin finish, secured to wall with stainless steel tamper resistant Torx head screws.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install compartments in accordance with manufacturer's instructions and approved Shop Drawings.

B. Install rigid, straight, plumb, and level.

C. Locate bottom edge of doors and panels 14 inches above finished floor.

D. Provide uniform, maximum 3/8 inch vertical clearance at doors.

E. Not Acceptable: Evidence of cutting, drilling, or patching.

3.2 ADJUSTING

A. Adjust doors and latches to operate correctly.

END OF SECTION

SECTION 10800

TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Plans and general provisions of the Contract, including General and Special Provisions Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes toilet and bath accessory items as scheduled.

B. Not Used

C. Toilet compartments and related accessories are specified in Division 10.

1.3 SUBMITTALS:

A. General: Submit the following according to the Contract and Special Provisions Specifications Sections.

B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

C. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.

D. Maintenance instructions including replaceable parts and service recommendations.

1.4 QUALITY ASSURANCE:

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Engineer.

1.5 WORK CONDITIONS:

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.6 WARRANTY:

A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

B. Warranty Period: 15 years from date of Substantial Completion.

C. The warranty shall not deprive the District of other rights the District may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the Work include the following:
   1. Bobrick Washroom Equipment, Inc.
   2. Or approved equal.

2.2 MATERIALS, GENERAL:

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034 inch (22 gauge) minimum thickness.

B. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.4 TOILET TISSUE DISPENSERS:

A. Bobrick B-2892 Classic Series

2.5 WASTE RECEPTACLE UNITS:

A. Bobrick Model B-279

2.6 SANITARY RECEPTACLE UNITS:

A. Bobrick Model B-270

2.7 GRAB BARS:

A. Stainless Steel Type: Provide grab bars with wall thickness not less than 0.05 inch (18 gage) and as follows:
   1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
   2. Clearance: 1 1/2 inch clearance between wall surface and inside face of bar.
   3. Gripping Surfaces: Manufacturer's standard nonslip texture.
   4. Medium-Duty Size: Outside diameter of 1 1/4 inches.

2.8 FABRICATION:

A. General: Only a maximum 1 1/2 inch diameter, unobtrusive stamped manufacturer logo, as approved by Engineer, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing resupply, etc. Provide minimum of six keys to the District's representative.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Install grab bars to withstand a downward load of at least 250 lbs, complying with ASTM F 446.

3.2 ADJUSTING AND CLEANING:

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION

SECTION 15050

MECHANICAL GENERAL PROVISIONS

PART 1 – GENERAL

1.1 GENERAL

A. The requirements of Division O and Division 1 apply to the work of this Section.

1.2 RELATED DOCUMENTS

A. This Section applies to all Sections of Division 15, except as may be otherwise modified in each Section.

1.3 DESCRIPTION OF WORK

A. Work Included: The work under Division 15 includes all labor, new materials, equipment, appliances and tools necessary for the installation, in complete working order, of the systems as specified and as indicated on the drawings.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. Access doors, Division 9 Section, "Access Doors".

B. Individual motor controllers except when furnished as integral parts of packaged equipment, Division 16.

1.5 EQUIPMENT RESTRICTIONS AND SPACE LIMITATIONS

A. The proprietary name, and/or model indicated on the drawings, or the first listed for any category in the specifications is the make and/or model used as the basis for the design. All bids shall be based on the use of the products of the selected manufacturers. Substitutions will be considered as outlined in General Conditions and Division 1 Section, "Products and Substitutions".

B. Choice of Equipment: Equipment has been chosen which will properly fit into the physical spaces provided and indicated, allowing ample room for access, servicing, removal and replacement of parts, etc. Adequate space shall be allowed for clearance in accordance with the code requirements and the requirements of the local Inspection Department.

1.6 SUBMITTALS

A. General: Refer to Division 1 Section, "Shop Drawings' Product Data Samples". Comply with Section 01010, "General Provisions", Paragraph: Integrated Shop Drawings.

B. Equipment Submittals:

1. Copies: Submit five (5) copies of data as specified hereafter.

2. Manufacturer's Data: Give name of manufacturer, brand name, and catalog number of each item. Submit complete submittals, at one time, with items arranged in numerical sequence within each section and article of the specifications. Listing items "as specified" without both make and model or type designation is not acceptable, except pipe and fitting not specified by brand names may be listed "as specified" without

manufacturer's name, provided proposed materials comply with specification requirements.

3. Descriptive Data: Send copies of complete description, information, and performance data covering materials and equipment which are specified. Brochures submitted to the Engineer shall be published by the manufacturers and shall contain complete and detailed engineering and dimensional information. Brochures not compiled in the following manner shall be returned for re-submittal. Brochures submitted shall contain only information relevant to the particular equipment or materials to be furnished. The Contractor shall not submit catalogs which describe several different items other than those items to be used unless relevant information is clearly marked. Brochures from each manufacturer shall be identified and submitted separately.

4. Miscellaneous: Prior to installation, submit to Construction Supervisor on the job site, two copies of following:

a. Installation instructions for each piece of mechanical equipment furnished.

5. Submittal Data: Submittal shall be based on manufacturer's catalog cuts or brochures for items indicated on each section. Pages shall be clearly marked for the particular series, model, configuration, all accessories, etc. which apply.

1.7 RECORD DRAWINGS AND OPERATING AND MAINTENANCE BOOKS

A. Record Drawings: On completion of work, furnish the Owner through the Architect, with a complete set of reproducible sepia transparency record drawings and shop drawings which properly reflect the locations of all equipment fixtures, piping, ductwork, diffusers, mixing boxes, controls, etc., as actually installed. Where necessary to locate concealed equipment, dimensions shall be included on these drawings. Maintain a separate set of drawings at the job site for such marking of "As-Built" locations. This set shall be updated as the installation work progresses and shall be available to the Architect at job visits.

1.8 CODES, ORDINANCES, REGULATIONS AND DEFINITIONS

A. All work and materials shall be in full accordance with the latest rules and regulations of the State Fire Marshal; the Safety Orders of the Division of Industrial Safety; the NFPA Codes; the Uniform Plumbing Code; the Uniform Building Code; the Uniform Mechanical Code; City ordinances and other applicable laws or regulations. Nothing in the drawings or specifications is to be construed to permit work not conforming to these codes. Drawings and specifications shall take precedence when work and materials called for exceed code requirements.

B. References to standard code specifications shall mean editions in effect at date of proposals.

C. Reference to technical societies, trade organizations, governmental agencies are made in Mechanical Sections in accordance with the following abbreviations:

AGA	American Gas Association
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASTM	American Society of Testing and Materials
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute

ETL	Electrical Testing Laboratory
IRI	Industrial Risk Insurers
ISO	Insurance Service Organization
NCPWB	National Certified Pipe Welding Bureau
NEC	National Electrical Code
NFC	National Fire Codes
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
PDI	Plumbing and Drainage Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriter's Laboratories, Inc.

D. Fees, Permits, Licenses and Payments: Contractor shall secure all permits and inspections and pay full cost of same.

1.9 EXPLANATION AND PRECEDENCE OF DRAWINGS

A. For purposes of clearness and legibility, the drawings are essentially diagrammatic although size and location of equipment is drawn to scale wherever possible. The Contractor shall make use of all data in all contract documents and shall verify this information at building site.

B. Attention is called to the inclusion of the flow diagrams and riser diagrams in the list of drawings. These diagrams are not for the purpose of giving physical dimensions or locations, but rather to make clear the interconnections, by the piping, of the various units of the process. If an item is shown on either the flow or riser diagram or the piping detail drawings, but not on both, it will be assumed that the Contractor has included such items in his estimate of the cost of the work and that he shall install same.

C. All other drawings of the contract set are hereby made a part of these specifications and shall be consulted by the Contractor and his work adjusted to meet the conditions shown thereon.

D. Coordinate with all other trades so that no interferences shall occur as no extras will be allowed for changes made necessary by interferences with the work between trades.

1.10 COMPLETE PERFORMANCE OF WORK

A. Practices of the Trades: Work shall be executed in strict accordance with the best practice of the trades by competent workmen.

B. Complete Functioning of Work: All labor, materials, apparatus, and appliances essential to the complete functioning of the systems described and/or indicated, or which may be reasonably implied as essential, whether mentioned in these contract documents or not, shall be furnished and installed by the Contractor. In cases of doubt as to the work intended, or in the event of need for explanation thereof, the Contractor shall call upon the Architect for supplemental instructions.

1.11 CONTROL AND OBSERVATION

A. The Architect and Owner shall have the right to reject materials or workmanship which in their opinion are not in accordance with this contract, to interpret contract provisions and the meaning of the drawing and specifications. The above named parties shall be allowed access to the work for observation at all times.

B. Defective work or work in any way contrary to the contract documents may be rejected without regard to state of completion, even though said work has been rejected as a result of a previous observation.

1.12 APPROVALS

A. All electrical equipment shall meet the listing requirements and bear one of the following agency labels:
   1. Underwriter's Laboratories (UL)
   2. Electrical Testing Laboratory (E.T.L.)

1.13 GUARANTEES

A. In addition to any specific guarantee mentioned in these specifications, the Contractor shall leave the entire installation in complete working order and free from any and all defects in materials, workmanship or finish. Contractor shall repair or replace at his own expense any part that may develop defects due to faulty materials or workmanship during the tests and within a period of one (1) year after the work is accepted by the Owner. Contractor shall guarantee also to repair or replace with like materials any existing work of the building or equipment which is damaged during the repairing of such defective apparatus, materials or workmanship. The signing of the contract for his work covered by these specifications and of which they shall become a part, shall become a written guarantee on the part of the Contractor to carry out the provisions of this section of these specifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. Standards of Quality: Materials and equipment shall be new and in good condition. The commercially standard items of equipment and the specific names mentioned in sections of Division 15 are intended to establish the standards of quality and performance necessary for the proper functioning of the mechanical work.

B. Variations: Since manufacturing methods vary, reasonable minor equipment variations are expected; however, performance and material requirements are minimum. The Engineer retains the right to judge equality of equipment that deviates from the specifications.

2.2 FLASHINGS

A. Make all pipes and vents passing through roof or outside wall waterproof with flashings and storm collars or counterflashings.

B. Except as otherwise noted or required, extend vent pipes passing through roof at least 12 inches above finished roof line.

C. Furnish and install on each pipe passing through the roof a Stoneman Stormtite six-pound seamless lead flashing assemble with eight-inch skirt. Flashing shall have steel reinforced conical boot and be complete with open top cast iron counterflashing and permaseal waterproofing compound. For sanitary vent provide a hood with a minimum 2 to 1 free area to vent pipe size.

D. All ductwork penetrating roof or exterior walls shall be flashed and counterflashed with galvanized sheet metal.

2.3 SLEEVES, CUTTING AND PATCHING

A. Above Grade: The Contractor shall be responsible for the timely placing of sleeves for all piping passing through walls, partitions, beams, floors, and roof while same are under construction. A

pipe sleeve shall be one size larger than the size of pipe it serves. If a pipe is insulated, its pipe sleeve shall be one size larger that the outside diameter of the insulation around the pipe. Sleeves set in concrete floor construction shall be 18 gauge galvanized steel. If holes and/or sleeves are not properly installed and cutting and patching becomes necessary, it shall be done at no expense to the owner by parties approved by the Architect. All openings into existing masonry shall be core drilled or saw cut. The Contractor shall undertake no cutting or patching without first securing the Architect's written approval. Where a pipe passes through a sleeve, no joint of the pipe (or its insulation) shall touch the sleeve. Caulk around such pipe with sufficient layers of 1/8 inch neoprene and seal off opening between pipe and sleeve with a non-hardening mastic. Caulking in fire walls or floors shall be made using a U.L listed, fire-rated material.

2.4 ESCUTCHEONS

A. Provide heavy chrome-plated or nickel-plated plates or approved pattern on pipe passing through walls and ceilings in finished areas. Escutcheons shall be Beaton & Caldwell No. 10, or approved equal, chrome-plated steel plates with concealed hinges. Pattern shall be approved by the Architect.

2.5 ANCHOR BOLTS

A. Furnish and install anchor bolts for all equipment placed on concrete equipment pads or on concrete slabs. Bolts shall be of the size and number recommended by the manufacturer of the equipment and shall be located by means of suitable templates. When equipment is placed on vibration isolators, the equipment shall be secured to the isolator and the isolator secured to the floor, pad, or support as recommended by the Vibration Isolation Manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Inspect the architectural, structural, plumbing, fire protection, special systems and HVAC drawings and specifications to become familiar with the class of building construction and to coordinate with the work of others.

B. Piping: Install in a manner that permits expansion and contraction caused by changes in temperature and pressure. Provide additional supports as required. Run pipes straight and true, parallel to or at right angles to the building walls. Springing or forcing piping into place will not be permitted.

C. Fixtures and Equipment: Install in strict accordance with manufacturer's written installation instructions and recommendations. Fixtures shall be roughed in only from fixture manufacturer's certified "Rough-In Measurement Drawings" which shall be submitted to the Architect for approval.

3.2 STAGING AND HOISTING

A. Provide all hoisting equipment, staging scaffold, ladders, barricades, shores or similar facilities required to properly carry out this work in accordance with all safety regulations.

3.3 ENCLOSURES

A. The Contractor shall provide, install and maintain for the duration of the work as required, all lawful or necessary barricades and railings, lights, warning signs and signals and shall take all other precautions as may be required to safeguard persons, the site and adjoining property, including improvements thereon, against injuries and damages of every nature whatsoever.

3.4 CONTROL AND INSPECTION

A. The Architect, Engineer or Owner shall have the right to reject materials or workmanship which in his opinion are not in accordance with this contract, to interpret contract provisions and the meaning of the drawings and specifications. The above named parties shall be allowed access to the work for observation at all times.

B. Defective work or work in anyway contrary to the contract documents may be rejected without regard to state of completion, even though said work has not been rejected as a result of a previous observation.

3.5 PIPE SUPPORTS

A. Installation:

1. Securely support piping from building construction with manufactured iron hangers, brackets, trapezes, guides, anchors and sway braces to maintain pipe alignment and prevent sagging, noise and excessive strain due to uncontrolled movement under operating conditions. Secondary beams shall be furnished and installed under this section of the specifications wherever necessary to meet the requirements above.

2. Piping supports for each system shall be engineered as a system and the proposed system submitted for review.

3. Relocate hangers as necessary to correct unsatisfactory conditions that may become evident when system is put into operation.

4. Supporting of piping by wire, rope, wood or other make shift devices will not be permitted.

5. Burning of holes in beam flanges or narrow members will not be permitted.

6. Where rods exceed 12" in length for pipes 2" and larger and all trapezes, lateral sway bracing shall be provided at every third hanger. Each 40' or more straight run of pipe shall be equipped with a longitudinal sway brace. Sway brace rods shall either be two hanger or 1-1/2" x 1-1/2" x 1/8" angle iron to 2" pipe size and 2" x 2" x 1/4" for larger pipe, set on 45^0F. Secure bracing to pipe and structure as for hangers. All hanger rods not sway braced shall be fitted at the top with a swivel.

7. Piping shall not be supported from roof decking. Furnish and install structural members to span steel purlins to distribute load. Refer to roof shop drawings for location of beams and purlins for additional structural members for hangers.

8. Sheet lead, lead wool or wood plugs will not be accepted as a substitute for cinch anchors as a means of attaching materials and equipment to concrete.

9. Supports for insulated pipe shall be outside the insulation. Protect pipe insulation at every hanger, support or guide with inserts and shields. The galvanized steel shield shall be applied between the hanger or support and the pipe insulation. Provide saddles at all rollers for insulated pipe not equipped with inserts and shields.

3.6 IDENTIFICATION OF EQUIPMENT, PIPING AND VALVES

A. Equipment Labels: All equipment furnished and installed under this section shall be provided with manufacturer's metal labels securely attached to each individual piece of equipment and showing complete and comprehensive performance characteristics, size, model, serial number, etc.

B. Name Plates: Install engraved bakelite nameplates with 1/4" high white letters for all new equipment, switches, controls, room stats, damper motors, indicating zone, etc.

3.7 CLEANING

A. Equipment, Piping, Ductwork, and Related Valves and Appurtenances, Etc.: Thoroughly clean so as to remove rust, scale, plaster or any internal obstructions before any covering is installed or equipment is painted. No scarring or disfiguring of equipment, piping, etc. will be acceptable before covering or painting is applied.

B. Exposed Equipment: The exposed parts of equipment shall be cleaned, oil and grease removed, and the bright parts left clean and polished.

C. Completion: Upon completion of the work, the Contractor shall remove all rubbish, debris and surplus materials from the premises together with all test instruments, and equipment and shall leave the site in a neat, clean and acceptable condition as approved by the Architect.

3.8 PRELIMINARY OPERATIONS

A. Should the Owner require that any portion of the system or equipment be operated prior to the final completion and acceptance of the work, the Contractor shall furnish such operation. All the expense thereof will be paid by the Owner separate and distinct from any money paid on account of the contract.

B. For such preliminary operation, payment shall not be construed as final acceptance of any of the work of this contract.

3.9 OPERATING INSTRUCTIONS

A. The Contractor shall provide the services of a competent start up mechanic to supervise the operation of all equipment specified herein and to instruct the Owner's operators during a one day operating period. The operating instruction period shall be defined as straight time working hours and shall not include nights and weekends.

B. The Owner shall be notified in writing at least five days before each operating instruction period begins. The Owner shall verify the instructional starting time to the Contractor.

3.10 TESTS

A. Tests must be performed and systems approved prior to painting, covering, insulating, furring, or concealing piping.

B. Provide all test equipment, instrumentation and labor in conjunction with tests.

C. Prior to test, protect or remove all control devices, air vents, and other items which are not designed to stand pressures used in test.

D. Accomplish testing of piping in sections so as not to leave any pipe or joint untested.

E. Obtain prior approval for test procedure.

F. Responsibility for Damages: Contractor shall pay for costs of repair and restoration of work of other trades damaged by tests or cutting done in connection with tests.

3.11 COMPLETION DATE AND TESTING OF MECHANICAL SYSTEMS

A. Final Acceptance Tests: The date for the final acceptance tests shall be sufficiently in advance of

the contract completion date to permit the execution before the expiration of the contract of any adjustments and/or alterations which the final acceptance tests indicate as necessary for the proper functioning of all equipment. Any such modifications shall be completed within the number of days allotted for completion of the contract. Retests shall not relieve the Contractor of completion date responsibility.

B. Starting and Operation: Before starting or operating equipment of systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated and serviced. Notify Owner at least three days in advance of starting these tests.

3.12 FINAL REVIEW

A. Date and Time: At a time designated by the Architect, the entire system shall be reviewed by the Architect. The Contractor shall be present at this review.

B. System Operation: The system shall be operating properly with all water and air volumes balanced and all temperature controls adjusted. All labels shall be removed from the plumbing fixtures, and the fixtures shall be cleaned and in operating condition. Air balance report shall be submitted to the Architect.

C. Documentation: Certificates and documents required herein shall be in order and presented to the Architect at least two weeks prior to the review.

D. Changes and Corrections: After the review, and changes or corrections noted by the Architect as necessary for the work to comply with these specifications and the drawings shall be accomplished without delay in order to secure final acceptance of the work.

END OF SECTION

SECTION 15400

PLUMBING

PART 1 - GENERAL

1.1 SUMMARY:

A. The "Mechanical General Requirements," 15050, is a part of this section and applies as fully as if repeated herein.

B. The work under this section includes everything necessary for and incidental to executing and completing the plumbing work, except as hereinafter specifically excluded.

C. Work included shall be as indicated on the drawings, including, but not limited to, the following:

1. Sanitary Soil, Waste and Vent System.
2. Cold Water System.
3. Plumbing Fixtures and Equipment.

D. Related Work:

1. Mechanical General Requirements, Section 15050.
2. Fire Protection, Section 15300.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS:

A. All cast iron piping shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.

B. All couplings for hubless cast iron pipe and fittings shall meet the requirements of CISPI 310 and shall be certified by NSF International.

C. Soil, Waste, Vent and Rainwater Pipe and Fittings Above Ground:

1. Cast Iron (Hubless): CISPI Standard 301, ASTM A74, service weight, cast iron soil pipe and fittings, with stainless steel shield, clamp assembly and neoprene gasket, conforming to CISPI Standard 310. Manufactured. by AB&I, Charlotte or Tyler. Couplings shall be Type 301 stainless steel with elastomeric gasket, stainless steel bolts complying with ASTM C1277.

    a. Couplings for hubless to copper transition: Type 304 stainless steel (ASTM C1460) with elastomeric gasket complying with ASTM C564 and stainless steel screws. Husky SD 4101 and 4102 or reviewed equivalent.

2. Cast Iron (Hub End): CISPI 301, ASTM A74, Service weight, hub and spigot soil pipe and fittings. Manufactured. by AB&I, Charlotte or Tyler.

    a. Neoprene Compression Gaskets: ASTM C564.

3. Copper: ASTM B306, Type DWV for pipe, and cast bronze drainage pattern fittings, with soldered joints.

a. Solder: ASTM B32, 50-50 tin lead solder.

4. Where space does not permit the use of cast iron piping, install DWV copper drainage tubing and cast brass fittings. Except copper is not permitted at urinals.

D. Domestic Water Pipe and Fittings Above Ground:

1. Copper: ASTM B88, Type L Water Tube, drawn temper with ANSI B16.22, streamlined pattern wrought copper solder-joint fittings.

a. Solder: ASTM B32, 95-5, tin-antimony. Soldering fluxes shall conform to ASTM B813.

b. Solder and fluxes used in drinking water systems shall be listed by a third party agency to conform to NSF 61.

2. Copper Press Fittings shall conform to the material and sizing requirements of ASME B-16.18 or ASME B-16.22. O-rings for copper press fittings shall be EPDM. Copper Press Fittings shall be as manufactured by Viega/Rigid, Nibco or reviewed equivalent. Installation shall be in accordance with manufacturer's instructions.

2.2 PIPING SPECIALTIES:

A. Unions, Copper Piping: ANSI B16.24, Class 150, hexagonal stock, with ball and socket joints, metal-to-metal bronze seating surfaces, female threaded or solder ends. (Except where indicated to be Gruvlok Fittings).

B. Unions, Steel Piping: ANSI B16.39, Class 150, black malleable iron; female pattern; brass to iron seat; ground joint.

C. Flanges Copper Piping: 150 psi ANSI B16.24 bronze flanges. (Except where indicated to be Gruvlok Fittings).

1. Gaskets: 1/16 inch thick.

D. Isolation Unions: EPCO, W & K or Watts dielectric unions or flanges, same size as pipe or Grinnell Gruvlok “D1-LOK” nipple dielectric pipe connection.

E. Water Hammer Arrestors: In accordance with PDI-WH-201 standards, J.R. Smith 5000 series or Zurn Z-1700 series, bellows type. Size as indicated in drawings. Water hammer arrestors concealed in wall shall be provided with a minimum 12" x 12" access panel.

F. Trap Primer: Precision Plumbing Products, Inc. "Prime Rite" trap primer valve with distribution unit where required. Trap primers concealed in wall shall be provided with a access panel.

G. Flexible Connectors: Hyspan 4506 or 4507 series, type 304 stainless steel corrugated inner core with type 304 stainless steel single braid wire reinforced protective jacket brazed to copper tube ends; 500-100 psig working pressure (varies with pipe size),maximum 600 degree F operating temperature for 1/2" to 4" size. Connectors shall have flanged or threaded-end connections to match equipment connected and shall be capable of 3/4-inch minimum misalignment.

H. Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction. Labels shall be precoiled, semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

1. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

a. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

b. Lettering Size: At least 1 inch high

2.3 VALVES:

A. Water: All shut-off valves for water service shall be full port ball valves except valves 2-1/2 inch and larger.

B. All valves shall be low-lead complying with California Assembly Bill AB1953.

C. Ball Valves, 2" and Smaller: Class 150, 600 psi W.O.G., bronze, two piece body, blowout proof stem, full port, TFE seat ring, screw or solder ends. Nibco 585-70 series, Watts, Apollo or reviewed equivalent..

D. Angle Stops, Loose key quarter turn stop, brass ball and stem with stainless steel escutcheon. Brasscraft, Nibco or reviewed equivalent.

2.4 CLEANOUTS:

A. Floor Cleanout: J.R. Smith Fig. 4023; Zurn ZN-1400-BP-NL or reviewed equivalent with nickel bronze non-skid adjustable round or square top with NEO-LOC or SPEEDI set gasket.

B. Wall Cleanouts: J.R. Smith Fig. 4512; Zurn Z-1446-BP, or reviewed equivalent with stainless steel or chrome plated access cover and screws with No-Hub 'T' fitting and bronze plug.

2.5 HANGERS AND SUPPORTS:

A. Hangers and supports shall comply with the currently accepted edition of the C.P.C. and the IAMPO installation standards.

B. All hangers and supports shall be a manufactured product. Field or shop fabricated hangers or supports are not acceptable unless submitted for review prior to installation.

C. Perforated metal strapping (plumber's tape) is not acceptable as material for hangers and supports.

D. Hangers and supports exposed to the elements shall be B-Line system hot dipped galvanized after fabrication, ASTM 123. Provide B-Line zinc rich paint for application to all field cuts.

E. Hangers and Supports:

1. Hangers: Adjustable “J:” hanger, plain steel, B-Line fig. B3690 for steel, cast iron or insulated copper piping, and plain steel, fig. B3690F felt lined for all uninsulated copper piping. Elcen, Grinnell or reviewed equivalent.

2. Hangers: Adjustable swivel ring hanger (8" maximum size), plain steel, B-Line fig. B3172 for steel, cast iron or insulated copper piping, and plain steel, fig. B3172F felt lined for all uninsulated copper piping. Elcen, Grinnell or reviewed equivalent.

3. Channel: 12 gauge, steel, dura green epoxy finish, with hole pattern of 9/16" diameter holes at 1 7/8" on center, B-Line fig. B22H17/8; Elcen, Superstrut or reviewed equivalent.

4. Channel Pipe and Tubing Clamps: 12 gauge, steel, dura green epoxy finish, pipe and tubing clamp, fig. B-Line B2007 through B2129; Elcen, Superstrut or reviewed equivalent.

5. Channel Pipe and Tubing Clamp Cushion: Cush-A-Strip, Superstrut series 70, rubber lining; B-Line, Elcen, or reviewed equivalent.

6. Channel Structural Attachments, Bolts, Nuts, Clamps, Etc.: As manufactured by B-Line, Elcen, Superstrut or reviewed equivalent.

7. Riser Clamp: Standard riser clamp, including bolts and nuts, plain steel, B-Line B3373; Elcen, Superstrut or reviewed equivalent.

8. All copper tube supports shall be made with Holdrite Silencer system used with Hubbard/Holdrite Stout Bracket System, including clamps, isolators, inserts, thru-stud isolators, straps, trapeze clamps and perforated brackets for pipe stubouts.

9. Shields: Insulation protection shields, pre-galvanized steel, metal thickness and length varies from 18 through 12 gauge, and 12" through 24" length, B-Line B3151; Elcen, Grinnell or reviewed equivalent.

10. Attachments To The Structure: Shall be by ceiling flanges, beam brackets, angle clips, side beam connectors, rod beam attachments, adjustable metal deck ceiling bolts, concrete inserts, etc. as manufactured by B-Line; Elcen, Grinnell or reviewed equivalent.

11. Hanger Rods: Shall be steel, continuous thread, length as required and diameter as listed in Execution portion of specifications.

2.6 SECONDARY PIPE POSITIONING AND SUPPORTS:

A. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. These shall be Hubbard Enterprises/HOLDRITE Silencer System or reviewed equivalent.

B. Makeshift, field devised methods of plumbing pipe support, such as with the use of scrap framing materials, are not allowed.

2.7 ACCESS PANELS:

A. Access Panel for Valves Trap Primers and Water Hammer Arrestors: Stainless] steel, size as required for easy access (Minimum size shall be 12" square.), screwdriver latch, concealed hinge and flush face. Elmdor, Milcor or reviewed equivalent.

B. Access panels for rated walls shall match the rating of the wall.

2.8 PLUMBING EQUIPMENT:

A. The equipment described in this Section is to be furnished and installed complete under this section of the specifications. See "Equipment Schedule" on drawings for size, capacity and electrical characteristics.

2.9 PLUMBING FIXTURES, GENERAL:

A. General: Provide plumbing fixtures and trim, fittings, other components, and supports as specified in "Plumbing Fixtures" at the end of Part 2 of this Section.

1. Provide new fixtures, approved, free from flaws and blemishes with finished surfaces clear, smooth and bright.

2. Fixtures shall be the product of one manufacturer. Fittings of the same type shall be the

product of one manufacturer.

3. Protect fixtures against use and damage during construction.

4. Unless otherwise specified, provide fittings fabricated of brass with a polished chrome-plated finish.

5. Fixture supplies shall be Brasscraft loose key, quarter turn angle type stop, heavy pattern Prefix "H" (I.P.S.) (Compression) (Sweat) inlet by compression outlet, with flexible risers and stainless steel escutcheons. All piping, valves and connections shall be low-lead complying with California Assembly Bill AB1953.

6. Fixture traps above floor shall be chrome-plated cast brass "P" traps with bronze nuts unless otherwise indicated. Trap arms shall be 17 gauge chrome-plated brass.

7. Insulate the trap and supplies of sinks or lavatories where indicated on drawings as handicap (Accessible) fixtures. See insulation specifications.

8. Do not install toilet seats, aerators or shower heads until final inspection or before the complete water system has been flushed.

9. Individual loose key stops or, when so specified, screw driver stops, shall be provided for all supplies and shall be low-lead complying with California Assembly Bill AB1953

10. Unless stops are integral with valves or faucets and unless they are otherwise approved by Architect, they shall be mounted under the fixture.

11. All fixture supplies and waste piping through the wall shall be provided with polished chrome-plated cast brass wall escutcheons.

B. Fixture Supports:

1. Water closet carriers shall have an additional faceplate and coupling when used for wide pipe spaces. Provide tiling frame or setting gauge with carriers for wall-hanging water closets.

2. Reinforcement: Provide steel plates attached to studs to secure wall hung fixtures. Where studs are light gauge steel, provide standard manufactured floor mounted rectangular upright supports attached to backing plate and matched to type of wall fixture being used.

3. Provide fixture support having the features required to match each fixture.

C. The manufacturers listed for the plumbing fixtures set a standard for reviewed equivalents.

2.10 PLUMBING FIXTURES

A. See fixture schedule on the drawing.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify all dimensions by field measurements. Verify that all drainage piping and specialties may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.

B. Verify all existing grades, inverts, utilities, obstacles, and topographical conditions prior to installations.

C. Examine rough-in requirements for roof drain connections to verify actual locations of piping connections prior to installation.

D. Examine walls, floors, roof, and plumbing chases for suitable conditions where piping and specialties are to be installed.

E. Do not proceed until unsatisfactory conditions have been corrected.

3.2 GENERAL PIPING INSTALLATION:

A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. The location and arrangement of the piping layout takes into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

B. All pipe and fittings shall be carefully cleaned before installation.

C. All exposed piping shall be installed to maintain headroom and keep passageways and openings clear.

D. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings and below grade or floors unless indicated to be exposed to view.

E. Use premanufactured pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

F. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

G. Install all piping at right angles or parallel to building walls. Diagonal runs are not permitted unless expressly indicated.

H. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves. Support groups of pipes from trapeze hanger system where practical.

I. Install piping free of sags or bends and with ample space between piping to permit insulation applications.

J. Isolate piping systems from building structure to minimize noise transfer by using acoustical suspension isolator silencer and bracket system.

K. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4-inch ball valve, and short 3/4-inch threaded nipple and cap.

L. Protect all openings in piping at all times. Do not permit any foreign materials of any kind to be put into the system. Any system which has been found to contain foreign material shall have that portion of the system removed and replaced with new material to guarantee proper system flow, at no additional cost to the owner.

M. Bending or forcing of pipe will not be allowed. Use fittings for all offsets, changes in direction and branch piping.

N. Proper provision shall be made for expansion and contraction by means of fittings, anchors and supports. Anchor piping to ensure proper direction of expansion and contraction. Install expansion loops and joints as indicated on the Drawings.

O. Street elbows, bushings and long screw fittings will not be allowed.

P. All piping penetrating any component of the building framing, including wall studs and blocking, shall have a minimum clearance of 1/4" all around the pipe. Exception, floor or foundation wall sleeves.

Q. All piping shall be isolated from other piping, studs, ducts, any part of the building, framing, conduit, etc., with Superstrut Cush-A Strip pipe isolators.

R. The ends of threaded steel pipe shall be reamed out full-size with a long tapered reamer so as to be partially bell-mouthed and perfectly smooth.

S. Install water shutoff valve at service entrance outside building. When located inside building, install valve with pressure gauge and test tee unless otherwise indicated on the drawings.

T. Install water hammer arrestors at all flush valves, foot valves, dish and clothes washers and quick closing valves per PDI-WH-201 standards, and as indicated on drawings.

U. Unions shall be installed after each screw-type valve, connections for all equipment, appliances, and as required for erection and maintenance. No unions shall be installed in concealed locations. Install isolation unions on all connections between dissimilar metals (galvanized steel, black steel, or cast iron to copper).

V. No holes for pipe or equipment will be allowed in any structural member without written consent of the Architect. Where pipes are to pass through or interfere with any member, or where notching, boring or cutting of the structure is necessary, the work shall be done by the General Contractor as directed.

W. Any minor changes in work, which has not been installed, shall be made by the Contractor without additional compensation, except changes which are caused by architectural revisions which increase or decrease the size of the materials specified or indicated on the drawings. The Contractor shall submit an estimate of the cost or credit for such changes he does not consider being minor in nature and shall proceed only upon the written authorization of the Architect.

X. Flush out all water mains, sanitary, storm and condensate drains with water so as to obtain free flow. Remove all obstructions and defects discovered. Remove and replace pipe already laid and found to be defective or which has had grade or joints disturbed at no additional cost.

3.3 SLEEVES:

A. Sleeve diameter for piping through masonry, concrete and framed walls above grade shall be #10 gauge galvanized sheet steel, round tube closed with welded longitudinal joint, and shall extend completely through the walls, finishing flush on both sides.

B. Sleeves for piping through masonry or concrete floors above grade or through floors shall be galvanized steel pipe sleeves and shall extend completely through the floor, finishing flush on both sides. Provide clamp for pipe sleeve above slab.

C. Sleeves shall be 1” larger than the pipe with oakum caulking to make opening airtight.

D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

E. Provide and install polished chromium plated brass floor ceiling or wall escutcheons for all pipes which are exposed in finished portions of the buildings.

3.4 SANITARY SEWER, STORM DRAIN, WASTE AND VENT PIPING:

A. Install No-Hub and Bell end cast iron piping per No-Hub Cast-Iron Soil Pipe Institute Pamphlet #100 and the IAMPO IS-6. Trench excavation, bedding and backfill procedures and testing procedures shall be in accordance with Chapter IV of the Cast Iron Soil Pipe and Fitting Handbook.

B. Install copper DWV piping per IAPMO 1S-3.

C. Sanitary sewers, storm drains, waste lines and vent lines shall be installed so as to provide a smooth and uniform invert. Water shall not be allowed in the trenches while the sewer lines are being laid. Dirt, cement, or any other superfluous material shall be carefully removed from piping as the work progresses. Constant inspection shall be made of pipe and fittings during and after all installation for possible fractures and failures caused by installation. Backfill so as not to disturb pipe or joints.

D. Make changes in direction for sanitary sewer, storm drain, waste and vent piping using appropriate 45-degree wyes, half-wyes, or short or long sweep quarter, sixth, eighth, or sixteenth bends. Sanitary tees or quarter bends may be used on vertical stacks of drainage lines where the change in direction of flow is from horizontal to vertical. No change in direction of flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use standard increasers and reducers of proper size. Reduction of the size of drainage piping in the direction of flow is prohibited.

3.5 JOINING PIPES AND FITTINGS:

A. Copper Tubing: Solder joints in accordance with the procedures specified in ANSI B9.1, AWS Solder Manual, NFPA 99C and IAMPO 1S-3 and 1S-21. Solder and fluxes used in drinking water systems shall be listed by a third party agency to conform to NSF 61.

B. Brazed Joints: Comply with the procedures contained in the Brazing Manual and IAPMO 1S-3 and 1S-21.

1. CAUTION: Remove stems, seats and packing of valves and accessible internal parts of piping specialties before soldering and brazing.

2. Fill the tubing and fittings during soldering and brazing with an inert gas (nitrogen or carbon dioxide) to prevent formation of scale.

3. Heat joints to proper and uniform temperature.

C. Press Connections: Copper press fittings shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

D. Cast-Iron Soil Pipe: Make compression joints and hubless joints in accordance with the recommendations in the CISPI Cast Iron Soil Pipe and Fittings Handbook, Volume I.

E. Threaded Joints: Conform to ASME B1.20.1, tapered pipe threads for field-cut threads. Join pipe fittings and valves as follows:

1. Note the internal length of threads in fittings or valve ends and proximity of internal seat or wall to determine how far pipe should be threaded into joint.

2. Align threads at point of assembly.

3. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

4. Assemble joint wrench-tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

   a. Damaged Threads: Do not use pipe with corroded or damaged threads. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

3.6 INSTALLATION OF PIPING SPECIALTIES:

A. Install expansion joints on vertical risers as indicated and as required by the plumbing code.

B. Cleanouts: Install in piping as indicated.

1. Install as required by plumbing code.

2. Install at each change in direction of piping greater than 135 degrees.

3. Install at minimum intervals of 50' for piping 3" and smaller and 100' for piping larger than 3".

4. Install at base of each vertical soil, waste or storm drain stack.

5. Cleanouts shall be caulked into or clamped to pipe. Install under counter tops where they occur in walls to avoid exposed condition. Cleanouts shall be accessible in all cases and shall be brought to surface on "Y" branches.

6. Cleanout Covers: Install floor and wall cleanout covers for concealed piping, types as indicated.

C. Flashing Flanges: Install flashing flange and clamping device with each stack, cleanout, and drain passing through waterproof membranes.

D. Install trap primers with piping pitched towards drain trap with a minimum of 1/8 inch per foot (1 percent). Adjust trap primer for proper flow.

3.7 VALVE INSTALLATIONS:

A. Install valves in accessible locations and protected from physical damage. Tag valves with a metal tag attached with a metal chain indicating the piping systems controlled by valve.

3.8 CONNECTIONS:

A. Sanitary Sewer, Waste and Vent Piping Runouts to Fixtures: Provide piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but in no case smaller than that required by the plumbing code.

B. Water Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than that required by plumbing code.

C. Mechanical Equipment Connections: Connect cold water piping systems to mechanical equipment as indicated. Provide shutoff valve and union for each connection. Provide drain valve on drain connection. For connections 2-1/2 inches and larger, use flanges instead of unions.

3.9 PIPE HANGERS AND SUPPORTS:

A. Installation shall comply with the currently accepted edition of the C.P.C.

B. Piping shall be firmly held in place by hangers, supports and pipe rests, located adjacent to fitting at each offset or change of direction, at the ends of branches over 5' long, at base of riser pipes and along piping where necessary to prevent sags, bends or vibration.

C. All hangers and supports shall be of design which will support weight of pipe, fluid and insulation and prevent sagging.

D. Pipe clamps shall be heavy gauge iron, factory fabricated to fit against supporting surface when installed. Makeshift devices will not be acceptable. Plumbing tape or wire are not permitted.

E. Equipment or fixtures shall not bear the support of piping.

F. Provide isolation at all hangers and supports for water piping. Hanger shall be sized for installation of isolator.

G. All insulated piping shall have hangers or supports sized for insulation.

H. Seismically brace all piping and equipment as specified in Section 15050.

I. Hangers supported by concrete structure shall be attached by cast-iron manufactured concrete inserts installed at the time concrete is poured. Each insert shall be provided with through rods lapped over structural reinforcing.

J. Hangers supported by structural steel shapes shall be attached by cast-iron clamps designed for use on the specific steel shape and equipped with retainers.

K. All hangers shall be attached to hanger rod by means of adjustable swivel, turnbuckle or double nut arrangement to allow height adjustment.

L. Vertical piping shall be suitably supported from the building structure where required by means of malleable iron or steel pipe clamps of ample size, either bolted or welded to the pipe and supported at the floor slab. Supports shall also act as anchors to allow for expansion and contraction of the piping. Provide rubber isolators for clamps where required for elimination of vibration and sound transmission to the structure. Vertical "no-hub" components shall be secured at each joint and at each floor.

M. Miscellaneous Supports: Floor and wall brackets, etc., shall be provided where required in accordance with the best standard practice of the trade. Provide structural members between joists or beams to support piping where floor or roof deck cannot support piping. Structural member size and attachment shall be calculated by a structural engineer. In the event additional structural steel is required to transmit loads to main structure, same shall be provided at no additional cost to the Owner.

N. Place a hanger within one foot of each horizontal elbow.

O. Horizontal Cast-Iron Piping:

1. Supports shall maintain alignment and prevent sagging and shall be placed within eighteen (18) inches of the hub or joint. "No-Hub" or "Compression" gasket joints shall be supported at least at every other joint. When the developed length between supports exceeds four (4) feet, they shall be provided at each joint.

2. Supports shall also be provided at each horizontal branch connection. Supports shall be placed on or immediately adjacent to the coupling. Suspended lines shall be braced to

prevent horizontal movement as specified in Section 15000.

3. Support multiple No-Hub fittings with "V" 10 gauge galvanized steel, extending 3-inches beyond the last No-Hub band. Strap to pipe with stainless steel bands at 4'-0" minimum intervals and support to structure as scheduled for standard length pipe.

4. Hanger rod sizes shall be as follows:

Pipe Size	Rod Diameter
1-1/2 inch to 2 inch Pipe	3/8 inch
2-1/2 inch to 3 inch Pipe	1/2 inch
4 inch to 5 inch Pipe	5/8 inch

5. Trap arms and similar branches shall be firmly secured against movement in any direction. Closet bends shall be stabilized by firmly clamping and blocking. Where vertical closet stubs are used, they shall be completely stabilized against all horizontal movement.

P. Horizontal Copper Tubing:

1. Hanger spacing shall be as follows:

Pipe Size	Copper	Steel
1/2 inch	5 feet-0 inch	6 feet-0 inch
3/4 inch	5 feet-0 inch	8 feet-0 inch
1 inch	6 feet-0 inch	8 feet-0 inch
1-1/4 inch	7 feet-0 inch	10 feet-0 inch
1-1/2 inch - 2 inch	8 feet-0 inch	10 feet-0 inch
2-1/2 inch & larger	10 feet-0 inch	10 feet-0 inch

2. Rod diameters shall be as follows:

Pipe Size	Rod Diameter
3/4 inch to 2 inch	3/8 inch

Q. Vertical Piping:

1. Hanger spacing shall be:

Material	Maximum Spacing
Copper, Steel,	At Each Floor and as listed
Cast-iron	Same as for horizontal piping.

3.10 FIXTURE INSTALLATION:

A. All plumbing fixtures and trim shall be bedded and caulked along joint at walls, counter tops, and other intersecting surfaces with white adhesive caulking.

B. Install plumbing fixtures level and plumb in accordance with the fixture manufacturer's written installation instructions, roughing-in drawings and referenced standards.

C. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gauge. Anchor chair carrier and water closet support to slab. Provide leveling rod, nuts and washers for single water closet carrier back support.

D. Install wall-hanging, back-outlet urinals with gasket seals.

E. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified or to building wall construction where no support is indicated.

F. Fastening of floor-mounted fixtures and special fixtures having holes for securing fixture to wall construction shall be to the reinforcement built into walls.

G. Fasten wall-mounted fittings to reinforcement built into walls.

H. Fasten counter-mounted fittings to reinforcement built into walls.

I. Secure supplies behind wall or within wall pipe space, providing rigid installation.

J. Install quarter turn stop valve in an accessible location in each water supply to each fixture.

K. Install trap on fixture outlet except for fixtures having integral trap.

L. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.

M. Adjust water pressure at electric water coolers, faucets and flushometers having controls to provide proper flow and stream.

N. Replace washers of leaking or dripping faucets and stops.

O. Clean fixtures, fittings and spout and drain strainers with manufacturer's recommended cleaning methods and materials.

P. Fixtures with hangers or supporting arms shall have hangers or arms securely mounted on a 1/4 inch thick x 6 inch wide steel wall plate which shall extend at least one stud beyond the first and last fixture mounting points.

1. Provide backing for each plumbing fixture requiring same at the time roughing-in is done.

2. Wall plates shall be recessed flush with studs and shall be securely attached to each stud crossed.

3. In steel stud construction, a 1-1/2 inch x 18 inch long furring channel shall be attached to each notched stud with fillet welds which are 1 inch long on 6 inch centers front and back. Plates shall be continuous fillet welded at both top and bottom to each furring channel.

4. In wood frame construction, the wall plate shall be anchored to each stud with two (2) 3/8" x 3" long Lag screws.

5. Concealed arm assemblies shall be attached to plates by four 3/8 inch x 1-1/4 inch steel bolts and nuts.

6. Hangers and exposed arms shall be attached to plates by 5/16 inch minimum full thread steel studs and jamb nuts.

7. Plates shall be drilled and tapped at the time of fixture installation.

Q. Where drains are specified with clamping collars, the water proofing membrane and flashing shall be carefully cut to fit the drain, then anchored between drain and collar with rustproof bolts.

R. Traps above floor shall be cast brass "P" traps with bronze nuts, unless otherwise indicated.

S. Instructions for Installation of Accessible Fixtures: All Accessible fixtures shall be in compliance with current applicable codes.

1. Water Closets: Installed height shall be a minimum of 17 inches and a maximum of 19 inches measured to the top of the toilet seat. Flush controls shall be operable by an oscillating handle with a maximum operating force of 5 pounds. The handle shall be located so it is operable without requiring excessive body movement.

2. Urinals: The elongated rim on urinals shall project a minimum of 14 inches from the wall and the height of the rim shall be at a maximum of 17 inches above the floor. Hand operated controls shall be mounted no more than 48 inches above the floor.

3. Lavatories: Lavatories shall be mounted with a clearance of at least 29 inches from the floor to the bottom of the apron with knee clearance under the front lip extending a minimum of 30 inches in width with 8 inches minimum depth at the top. Toe clearance shall be the same width and a minimum of 17 inches deep from the front of the lavatory. Hot water and drain pipes under lavatories shall be insulated. There shall be no sharp or abrasive surfaces under lavatories. Lever-operated faucet controls shall be operable with one hand and shall not require tight grasping, pinching or twisting of the wrist. The force required to activate controls shall be no greater than 5 pounds. Self-closing valves are allowed if the faucet remains open for at least 10 seconds.

4. Drinking Fountains: The drinking fountain shall be a minimum of 18 inches in depth and shall provide clear and unobstructed space not less than 27 inches in height and 8 inches in depth, the depth measurements being taken from the front edge of the fountain. The bubbler shall be activated by a hand-operated lever type control located within 6 inches of the front of the fountain. The bubbler outlet orifice shall be located within 6 inches of the front of the drinking fountain and shall be within 36 inches of the floor. The water stream from the bubbler shall be substantially parallel to the front edge of the drinking fountain.

3.11 PROTECTION:

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by the Owner.

3.12 INSTALLATION OF FLOOR DRAINS AND STRAINERS:

A. Provide floor drain strainers to match existing drains and install in accordance with manufacturer's written instructions and in locations indicated.

B. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

3.13 REQUIREMENTS FOR FINAL INSPECTION:

A. The following items shall be completed prior to final inspections:

B. Thoroughly clean all parts of the piping, valves and fixtures. Exposed parts which are to be painted shall be thoroughly cleaned of cement, plaster, oil and grease spots. Such surfaces shall be carefully wiped and all cracks and corners scraped out.

C. Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots and shall be left smooth and clean. Trap elements shall be removed during cleaning and flushing period, after which they shall be replaced and adjusted.

D. Electrical device covers shall not be installed until finish coat of paint is completed. Device handles and receptacles shall be covered and/or protected during the painting operation to preserve the original factory bright new finish.

E. All potable water lines shall be sterilized with chlorine. The chlorine residual concentration shall indicate not less than 50 parts per million and shall be retained for a period of not less than twenty-four (24) hours. Repeat procedure if residual concentration has decreased below 25 PPM. After test is in compliance with specification, flush system until residual is not more than 0.5 PPM. All work and certification of performance must be done by qualified personnel. Submit certification to Architect.

NOTE: Install Tee's and ball valves at locations required to facilitate sterilization.

3.14 TESTS AND ADJUSTMENTS:

A. No piping work, fixtures, or equipment shall be concealed or covered until inspected by the Architect/Owner's Representative, who shall be notified when the work is leak-tight and ready for inspection. All work shall be completely installed and tested as required by local code, this section and the State Ordinances and State Safety Orders. All tests shall be repeated as required by those making the inspection.

B. All domestic water piping, shall be flushed out, tested at 150 psi and shall be left under pressure of supply main or a minimum of 50 psi for the balance of the construction period. No air testing is allowed. Tests are to be applied for a minimum period of one hour and until tests are complete. Final pressures at the end of test period shall be not more nor less than that caused by expansion or contraction of the test medium due to temperature changes.

C. Soil, waste, vent, condensate and storm drain piping within the building shall be tested with a minimum of 10 foot head at each joint for a minimum of three hours with no loss in head.

D. Plumbing fixtures shall be filled with water and checked for leaks and retarded drainage flow. Faucet aerators and shower heads shall be removed and cleaned thoroughly.

3.15 GUARANTEE:

A. All work under this section shall be guaranteed in writing in accordance with the "Mechanical General Requirements," Section 15000.

B. All material, except as otherwise noted, shall be new, free from defect and of the quality and rating shown or specified.

3.16 OPERATING INSTRUCTION AND SERVICE MANUAL:

A. The Contractor shall carefully prepare an operating instruction and service manual for the entire system including all equipment, excepting Owner-furnished equipment. The manual shall be submitted for review to the Architect at least thirty (30) days prior to completion of the work. Failure to submit manual will delay final inspection and acceptance of the work. Contents shall be bound in a durable loose-leaf binder, complete with index.

B. The following items shall be included in the manual. This list may not be complete and is to be used as a guide:

1. Part numbers of all replaceable items.

2. Manufacturer's cuts and rating tables, including brochures on all fixtures, equipment and materials installed.

3. Test data on all equipment.

4. Serial numbers of all principal pieces of equipment.

5. Manufacturers', suppliers' and subcontractors' names, addresses and phone numbers.

6. Written guarantee.

7. Prints of complete as-built drawings, signed by the Contractor.

8. Reviewed submittal data and shop drawings in binder.

9. Test and balance data, copies of building inspections check lists signed off by the Inspector.

10. Potable water piping sterilization certificate.

11. Letter of Certification required of the following:

    a. All sensor operated lavatory faucets have been adjusted to operate for a minimum of 10-seconds.

    b. All water heaters have been set to the temperature listed on the drawings.

C. After review of the manual by the Engineer, two copies of each manual shall be furnished for distribution.

END OF SECTION

SECTION 16010

ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical general requirements. These requirements shall apply to all Division 16 Sections of this Specification.

B. Demolition, dismantling, cutting and alterations of the existing electrical systems as indicated and/or required for demolition of existing electrical systems.

C. Maintenance of electrical services.

D. Removal of debris and demolished equipment.

E. Removal of specific electrical items as indicated on the Drawings.

F. Phasing of construction.

1.2 RELATED SECTIONS

A. Division 01: GENERAL REQUIREMENTS

B. Division 02: SITEWORK

C. Division 03: CONCRETE

D. Division 15: PLUMBING

E. Division 16: ELECTRICAL

1.3 REFERENCES

A. California Building Code (CBC)

B. California Electric Code (CEC)

C. National Electrical Contractors Association (NECA)

D. Occupational Safety and Health Administration (OSHA)

E. California Administrative Code Title 24

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

1.4 SUBMITTALS

A. Refer to Division 01 for procedures for shop drawings and 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.

1.5 QUALIFICATIONS

A. Refer to each individual Section of Division 16 Specifications for specific qualifications required for manufacturers and installers for each specific electrical system and component.

1.6 PROJECT CONDITIONS

A. Division 01: 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.*

1.7 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 conduits. It shall be the responsibility of the Contractor to install the conduits with minimum number of bends to avoid obstructions, keep openings and passageways clear, and meet all applicable code requirements.

3. The routing of conduits may be changed, if approved by the Owner's Electrical Inspector, 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 electrical elements be located symmetrically 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 Owner's Representative before submitting bid.

A. 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, Civil, or Landscape Document, the Contractor shall bid the more expensive or elaborate material, process or procedure and shall call the discrepancy to the Owner's Representative's 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, bell, fire alarm, annunciator, sound, public address, public telephone, television, security 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 "install" used on the Drawings and elsewhere in the Specifications shall be considered to mean "furnish and install".

6. The term "UL" means Underwriters Laboratories Inc.

7. The term "SCE" means Southern California Edison.

1.8 WORK INCLUDES

A. Distribution panelboards complete.

B. New lighting fixtures, installed complete lamps, LED drivers, mounting hardware and all accessories.

C. New lighting controls (manual and/or automatic) as indicated on the Drawings and as Specified.

D. The complete connecting of all electrical equipment and devices, including equipment and/or devices furnished under other Sections of the Specifications.

E. Electrical work described in other Sections. Examine all other Sections for work related to those other sections and required to be included as work under this section.

F. Demolition of certain existing electrical components as indicated on the Drawings, and as required.

G. General provisions and requirements for electrical work.

1.9 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. **The latest Electrical Ordinance of the City of Santa Paula, including amendments thereto, effective on the date of opening bids for the work, is hereby made a part of this Specification, and shall apply to all work.**

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 Owner at once and cease work on all parts of the Contract that 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. Record (As-Built) Drawings shall be completed and delivered to the Owner’s Representative prior to or at the time of final inspection. Record Drawings shall comply with the requirements of Division 01 of the Specifications.

B. 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 pullboxes and ‘stub-outs’ indicated for future extension shall be completely dimensioned on Record Drawings.

C. The Record Drawings shall be complete, legible, and prepared as described in Division 01 of the Specifications. Record Drawings not satisfactorily prepared will be returned to the Contractor.

1.12 GUARANTEE

A. Division 01: GENERAL REQUIREMENTS

B. Refer to Division 01 for procedures and requirements regarding Guarantees and Warranties.

1.13 ELECTRICALLY OPERATED EQUIPMENT

A. Equipment 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 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.

1.14 PHASING OF WORK

A. The project may be constructed in multiple phases as described elsewhere in the Contract Documents. Contractor shall include all phasing costs in his/her bid.

B. Contractor shall furnish and install all temporary and/or interim connections as indicated and/or required for proper operation of all systems during all phases of construction.

C. Refer to Drawings and Division 01 for additional phasing information and requirements.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

A. Products for Division 16 shall be new and suited to the intended use.

B. Specified products shall establish quality of products and substitute products shall be equal or exceed the quality of products specified. Refer to Division 01 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 Owner’s Representative and/or Engineer, to be not in accordance with the Specifications either before or after installation will be rejected. If after installation, the Contractor shall replace rejected items 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 01 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.

2.2 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.

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 electrical items of work shall be protected from graffiti during construction period. Contractor shall remove all unauthorized markings prior to acceptance of work by the Owner.

G. All damaged material or equipment shall be replaced or refinished by the contractor at no expense to the Owner.

2.3 SUBMITTALS

A. Material Lists and Shop Drawings shall comply with the requirements of Division 01. All submittals shall be submitted with a minimum of eight (8) copies (or more if required by Division 01).

B. A complete list of all proposed materials and equipment specified in Division 16 and the Electrical Drawings shall be submitted after the Contract is awarded. The list 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 each meter/main, meter pedestal, lighting and power panelboard, terminal cabinet, special relay or control cabinet and other equipment with special requirements.

E. 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.

F. Product samples shall be furnished where required.

2.4 SUBSTITUTIONS

A. Where Shop Drawings are being submitted for products that are being substituted for specific products, refer to Division 01 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 01.

D. Only "standard products" of manufacturer shall be offered as substitutions for specified "standard products".

2.5 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 Owner's Representative, 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 Owner's Representative without change in contract price.

PART 3 - EXECUTION

3.1 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.

3.2 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, civil and landscape 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 piping, conduit and pull boxes.

C. Install all conduit and equipment in such a manner as to avoid all obstructions, keeping openings and passageways clear.

D. All conduit shall be installed to clear new and proposed street utilities and equipment. Locate pull boxes in accessible locations. Pull boxes shall not be located in traffic areas or curb ramps.

E. 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.

F. Furnish and install additional pull boxes, fittings or offsets as required to clear obstructions or to simplify the pulling in of wires or cables.

G. 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, Civil and Landscape Drawings and with all Shop Drawings, including Shop Drawings of other trades. Architectural elevations and plans shall generally take precedence. However, in the event of large variations

between Architectural, Civil or Landscape Drawings and Electrical Drawings, the Owner's Representative shall be consulted for instructions.

H. In the event changes in the indicated locations or arrangements are necessary due to developed conditions in the construction or rearrangement of 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.

3.3 EXCAVATION

A. All excavating, trench work and backfilling required for the installation of the work shall be performed in accordance Specification Division 02: Sitework, and as detailed on the Drawings.

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.

3.4 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 03 of the Specifications and/or Drawings.

3.5 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.

3.6 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.

3.7 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 meter pedestal, 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 workers and shall leave the premises and all parts of the site free from his/her debris.

F. All electrical items of work shall be protected from graffiti during construction period. Contractor shall remove all unauthorized markings prior to acceptance of work by the Owner.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic electrical materials and methods

B. Outlet boxes

C. Fittings

D. Pullboxes

E. Color coding

F. Wiring devices (receptacles, switches, etc.) and plates

G. Nameplates

H. Relays and contactors

I. Keys and locks

1.2 RELATED SECTIONS

F. Division 01: GENERAL REQUIREMENTS

G. Division 02: SITEWORK

H. Division 03: CONCRETE

I. Division 26: ELECTRICAL

1.3 REFERENCES

A. California Building Code (CBC)

B. California Electric Code (CEC)

C. National Fire Protection Association (NFPA) Standards

D. National Electrical Contractors Association (NECA)

E. American National Standards Institute (ANSI)

F. Institute of Electrical and Electronics Engineers (IEEE)

G. National Electric Manufacturer's Association (NEMA)

H. City, State and other local codes and requirements as applicable

1.4 SUBMITTALS

A. Refer to Division 01 for procedures for shop drawings and submittals.

B. A complete, detailed Material List shall be submitted to the Owner's Representative as specified in Section 16010, and as required by Division 01.

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.

1.5 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. Electrical work described in other Sections. 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

1.6 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

2.1 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 or junction boxes shall be of the following type:

1. In all exterior exposed work, 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.

2. Outlet boxes installed in exposed, surface mounted locations shall be cast type boxes with integral threaded hubs – Type “FS” series or “FD” series as required for the number of conductors, etc.

3. Outlet boxes flush mounted in ‘cast-in-place’ masonry shall be approved for the installation and shall be of the type specifically designed for the application.

C. Outlet boxes shall be accurately placed, independently and securely fastened to the mounting surface, independent of the conduit. Recessed boxes shall be set flush with finished surface.

D. All outlet boxes shall be accurately placed and securely fastened to the supporting structure independent of the conduit.

E. Close unused openings in cast boxes with threaded plugs.

F. Locate outlets required for feeds to equipment in accordance with the requirements of the equipment and with Drawings furnished by the equipment supplier.

G. Equip outlet boxes used as junction boxes with blank device plates.

H. 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.

2.2 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.

2.3 GRADE MOUNTED PULLBOXES (HANDHOLES)

A. Provide precast, reinforced concrete, grade mounted pullboxes (handholes) as indicated on the Drawings to facilitate the pulling of wire and cable. Pull boxes, in addition to those indicated, shall only be used where absolutely necessary with the specific approval of the Owner's Representative in each case.

B. Pullboxes shall be “#2” size boxes - 12” x 22” (nominal size) and shall be manufactured by Brooks Products or equal.

C. Pullboxes shall have a cast-iron, bolt-down cover with lifting slots and recessed hold down, tamper proof nuts. Covers shall be marked with specific text as described on the Drawings. In absence of any specific text indicated on the drawings, covers shall marked as directed by the Owner’s Representative.

D. Pullboxes shall be installed flush with the finished grade (or paving) as indicated on the Drawings. Where installed in concrete paving, the pullbox shall be spaced a minimum distance from the edge of the paving to minimize cracking and failure of the paving. Refer to details on the Drawings.

E. Every conduit run entering a pullbox shall be bonded together inside the box, using a ground bushing on each conduit and looping a #6 copper ground wire between bushings.

2.4 PULLBOXES

A. Provide sheet metal pullboxes 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 Owner's Electrical Inspector in each case.

B. The pullboxes shown are the major boxes required due to obvious conditions. Additional pullboxes 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. Weatherproof pull and junction boxes shall conform to the following: 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. Boxes shall be constructed of heavy gauge galvanized steel and finished with a prime coat and a coat of baked-on gray enamel. Pullboxes shall be manufactured by Hoffman, Circle A-W, Wiegmann, or equal.

D. All junction and pull boxes shall be rigidly fastened to the supporting structure and shall not depend on the conduits for support.

E. Pullboxes shall be installed wherever required so that no power feeder conduit has more than three (3) 90 degree bends or the equivalent.

F. Every conduit run entering a pullbox shall be bonded together inside the box, using a ground bushing on each conduit and looping a #6 copper ground wire between bushings.

2.5 COLOR CODING

A. Color code power wire and cable for feeders and branch circuits as follows. Refer also to Section 26 05 19.

Phase	120/240-V	120/208 VOLT	277/480 VOLT
A	Black	Black	Brown
B	Red	Red	Orange
C	N/A	Blue	Yellow
Neutral	White	White	White
Ground	Green	Green	Green

B. Signal systems, control conductors, etc. 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's Representative. Refer to Section 26 05 33 for additional information.

2.6 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 Owner's Representative, 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 that 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).

   c. Receptacles shall be installed with the "U" grounding contact at the top. Where receptacles are 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).

4. In exposed locations, weatherproof convenience outlets shall be duplex ground fault circuit interrupting (GFCI) type as hereinbefore specified, installed in cast, weatherproof outlet box with Taymac Cat. #MX series ‘weatherproof while-in-use’ type cover or approved equal.

2.7 LOCAL SWITCHES

A. Circuit switches shall be color as directed by Owner's Representative, 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
2.	Double Pole Switches	Toggle Type	Lock Type
	Hubbell	#1222-I	#1222-L
3.	Three Way Switches	Toggle Type	Lock Type
	Hubbell	#1223-I	#1223-L

2.8 COLORS - DEVICES

A. All devices shall be of colors as selected by the Owner's Representative from the manufacturer's standard colors. Different colors may be selected for different areas. Contractor shall coordinate color selection with Owner's Representative.

2.9 NAMEPLATES

A. Provide black-on-white laminated plastic engraved nameplates for each service pedestal, panel, control center, time switch and relay to correspond with designations on the drawings. Nameplates shall be secured with screws, bolts or rivets. Other means of attachment shall not be accepted. "DYMO" type labels will not be accepted.

B. Nameplates shall be black on white laminated 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.

2.10 RELAYS AND CONTACTORS

A. The contractor shall furnish and install all relays and contactors as indicated or required.

B. All relays and contactors installed in panelboards, meter pedestals 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 made up on terminal strips and shall be neatly formed and laced.

2.11 KEY AND LOCKS

A. The Contractor shall provide two keys with each door lock furnished, including cabinet door locks, panelboard locks, pedestal locks, etc. Deliver keys to the Owner's Representative.

PART 3 - EXECUTION

3.1 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 wherever encountered. It shall be the Contractor's responsibility to verify and coordinate the location of all outlets and lighting fixtures with the Architectural drawings. Architectural plans shall generally take precedence. However, in the event of large variations between Architectural drawings and electrical drawings, the Owner's Representative shall be consulted for instruction.

B. In the event changes in the indicated locations or arrangements are necessary due to developed conditions in the construction, 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.

3.2 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. 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.

F. 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.

3.3 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 each 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/terminal block secured to the interior of the enclosure. The bus/terminal block 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.

3.4 LOCATIONS

A. Contractor shall verify exact locations of all outlets prior to installation.

B. Heights: Heights of all outlets shall be verified with Architect. Refer to elevations on Architectural and Landscape Drawings for heights of walls, benches, etc.

3.5 BOXES - INSTALLATION AND SUPPORT

A. Outlet boxes shall be accurately placed, independently and securely fastened to the mounting surface, independent of the conduit. Outlet boxes shall be supported by conduit stub-up as detailed on the drawings.

3.6 GRADE MOUNTED PULLBOXES - INSTALLATION AND SUPPORT

A. Excavation: Prepare the excavation approximately 6" deeper than the overall height of the enclosure. The length and width of the excavation should be determined by adding 4" to 6" to the overall length and width of the pull box.

B. Installation: Place approximately 3” to 6" of compacted gravel under the box. Gravel is the recommended material because of its drainage characteristics. The compacted gravel should be leveled so the top of the pull box cover is flush to grade.

C. Backfilling: Place backfill material into the excavation at 12" lifts and compact by mechanical compacting to achieve the desired relative compaction. The backfill should be discontinued at a distance below grade to allow installation of the paving material. Coordinate with paving contractor as required. Install pullbox with the cover in place.

3.7 TESTING

A. The Contractor shall furnish all necessary labor, instruments and equipment required for making tests and shall test 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

1.1 SECTION INCLUDES

A. Conduit materials

B. Rigid steel conduit and fittings

C. Liquidtight flexible metal conduit

D. Nonmetallic Conduit

E. Fittings

1.2 RELATED SECTIONS

J. Division 01 GENERAL REQUIREMENTS

K. Division 02: SITEWORK

L. Division 03: CONCRETE

M. Division 26: ELECTRICAL

1.3 REFERENCES

A. California Building Code (CBC)

B. California Electric Code (CEC)

C. National Fire Protection Association (NFPA) Standards

D. National Electrical Contractors Association (NECA)

E. American National Standards Institute (ANSI)

F. National Electric Manufacturer's Association (NEMA)

G. City, State and other local codes and requirements as applicable

1.4 SUBMITTALS

A. Refer to Division 01 for procedures for shop drawings and 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.

1.5 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.

1.6 CONDUITS GENERAL

A. All wiring of every description shall be installed in conduit (or other type 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. Poly-vinyl-chloride (PVC), or liquidtight 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.

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.

H. Wire Lubricant: Wire-pulling compounds used as lubricants in installing conductors in raceways shall be only Ideal Yellow #77 wire pulling compound or other lubricant recommended by cable manufacturer and listed by UL. No oil, grease, graphite, or similar damaging type of pulling compound may be used.

I. Minimum Size: All 'above grade' conduit shall be minimum size of 1". All underground conduits shall be a minimum size of 1". These minimum sizes shall apply to all conduit unless specifically indicated otherwise.

1.7 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. Refer to Specification Section 260519 for pull line specification.

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. Empty conduit stubs shall be capped to prevent debris and contaminants from entering.

PART 2 - PRODUCTS

2.1 CONDUIT MATERIALS

A. Metallic conduit shall be manufactured under the supervision of UL, Factory Inspection and Label Service Program. Each 10 foot length of conduit shall bear the UL label and manufacturer's name.

2.2 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.

D. 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.

2.3 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.

2.4 NONMETALLIC CONDUIT

A. Nonmetallic conduit shall be rigid PVC electrical conduit extruded to Schedule 40 dimension Type II, Grade 1, high impact, polyvinyl chloride. Conduit, 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, offsets, and all other non-straight lengths shall be 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.

2.5 FITTINGS

A. Furnish and install Appleton or Crouse-Hinds fittings, special devices and materials that 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. Special fittings, such as ground fittings, shall be furnished as noted or required.

2.6 CONDUIT BUSHINGS

A. 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.

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.

PART 3 - EXECUTION

3.1 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.

3.2 RIGID STEEL CONDUIT

A. Rigid steel standard weight conduit shall be exclusively used for all runs underground, or exposed to the weather.

B. Bushings for all sizes of rigid steel conduit shall be threaded insulating type. Set screw bushings are not acceptable.

C. Where conduit is placed in contact with dissimilar metals or with concrete, separate contact surfaces by means of a gasket, nonabsorptive tape or approved bitumastic coating to prevent corrosion.

D. 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.

3.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Flexible metal conduit shall be used only for making motor connections, and as specifically noted on the Drawings.

B. All flexible conduits shall be cut square and not at an angle.

3.4 NONMETALLIC 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.

3.5 INSTALLATION OF CONDUIT

A. All conduit shall be run concealed, except in certain approved and indicated locations. All conduit, outlet boxes, junction boxes and pull boxes, etc., shall be installed so as not to interfere with any piping, fixtures or equipment.

B. Conduits exposed to view shall be installed parallel or at right angles to mounting surface. 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 two hole pipe straps.

C. 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.

D. 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 and communications cable shall have not more than three 90 degree bends, or the equivalent, without specific permission.

E. 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. 1-1/2” 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.

F. 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.

G. Provide approved conduit unions where union joints are necessary.

H. The open ends of conduits shall be delivered with, and kept closed with, approved conduit seals during construction and during the installation of underground systems.

I. 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.

J. Conduit shall not obstruct any removable panel, access door, or control devices. It shall not interfere with any maintenance or replacement procedure required by the equipment.

K. 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 been placed and set and forms have been removed.

L. 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.

M. All PVC coated conduit, with damage to the PVC coating, such as wrench marks, shall be repaired or replaced according to the recommendations of the manufacturer.

N. 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 structure and without unnecessary offsets or bends. Conduit work installed that does not conform to acceptable workmanship standards in the opinion of the Owner's Representative, shall be removed and replaced without cost to the Owner.

O. 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 two inches. All conduit runs in concrete slabs shall be securely tied to the reinforcing steel. All said conduit runs shall be reflected on the Record Drawings to $\pm$1" dimensional tolerance.

P. Conduit bushings shall be installed on the end of every conduit run in outlet boxes, panelboards, terminals or switchboards.

Q. 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.

R. Conduit stubbing up into bottom of cabinets or equipment shall be lined up, properly spaced, and shall be straight and plumb. Conduits shall be installed at a sufficient depth below grade to eliminate any part of the bend above grade.

S. All conduit stub-ups through a concrete slab or mounting base shall be wrapped with tape (or approved bitumastic coating) from a point 2" below the top of slab, to at least 3" above slab. Tape (or coating) shall be removed after slab had been cured.

T. The routing of conduits may be changed if approved by the Owner's Electrical Inspector, providing the length of any conduit run is not increased or decreased more than 10% of the length shown on the Drawings.

3.6 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 Representative shall be called to the site for approval of all underground installations before and during concrete pour. 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 watertight 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. Where a concrete encasement for underground conduit abuts a foundation wall or underground structure that 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.

3.7 SUPPORT OF CONDUIT AND OUTLETS

A. Outlet boxes shall be accurately placed, independently and securely fastened to the structure.

B. Exposed conduit one inch and smaller shall be supported with T&B, or equal, two hole pipe straps spaced at a maximum of 5 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.

C. Support shall be by expansion shields or inserts in masonry or concrete. Perforated strap iron shall not be used.

D. 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" and will be strictly enforced. 1" and smaller conduits installed exposed shall be fastened with two-hole malleable iron straps. Perforated strap and plumber's tape shall not be used in the support of conduits.

3.8 CONDUIT INSPECTION REQUIREMENTS

A. The underground conduit system (if any) will be inspected by the Owner's Representative prior to encasement and backfilling. Any items noted for correction shall be corrected at his time. This approval must be obtained by the Contractor prior to encasement and backfilling.

3.9 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 16120

CONDUCTORS (600 VOLT)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wire and cable

B. Lighting control system conductors

C. Pull lines

D. Lugs

E. Wire joints and taping

F. Tagging

G. Testing of conductors and wiring

1.2 RELATED SECTIONS

A. Division 01: GENERAL REQUIREMENTS

B. Division 26: ELECTRICAL

1.3 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

1.4 SUBMITTALS

A. Refer to Division 01 for procedures for shop drawings and submittals.

B. Product Data: Furnish complete product data for all conductors, connectors, etc. furnished under this Section of the Specification.

1.5 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 as 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.

1.6 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.

Phase	120/240-V	120/208 VOLT	277/480 VOLT
A	Black	Black	Brown
B	Red	Red	Orange
C	N/A	Blue	Yellow
Neutral	White	White	White
Ground	Green	Green	Green

PART 2 - PRODUCTS

2.1 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.

2.2 MINIMUM SIZE

A. The minimum wire size shall be #12 AWG for all power and lighting systems unless specifically noted on drawings or in other sections of this specification.

B. The minimum wire size for the Class II control circuits shall be #14 AWG, unless otherwise indicated on the drawings, or in other sections of this Specification.

2.3 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 "XHHW" or "THWN", 600-volt insulation unless noted otherwise.

C. Conductor type selected by Contractor shall be compatible with all connectors, splices and terminations provided/installed by the Contractor.

D. Type "XHHW" shall be used exclusively in areas of direct solar exposure.

2.4 SIGNAL AND CONTROL SYSTEM CONDUCTORS

A. Furnish and install the conductors for the various systems such as lighting controls, etc., per the requirements of each of the applicable Sections.

2.5 PULL LINES

A. A pull line shall be furnished and installed in every empty conduit installed for future conductors or for future use.

B. Pull lines shall be Ideal Cat. No. 31-343 POWER-FISH, with a minimum tensile strength of 210 lbs.

PART 3 - EXECUTION

3.1 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 meter pedestal, 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.

C. 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 Ideal Yellow #77 wire pulling compound, or equal approved by the conductor manufacturer.

D. 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.

E. All control wiring shall be color-coded and color continuity shall be maintained throughout the system.

F. Branch circuit wiring color code shall be maintained throughout the systems.

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.

3.2 LUGS

A. Furnish and install proper lugs in all panelboards, ground bars, pedestals, 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.

3.3 WIRE JOINTS AND SPLICES

A. In above grade (dry) locations:

1. Joints in 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.

2. All joints and splices 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. All connections and splices shall be electrically and mechanically perfect, and in strict accordance with all code requirements.

3. Bolt type solderless connectors shall be tightened and then re-tightened after 24 to 48 hours and before taping. Owner's Inspector shall be informed of this procedure during the waiting period and shall witness the act of re-tightening.

B. In grade mounted handhole locations and other wet/submersible locations:

1. Joints and splices in all conductors shall be listed as suitable for wet locations as required by NEC/CEC Article 314, paragraph 314.30(C).

2. All connectors and splices shall be listed under “UL 486D Sealed Wire Connector Systems” or equivalent.

3. Joints and splices in all conductors shall comply with the requirements of NEC/CEC Article 110.14.

C. 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.

3.4 TAGGING

A. All branch circuits shall be left tagged in the panelboards and in all junction boxes where unused circuits terminate for the purpose of identifying the various circuits.

B. Feeders and mains shall be tagged in the panelboards. 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.

3.5 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.

B. The Contractor shall include in his bid, the services an approved independent testing laboratory to test the insulation resistance of all feeders and branch circuit conductors.

C. The tests to be performed are as follows:

1. With a megger insulation tester, use the time-resistance method (Sometimes referred to as absorption test) to test each feeder and branch circuit conductor. Tests must be conducted with wire disconnected at each end in order to test the wire itself. A second test must be conducted with the wire connected at each end and the circuit breakers or switches in the closed positions.

2. Tests shall be performed in presence of the Owner's Inspector.

3. Three copies of the test results shall be submitted to the Owner's Inspector. Test results shall be submitted on an official form from the independent testing laboratory showing project location, test engineer, test conditions, test equipment data, and final test results.

END OF SECTION

SECTION 16400

ELECTRICAL SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Externally operated switches

B. Fuses

C. Test and inspection

1.02 RELATED SECTIONS

A. Division 1: GENERAL REQUIREMENTS

B. Division 3: CONCRETE

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. National Electrical Contractors Association (NECA)

E. American National Standards Institute (ANSI)

F. Institute of Electrical and Electronics Engineers (IEEE)

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. Shop Drawings: Furnish shop drawings for equipment, switchboards, pedestals, switches, etc. furnished under this section of specifications.

1. Contractor shall submit a minimum of six (6) copies of detailed, dimensioned shop drawings to the Architect for checking and review.

C. Submit written report for testing of all circuit breakers and switches as described in this section. Six (6) copies of the report shall be submitted for review at completion of the testing.

1.05 EXISTING ERVICE VOLTAGE

A. The existing service to the site is from SCE (Southern California Edison Company).

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.

1.07 WORK INCLUDED

A. The work of this section shall include all services, labor, materials, transportation, equipment, plant and facilities to furnish and install the service and distribution, equipment, and accessory items indicated on the Drawings and specified herein.

B. 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. New Externally Operated Switches.

4. Comply with requirements California Administrative Code Title 24, National Electrical Code and all other codes referenced herein:

PART 2 - PRODUCTS

2.01 SECONDARY SERVICE CONDUITS

A. The secondary service conduits are existing.

2.02 MAIN SWITCHBOARD

A. The main switchboard is existing to remain.

2.03 EXTERNALLY OPERATED SWITCHES

A. Disconnect switches shall be Square "D", Eaton or General Electric externally operated, quick-make, quick-break, 250 volt rating for 240 circuits, fused or non-fused, single throw, two pole, knife switches. All disconnect switches shall be heavy-duty type. General duty switches are not acceptable.

B. All fused disconnect switches shall have cover interlocked so the cover cannot be opened if the switch is in the "ON" position.

C. Weatherproof disconnect switches shall have a NEMA Type 3R rain-tight enclosure.

D. All disconnect switches shall have provisions for padlocking in both the “ON” and “OFF” positions.

2.05 FUSES

A. Provide Bussman Type FRN-R, 250 volt, dual element, rejection type “Fusetrons” Class R of the sizes required for all fused switches on 240-volt circuits.

B. Provide a warning label on the inside cover of each switch concerning the replacement of fuses with the same type, class and ampacity.

PART 3 - EXECUTION

3.01 INSTALLATION IN GENERAL

A. All work shall conform to the latest NECA and NEMA standards for workmanship. All cabinets, conduit, and other equipment shall be installed plumb with building lines in neat vertical manner.

B. Clean all components of dirt, grease and debris prior to final connections. The exterior of all cabinets shall be thoroughly cleaned and all paint scratches shall be repainted.

3.02 TORQUE TIGHTENING OF BOLTED CONNECTIONS

A. Contractor shall be responsible for all torque tightening after switchboards are installed. Torque tighten all bolted connections of bus bars in all new switchboards. All torque settings shall conform to ASA Standards as follows:

Bolt Size	Setting
1/4"	5 ft. lbs.
3/8"	20 ft. lbs.
1/2"	50 ft. lbs.
5/8"	95 ft. lbs.

All bolts shall be Grade 5. All torque tightening shall be performed in the presence of the Owner's Representative.

3.03 TEST AND INSPECTION

A. All circuit breakers or switches, shall be tested and inspected as follows:

1. All new circuit breakers shall be tested and inspected for proper trip operations on long delay, short delay and instantaneous trip. Test current for long delay tripping shall be 300% of rated trip. All circuit breakers shall have Ductor readings made where possible.

2. All new fused and non-fused switches shall be checked for proper operation. Ductor readings shall be made where possible.

3. All bolted connections in new switchboards shall be checked and tightened for proper torque.

B. All testing and inspection shall be performed by qualified personnel of one of the following companies:

1. Emerson Network Power / Electrical Reliability Services (formerly Electro-Test, Inc.)

2. Brar Electrical Systems, Inc.

3. Power Systems Testing Company

C A written report showing test results shall be submitted.

3.04 TESTING - GENERAL

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 equipment is 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 16450

GROUNDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding system requirements

B. Ground rods

C. Yard boxes for ground rods

D. Equipment grounding conductors

E. Testing procedures and requirements

1.02 RELATED SECTIONS

N. Division 01: GENERAL REQUIREMENTS

O. Division 26: ELECTRICAL

1.3 REFERENCES

A. California Building Code (CBC)

B. California Electric Code (CEC)

C. National Fire Protection Association (NFPA) Standards

D. Institute of Electrical and Electronics Engineers (IEEE)

E. City, State and other local codes and requirements as applicable

1.4 SUBMITTALS

A. Refer to Division 01 for procedures for shop drawings and submittals.

B. Product Data: Furnish complete product data for all devices and equipment furnished under this section of the specification.

1.5 SECTION SUMMARY

A. The work of this section shall include all services, labor, materials, transportation, equipment, plant and facilities to complete the electrical grounding 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.

1.6 GROUNDING SYSTEM DESCRIPTION

A. Work Included: Provide and install a complete grounding system as specified, indicated and as required for compliance with all applicable codes.

B. Grounding shall be as approved and required by the State of California, Division of Industrial Safety.

C. A green insulated copper equipment ground wire, sized per table 250-95 of CEC shall be provided with each 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.

D. All grounding electrodes shall be "made electrodes" as specified herein.

E. Electrical continuity to ground metal raceways and enclosures, isolated from the equipment ground by use of non-metallic conduit or fittings, shall be provided by a green insulated grounding conductor of approved size within each raceway connected to the isolated metallic raceways or enclosures at each end. Each flexible conduit shall be provided with a green insulated grounding conductor of approved size.

F. Non-current-carrying metal parts of all power and signal conduit systems, supports, cabinets, enclosures, fixed equipment, and portable equipment, shall be permanently and effectively grounded.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of grounding and bonding products, of types, and ratings required, and ancillary grounding materials, including cable, copper bus, grounding electrodes, and bonding jumpers whose products have been in satisfactory use in similar service for not less than 10 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical grounding work similar to that required for project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction, and CEC as applicable to electrical grounding and bonding, pertaining to systems, circuits and equipment. Grounding shall be in accordance with NFPA and ANSI C2.

2. UL Compliance: Comply with applicable requirements of UL Standards No.'s 467, "Electrical Grounding and Bonding Equipment", and 869 "Electrical Service Equipment", pertaining to grounding and bonding of systems, circuits and equipment. In addition, comply with UL Std. 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors." Provide grounding and bonding products that are UL-listed and labeled for their intended usage.

3. IEEE Compliance: Comply with applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141 and 142 pertaining to grounding and bonding of system, circuits and equipment.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Ship each unit securely packaged and labeled for safe handling and to avoid damage.

B. Store equipment in secure and dry storage facility.

1.9 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering grounding and bonding products which may be incorporated in the work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide grounding and bonding products of one of the following (for each type of product):

1. Adalet-PLM Division; Scott Fetzer Co.

2. Burndy Corporation.

3. Cadweld Division; Erico Products Inc.

4. Crouse-Hinds Division; Cooper Industries.

5. Ideal Industries, Inc.

6. Okonite Company.

7. OZ Gedney Division; General Signal Corp.

8. Thomas and Betts Corp.

PART 2 - PRODUCTS

2.1 GENERAL

A. Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes, exothermic welding (Cadwelding), and additional accessories needed for a complete installation. Where more than one type component product meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products that comply with NEC, UL, and IEEE requirements and with established industry standards for those applications indicated.

2.2 GROUND RODS

A. Made electrodes shall be approved copper clad stainless steel ground rods, minimum of 3/4" in diameter. Rods shall be 10 feet in length.

2.3 YARD BOXES – GROUND RODS

A. Yard boxes shall be pre-cast concrete and shall be approximately 14" wide, 19" long, and 12" deep (outside dimensions), or larger, if necessary to obtain the required clearances. Boxes shall be equipped with bolt down, checkered, cast iron covers and a cast iron frame cast into the box. Yard boxes shall be Brooks 36.

2.4 EQUIPMENT GROUND CONDUCTORS

A. Refer to Section 16120 - Conductors (600 Volt) for equipment ground conductor product specifications.

2.5 TERMINAL LUGS

A. For 4/O AWG and smaller conductors: Copper compression terminal lugs.

B. For 250 KCMIL and larger: Long barrel, copper, double-compression terminal lugs.

2.6 CONNECTORS, TERMINALS AND CLAMPS

A. Connectors, Terminals and Clamps: Provide connectors, terminals, lugs and clamps as recommended by bonding plate, connector, terminal and clamp manufacturers for indicated applications.

2.7 JUMPERS

A. Copper braided or leaf-type flexible jumper, size as necessary.

2.8 ELECTRICAL GROUNDING CONNECTION ACCESSORIES

A. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type service indicated.

2.9 FIELD WELDING

A. Field Welding: Comply with AWS Code for procedures, appearance, and quality of welds; and for methods used in correction welding work. Provide welded connections where grounding conductors connect to underground grounding electrodes and to entire grounding electrode system. Welding to main ground bar shall be by exothermic welding process -- Cadweld by Erico or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which electrical grounding and bonding connections are to be made and notify Architect in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEM

A. General: Install electrical grounding and bonding systems in accordance with applicable portions of CEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products comply with requirements.

B. Coordinate with other electrical work as necessary to interface installation of electrical grounding and bonding system work with other work.

C. Weld grounding conductors to underground grounding electrodes.

D. Ground electrical service system neutral at the service entrance equipment to grounding electrodes.

E. Ground each separately-derived system neutral to:

1. Ground rod.

2. Ground rod(s) shall be installed to comply with SCE requirements. Ground rod(s) shall be located in an approved location.

F. Connect together system neutral, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, plumbing systems, and all other electrodes.

G. Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug, bus or bushing.

H. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, specified in UL 486A to assure permanent and effective grounding.

I. Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible to minimize transient voltage rises.

J. Apply corrosion-resistant finish to field-connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed, which are subjected to corrosive action.

K. Waterproof Sealant: Use Kearney "Aqua Seal" mastic sealant on all below grade clamp or compression type connections.

L. Ground non-current carrying metal parts of electrical equipment enclosures, frames, conductors raceways or cable trays to provide a low impedance path for line-to-ground fault current and to bond all non-current carrying metal parts together.

3.3 GROUND ROD INSTALLATION

A. Grounding electrodes shall be located in the nearest usable planting area, where not otherwise indicated on the Drawings, and each electrode shall terminate within a concrete yard box installed flush with the finish grade. In planting area, the concrete yard box shall be 2" above planting surfaces.

B. A ground rod shall be installed at each new Service Pedestal to comply with SCE requirements. Ground rod shall be located within the footprint of the Service Pedestal in an approved location. Coordinate exact location with SCE.

C. Rods shall be driven vertically to depth of not less than 8'-0". Electrodes shall have a resistance to ground of not more than 15 ohms. If the resistance exceeds 15 ohms, multiple electrodes connected in parallel shall be provided. The minimum number and size of ground rods shall be as required by the State Electrical Safety Orders. Each electrode shall be separated from each other electrode by not less than 6'-0". Paralleled electrode shall be connected together with approved grounding conductors in galvanized rigid steel conduit, buried not less than 12" below finish grade.

3.4 EQUIPMENT GROUNDING CONDUCTORS

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 (EG) conductor. EG Conductor shall be installed entire length of <u>all</u> 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, 8-32 or larger. 'Forked' mechanical compression fittings shall be used for all stranded EG conductors. Where non-metallic raceways are used, the equipment ground conductor shall be connected directly to the ground terminal on the device with a pigtail. 'Forked' mechanical compression fittings shall be used for all stranded EG conductors. 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/terminal block secured to the interior of the enclosure. The bus/terminal block 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.

3.5 GROUNDING OF SERVICE EQUIPMENT

A. Ground in accordance with NEC.

B. Furnish and install all grounding as required by Southern California Edison Company (SCE) for new Electrical Service(s).

B. Ground enclosure and ground bus/terminal block in meter pedestal, or panelboard to ground bus/terminal block provided using insulated grounding electrode conductor.

C. Install copper bonding jumper between neutral and ground bus as shown.

3.6 SYSTEM TESTING AND FIELD QUALITY CONTROL

A. The Contractor shall include in his bid, the services an approved independent testing laboratory to test the grounding resistance of all ground rods.

B. The grounding resistance shall be tested by an approved independent testing laboratory. The grounding resistance shall be tested in the presence of the Owner’s Representative. The test results shall be submitted to the Owner’s Representative, in an official form, for file, with copies distributed to the City Electrical Inspector and Electrical Engineer.

C. Upon completion of the ground installation and before connection to the permanent power, the electrical contractor shall provide at his expense, a measurement of the new earth grounding electrode system. The testing shall utilize an earth resistance meter and be conducted in accordance with the IEEE Standard 3-point fall of potential method. Where tests show resistance-to-ground is over 15 ohms, take appropriate action to reduce resistance to 15 ohms, or less, by installing additional ground rods; then retest to demonstrate compliance.

D. The grounding system shall pass a "Sixty-two Percent Fall-of-Potential" test. The minimum length of the test conductors shall be 300 feet. Contractor shall have a curve of resistance vs. distance prepared. The contractor shall immediately notify the Owner's Representative if the measured resistance is above 15 ohms.

E. To meet resistance requirements, install additional ground rods.

F. Test metallic conduit and raceways, equipment enclosures, metallic structures and light standards for continuity to grounding system.

END OF SECTION

SECTION 16460

LOW VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Transformers as specified and as indicated.

1.2 RELATED SECTIONS

A. Division 01: GENERAL REQUIREMENTS

B. Division 16: ELECTRICAL

1.4 SUBMITTALS

A. Make submittals in accordance with Section 01300.

B. Shop Drawings: Include make, catalog number, dimensions, finish, type, insulation class, design temperature and taps provided. Include regulation at 80% and 100% of full load, no load loss, full load loss, percent efficiency, percent impedance, noise level and continuous capacity rating. Provide a connection schematic.

C. Test Reports:

1. No-Load Losses
2. Total Losses
3. Applied Voltage
4. Temperature Rise
5. Induced Voltage
6. Sound Level
7. Impulse Test

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Transformers shall be by Square D, G.E., Westinghouse, Sierra or approved equal.

2.2 DESIGN REQUIREMENTS

A. Transformers, Dry Type: Distribution transformers shall be constructed and tested in accordance with ANSI, NEMA and IEEE Standards, and shall be wound with copper or aluminum conductors. Performance of transformers shall be equal to or exceed ANSI, NEMA and IEEE published criteria.

B. Transformers shall be self-cooled type with 220° C. insulation and a maximum temperature rise of 150° C. under continuous full load conditions with an ambient of 40° C.

C. Transformers shall be equipped with four 2-1/2% (2 above and 2 below normal voltage) taps. Windings shall be of fire-resistant type, designed for natural convection cooling through normal air circulation.

D. Core mounting frames and enclosures shall be of welded and bolted construction with sufficient mechanical strength and rigidity to withstand shipping, erection and short circuit stresses.

E. Enclosure cover plates shall be code gage sheet steel, captive bolted to enclosure framework. Enclosure shall have suitable ventilating openings with rodent-proof screens. Enclosure shall be provided with lifting lugs and jacking plates as required. Transformers installed outdoors shall be weatherproof.

F. Transformers shall be furnished complete with mounting channels and mounting bolts. Metal parts, excepting cores and core mounting frames shall be cleaned, rust-proofed and given a heavy coating of an inert primer.

G. Transformer enclosure interior shall be lined with sound insulation to eliminate vibration noise from housing. It shall be provided with vibration dampers consisting of Korfund spring loaded shock mounts and Elastorib sheeting. Size and number of shock mounts shall be in accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Transformer core frame shall be installed level on shock absorbing pads within enclosure.

B. Mounting bolts on floor mounted transformers shall be extended into pads only and shall not be in direct contact with building structural members.

C. Flexible jumpers shall be installed for grounding continuity from enclosure to conduits or bus ducts where required.

D. Transformers installed outdoors or below grade shall be mounted on concrete pads as described under Division 03: CONCRETE.

3.2 VOLTAGE CHECK

A. Contractor shall set taps on all transformers which are a part of this Contract, as necessary to provide satisfactory operating voltages with all present loads energized, including new loads and any existing loads. A check shall be made in presence of the Inspector at a panel fed from each transformer which is farthest from transformer. Voltages at transformers ranging from 118 to 122 volts inclusive, for 120 volt systems and proportionately equivalent for higher voltage systems, are acceptable.

B. Contractor shall provide instruments and accessories required to perform checks. Voltmeters shall be accurate within 3/4 or 1% and shall have scales permitting voltage readings to be made on upper half of scale. Calibration of the meters shall be satisfactory to the Inspector.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Lighting and power distribution facilities, including panelboards.

1.2 RELATED SECTIONS

P. Division 01: GENERAL REQUIREMENTS

Q. Division 16: ELECTRICAL

1.3 SUBMITTALS

A. Submit in accordance with Section 01300: 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.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Panelboards shall be manufactured by W.A. Benjamin, General Electric, or approved equal.

2.2 DESIGN REQUIREMENTS

A. Panelboards:

1. Panelboards shall be wall-mounted, enclosed safety type with 120/240 volt, 3-wire solid neutral mains as indicated on Drawings or specified.

2. 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. 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. Two and 3 pole branches shall be enclosed, and shall be thermal magnetic circuit breakers with inverse time delay, non-tamperable, ambient compensated, single handle, internal common trip, and quick-make, and quick-break mechanism with silver alloy contacts. Circuit breakers shall be rated as indicated on the Drawings.

4. Main and subfeeder 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. 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.

6. 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.

7. 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.

8. All specified circuit breaker spaces shall include necessary hardware required for future installation of circuit breakers.

9. Provide locking devices for each individual circuit breaker. Padlocking device shall be secured to circuit breaker and by panel deadfront plate.

B. Panelboard Cabinets:

1. 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.

2. 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.

3. 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.

4. 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.

C. Panelboard Schedule: 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. 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 frame under transparent plastic 1/32" thick on inside of each panelboard cabinet door.

D. Panelboard Standards: All panelboards shall meet latest revisions of following standards:

1. National 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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Panelboards shall be located so that they are readily accessible and not exposed to physical damage.

B. Panelboards installed outdoors shall be specifically approved for wet locations and shall be weatherproof in a NEMA3 cabinet.

C. The Panelboard location shall have sufficient working space around the panel to comply with the California Electrical Code.

D. Panelboards shall be securely fastened to the mounting surface.

E. Unused openings in the cabinet shall be effectively closed.

F. Cabinets shall be grounded as specified in Article 250 of the California Electrical Code.

G. Conduits shall be installed to prevent moisture or water from entering and accumulating within the enclosure.

H. Lugs shall be suitable and approved for use with the conductor being connected.

I. Conductor lengths shall be kept to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.

J. Maintain the required bending radius of conductors inside the cabinet.

K. Clean the cabinet of all foreign material such as cement, plaster, paint.

L. Distribute and arrange conductors neatly in the wiring gutters.

M. Use the manufacturer's torque values to tighten all lugs.

N. Before energizing the panelboard the following steps must be taken:

1. Retighten all connections to the manufacturer's torque specifications. Verify that all required connections have been made.

2. All blocks used for shipment must be removed from all component devices and the panelboard interior.

3. Manually exercise all circuit breakers to make certain they operate freely.

4. Remove all debris from panelboard interior.

O. Follow all manufacturer’s instructions for installation.

END OF SECTION

SECTION 16500

LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

Lighting fixtures - general

Lighting

Lamps

Ballasts

LED light engines and LED drivers

1.2 RELATED SECTIONS

R. Division 01: GENERAL CONDITIONS

S. Division 26: ELECTRICAL

1.3 REFERENCES

A. California Building Code (CBC)

B. California Electric Code (CEC)

C. National Electrical Contractors Association (NECA)

D. California Administrative Code Title 24

E. American National Standards Institute (ANSI)

F. Institute of Electrical and Electronics Engineers (IEEE)

G. National Electric Manufacturer's Association (NEMA)

H. City, State and other local codes and requirements as applicable

1.4 SUBMITTALS

A. Refer to Division 01 for procedures for shop drawings and submittals.

B. Product Data: Submit manufacturer's product data and installation instructions on each type of exterior lighting fixture and component as per the requirements of Basic Electrical Requirements Section. Data shall be sufficient to show conformance to specified requirements and shall include the following:

1. Luminaires, including ballasts (or LED light engines and drivers as applicable) and all mounting hardware.

2. Mounting devices & all required accessories.

3. Lamp and wattage of lamp required.

4. Data for each type of LED light engine and LED driver

C. Shop Drawings:

1. Luminaires: Submit light fixture shop drawings in booklet form with separate sheet for each fixture, assembled in "fixture type" alphabetical or numerical order, with proposed fixture and accessories clearly indicated on each sheet. Include dimensions, accessories and installation and construction details. Photometric data, including zonal lumen data, average and minimum ratio.

2. Mounting Accessories: Submit complete details for all mounting accessories.

D. Wiring Diagrams: Submit control wiring diagrams for lighting indicating all control devices, photocells, time switches, contactors, etc. as indicated, described or required.

E. Samples: Submit samples as requested. Samples will be required for all substitutions, to allow proper evaluation of the proposed substitute.

F. Should the Contractor desire to propose substitutions, the Contractor shall provide all tests, data, samples, calculations, etc. that may be required by the Owner's Representative, as necessary to evaluate such substitutions, all at no cost to the Owner. Submittal for proposed substitutes shall include a complete computer generated "point by point" foot-candle calculation with horizontal and vertical foot-candle levels indicated for all surfaces of the illuminated area, etc.

1.5 SECTION SUMMARY

A. The work of this section shall include all services, labor, materials, transportation, equipment, plant and facilities to furnish and install all lighting, lighting controls, and accessory items indicated on the Drawings and specified herein.

B. Comply with requirements of California Administrative Code Title 24, California Electrical Code and all other codes referenced herein.

1.6 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 California Electrical Code.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver lighting fixtures and accessories in factory-fabricated containers or wrappings, which properly protect fixtures from construction debris and physical damage.

B. Store lighting fixtures and accessories in original wrappings in a clean dry space. Protect from weather, dirt, fumes, water, construction debris, and damage.

C. Handle lighting fixtures and accessories carefully to prevent damage, breaking, and scoring. Do not install damaged fixtures or components; remove units from site and replace with new.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate with other electrical work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of exterior lighting fixtures with other work.

B. Sequence lighting installation with other work to reduce possibility of damage and soiling of fixtures during remainder of construction period.

PART 2 - PRODUCTS

2.1 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 multiple fixtures are installed in combination, 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 accessories for a complete installation. All fixtures shall be supplied with lamps (or LED light engines and drivers as applicable) 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.

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 Owner's Representative 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.

2.2 LAMPS AND LIGHT SOURCES

A. Lamps shall be new and of wattage indicated, and shall be manufactured by General Electric, Westinghouse or Sylvania (unless indicated otherwise). Each fixture or lighting outlet shall be supplied with the proper base.

B. High Pressure Sodium (HPS) lamps shall be of wattage indicated, clear, mogul base, G.E. "Deluxe Lucalox" lamps, or approved equal. HPS lamps shall be color-corrected type with a minimum CRI 0f 70, and a 15,000 rated life.

C. LED light engines shall be of wattage and rating indicated and shall have a minimum power factor of 90% with a total harmonic distortion of less than 20%. LED light engines shall have a rated life of 100,000 hours at 25 degrees C ambient. LED light engines shall have a color temperature rating of 4000K.

D. Other lamps and light sources shall be of the type, size, and rating as indicated on the Drawings and/or as required for the fixture.

2.3 H. I. D. BALLASTS AND LED DRIVERS

A. All ballasts for HID fixtures of every type shall be 'high power factor' ballasts. 'Normal' or 'low' power factor ballasts are not acceptable.

B. LED drivers shall be of wattage and rating indicated and shall have a minimum power factor of 90% with a total harmonic distortion of less than 20%. LED drivers shall have an expected life up to 100,000 hours.

PART 3 - EXECUTION

3.1 FIXTURE INSTALLATION GENERAL

A. Fixtures shall be installed complete including lenses, lamps and finish trims. All fixtures shall be cleaned of dirt and grease.

3.2 EXAMINATION

A. Examine areas and conditions under which lighting fixtures are to be installed, and substrate that will support lighting fixtures. Notify Owner's Representative in writing of conditions detrimental to proper completion of the Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.3 INSTALLATION OF LIGHTING FIXTURES

A. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of CEC, NECA's "Standard of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.

B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the California Electrical Code.

C. Fasten electrical lighting fixtures and brackets securely to indicated structural supports, and ensure that installed fixtures are plum and level.

3.4 GROUNDING

A. Provide equipment grounding connections for lighting fixtures as indicated. Tighten connections to comply with tightening torques specified in UL STD 486A to assure permanent and effective grounds.

3.5 FIELD QUALITY CONTROL

A. Replace defective and burned out lamps (or LED light engines and drivers as applicable) for a period of one year following the Date of Substantial Completion. At the Date of Substantial Completion, replace lamps (or LED light engines and drivers as applicable) in exterior lighting fixtures that are observed to be noticeably dimmed after Contractor's use and testing, as judged by the Owner's Representative.

3.6 ADJUSTING AND CLEANING

A. Aim adjustable lighting fixtures and lamps in night test of system. The luminaire manufacturer (or its representative) shall generate and furnish a complete aiming chart for all luminaires. The aiming chart shall indicate the horizontal and vertical aiming angles for all luminaires as required. The aiming angles shall be as required to achieve the desired average foot-candle levels, and the desired ratios of minimum to maximum foot-candles and minimum to average foot-candles.

B. Clean lighting fixtures of dirt and debris upon completion of installation.

C. Protect installed fixtures from damage during construction period.

3.7 DEMONSTRATION

A. Upon completion of installation of lighting fixtures, and associated electrical supply circuitry, apply electrical energy to circuitry to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

END OF SECTION

EXISTING BUILDING


Shelters can be reserved by renting from Pleasant Valley Recreation and Park District Call 482-1996
2

Existing Building